

OXFORD LIBRARY OF PSYCHOLOGY

The *Oxford Library of Psychology*, a landmark series of handbooks, is published by Oxford University Press, one of the world's oldest and most highly respected publishers, with a tradition of publishing significant books in psychology. The ambitious goal of the *Oxford Library of Psychology* is nothing less than to span a vibrant, wide-ranging field and, in so doing, to fill a clear market need.

Encompassing a comprehensive set of handbooks, organized hierarchically, the *Library* incorporates volumes at different levels, each designed to meet a distinct need. At one level is a set of handbooks designed broadly to survey the major subfields of psychology; at another are numerous handbooks that cover important current focal research and scholarly areas of psychology in depth and detail. Planned as a reflection of the dynamism of psychology, the *Library* will grow and expand as psychology itself develops, thereby highlighting significant new research that will have an impact on the field. Adding to its accessibility and ease of use, the *Library* will be published in print and, later on, electronically.

The *Library* surveys psychology's principal subfields with a set of handbooks that capture the current status and future prospects of those major subdisciplines. This initial set includes handbooks of social and personality psychology, clinical psychology, counseling psychology, school psychology, educational psychology, industrial and organizational psychology, cognitive psychology, cognitive neuroscience, methods and measurements, history, neuropsychology, personality assessment, developmental psychology, and more. Each handbook undertakes a review of one of psychology's major subdisciplines with breadth, comprehensiveness, and exemplary scholarship. In addition to these broadly conceived volumes, the *Library* also includes a large number of handbooks designed to explore in depth more specialized areas of scholarship and research, such as stress, health and coping, anxiety and related disorders, cognitive development, or child and adolescent assessment. In contrast to

the broad coverage of the subfield handbooks, each of these latter volumes focuses on an especially productive, more highly focused line of scholarship and research. Whether at the broadest or most specific level, however, all of the *Library* handbooks offer synthetic coverage that reviews and evaluates the relevant past and present research and anticipates research in the future. Each handbook in the *Library* includes introductory and concluding chapters written by its editor to provide a roadmap to the handbook's table of contents and to offer informed anticipations of significant future developments in that field.

An undertaking of this scope calls for handbook editors and chapter authors who are established scholars in the areas about which they write. Many of the nation's and the world's most productive and best-respected psychologists have agreed to edit *Library* handbooks or write authoritative chapters in their areas of expertise.

For whom has the *Oxford Library of Psychology* been written? Because of its breadth, depth, and accessibility, the *Library* serves a diverse audience, including graduate students in psychology and their faculty mentors, scholars, researchers, and practitioners in psychology and related fields. Each will find in the *Library* the information they seek on the subfield or focal area of psychology in which they work or are interested.

Befitting its commitment to accessibility, each handbook includes a comprehensive index, as well as extensive references to help guide research. And because the *Library* was designed from its inception as an online as well as a print resource, its structure and contents will be readily and rationally searchable online. Furthermore, once the *Library* is released online, the handbooks will be regularly and thoroughly updated.

In summary, the *Oxford Library of Psychology* will grow organically to provide a thoroughly informed perspective on the field of psychology, one that reflects both psychology's dynamism and its increasing interdisciplinarity. Once it is published electronically, the *Library* is also destined to become a uniquely valuable interactive tool, with extended search and browsing capabilities. As you begin to consult this handbook, we sincerely hope you will share our enthusiasm for the more than 500-year tradition of Oxford University Press for excellence, innovation, and quality, as exemplified by the *Oxford Library of Psychology*.

Peter E. Nathan
Editor-in-Chief

Oxford Library of Psychology

CHAPTER
1

Introduction

Thomas A. Widiger

Abstract

This book concerns the Five Factor Model (FFM) of general personality structure. It brings together much of the research literature on the FFM and demonstrates its potential applications across a wide range of disciplines and concerns. The book is organized into four sections: the first section explores the FFM and its domains, the second focuses on matters and issues concerning the construct validity of the FFM, the third discusses applications of the FFM to a variety of social and clinical issues, and the fourth summarizes the book's interesting points and considers potential implications. Topics range from Neuroticism and Extraversion to Openness, Agreeableness, and Conscientiousness. The book also considers the universality of the FFM, the factor analytic support, childhood temperament and personality, animal personality, behavior and molecular genetics, personality neuroscience, personality disorders, adult psychopathology, and child psychopathology.

Key Words: Five Factor Model, personality structure, Neuroticism, Extraversion, Conscientiousness, childhood temperament, animal personality, molecular genetics, personality neuroscience, personality disorders

[John, Naumann, and Soto \(2008\)](#) asserted, in their chapter within the widely cited text edited by [John, Robins, and Pervin \(2008\)](#) on personality theory and research, that “after decades of research, the field has now achieved an initial consensus on a general taxonomy of personality traits, the ‘Big Five’ personality dimensions” (p. 116). This proclamation was perhaps overstated. Few areas of psychology can be said to have achieved consensus within an area of investigation that was once dominated by critical debate and sharp dispute. Even within this text, we will observe arguments and findings inconsistent with the Big Five perspective. Unanimity of opinion, and perhaps even an established consensus, may not really be achievable. But that is to be expected, if not embraced. Scientific research is driven largely by differences of opinion and ongoing debate

(Popper, 1963), and the structure of personality remains a richly productive line of investigation.

Nevertheless, consistent with the assertion of John, Naumann, et al. (2008), it does seem clearly evident that the Five Factor Model (FFM) of general personality structure has a singular strength and predominance within psychology. There are many reasons for this recognition. One is that the FFM has been richly successful in providing an integrative trait model. Its ready accommodation of the other predominant models of personality allows it not to compete with these models. As expressed by John, Naumann, et al. (2008), “rather than replacing all previous systems, the Big Five taxonomy serves an integrative function because it can represent the various and diverse systems of personality description in a common framework” (p. 116). We can recover and conceptualize most alternative dimensional trait models within the FFM (O’Connor, 2002, 2005; John, Naumann, et al., 2008; McCrae & Costa, 2003). We can also move higher up in the hierarchical model, working within a two-factor, three-factor, or four-factor model from which the FFM can be derived but, as suggested by Markon, Krueger, and Watson (2005), “the Big Five traits occupy an important, unique position in the hierarchy” (p. 154).

Authors of reviews of personality trait research repeatedly find that the FFM has proven to be very fruitful as a means of organizing a respective body of literature. Examples include the trait literature concerning temperament (Caspi, Roberts, & Shiner, 2005; Shiner & Caspi, 2003), temporal stability (Roberts & Del Vecchio, 2000), gender (Feingold, 1994), health psychology (Friedman & Kern, 2014; Hampson & Friedman, 2008; Segerstrom, 2000), positive and negative life outcomes (Ozer & Benet-Martinez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), personality disorder (Clark, 2007; Widiger & Trull, 2007), and even animal species behavior (Weinstein, Capitanio, & Gosling, 2008). The relative ease with which the FFM has been useful for such purposes reflects in part its coherence and comprehensiveness, as well as its naturally compelling inherent structure.

The FFM structure is comfortably aligned with how the trait language is itself organized, particularly within the English language. It is relatively easy to conceptualize personality trait literature in terms of the FFM in part because the organization of trait terms within the English language is itself consistent with the FFM. It may indeed be the case (De Raad et al., 2010)

that the first three domains of the FFM (i.e., Extraversion, Agreeableness, and Conscientiousness) are more unequivocally universal across languages than the latter two (i.e., Neuroticism and Openness), but it is also apparent that all five domains are necessary to fully account for personality trait research. Imagine the conceptualization of personality disorders and psychopathology more generally without the domain of Neuroticism. Neuroticism may not be as universal as Extraversion, but it would appear to be more than sufficiently universal. In any case, if our thoughts are in terms of the English language, then it is quite natural to conceptualize personality in a manner consistent with the FFM.

A further strength of the FFM is that it is atheoretical. There are certainly theoretical models for the existence, etiology, and structure of the FFM ([McCrae & Costa, 2003](#); [Wiggins, 1996a](#)), but the FFM structure is itself theoretically neutral. This substantially facilitates the ability for alternative theoretical models of personality (e.g., neurobiological, interpersonal, cognitive, and psychodynamic) to work together within the same model of personality structure. There is no necessary presumption as to how a person might have developed, for instance, a disposition for angry hostility, anxiousness, warmth, callousness, suspiciousness, or excitement seeking. Persons from alternative theoretical perspectives, such as the neurobiological ([DeYoung et al., 2010](#)), the interpersonal ([Wiggins & Trapnell, 1996](#)), and the psychodynamic ([Stone, 2013](#)), have worked comfortably within the FFM.

[Wiggins \(1996a\)](#) edited a text that provided five alternative theoretical models for the FFM, with chapters by [Digman \(1996\)](#), [Saucier and Goldberg \(1996\)](#), [McCrae and Costa \(1996\)](#), [Wiggins and Trapnell \(1996\)](#), [Hogan \(1996\)](#), and [Buss \(1996\)](#). “These essays [were] meant to illustrate (1) the diversity of theoretical perspectives that are currently being brought to bear on the FFM of personality and (2) the opportunities the FFM can provide for communication and the sharing of ideas among some of the major figures in contemporary personality research, investigators whose sub-disciplinary ‘boundaries’ might otherwise have proven less permeable to such exchanges” ([Wiggins, 1996b](#), p. viii). The current text will hopefully serve a similar function by informing one area of FFM investigation (e.g., research on Neuroticism, childhood antecedents, or universality) of all that is going on within another area of FFM investigation (e.g., research on Extraversion, adult psychopathology, and

assessment). To date, there has not been a text that brings together in one location all that is known about the FFM from different research programs.

The strength of a theoretical model is also evidenced by its ability to survive critical review (Meehl, 1978; Popper, 1963). The FFM, as a predominant model of general personality structure, has certainly been subjected to tough critical and empirical tests (e.g., Block, 1995, 2010; Shedler & Westen, 2004). It has not only survived (e.g., DeYoung, 2010b; John & Naumann, 2010; McCrae, 2010), it has arguably thrived, amassing a rich and extensive body of empirical research.

Indeed, a major strength of the FFM is the considerable body of empirical research in support of its validity that has now accumulated over the past few decades. A primary purpose of this text is to bring much of this research literature together within one location, as well as demonstrate its potential application across a wide array of disciplines and concerns. There are other notable texts devoted to the FFM, including, as noted earlier, the overview of alternative theoretical models edited by Wiggins (1996). De Raad and Perugini (2002) co-edited a text devoted simply to alternative measures for its assessment. The mere existence of this book was itself a testament to the importance and impact of the FFM, in that simply its assessment warrants an entire text. De Raad (2000) devoted a text to its lexical foundation. McCrae and Allik (2002) co-edited a text devoted to the cross-cultural and cross-language application of the FFM, documenting well its universal appeal and relevance. Finally, of course, McCrae and Costa (2003) composed a text on the FFM, summarizing the vast body of FFM research conducted by themselves and other investigative teams, presenting therein their own particular theoretical model for its understanding.

The current text is organized into four sections. The first section concerns the FFM and its domains, including a chapter covering Neuroticism by Jennifer Tackett and Benjamin Lahey (Lahey, 2009; Tackett, 2006), Extraversion by Joshua Wilt and William Revelle (Revelle, Wilt, & Condon, 2011; Wilt & Revelle, 2009), Openness by Angelina Sutin (McCrae & Sutin, 2009; Sutin, Beason-Held, Resnick, & Costa, 2009), Agreeableness by William Graziano and Renée Tobin (Graziano & Eisenberg, 1997; Graziano & Tobin, 2009, 2013), and Conscientiousness by Joshua Jackson and Brent Roberts (Jackson et al., 2010; Roberts, Chernyshenko, Stark, & Goldberg, 2005; Roberts, Jackson, Fayard,

[Edmonds, & Meints, 2009](#)). I believe readers unfamiliar with this literature will be struck and impressed by the sheer volume of theory and research devoted to each particular domain of the FFM. There is indeed a vast body of research devoted simply to Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness, and their many facets. I am truly grateful to the authors of these chapters for providing these overviews, as the task was quite daunting.

Introducing this section, as well as perhaps the book itself, is an overview of the FFM by Paul Costa and Jeff (Robert) McCrae. Their richly productive and internationally collaborative laboratory was highly instrumental in the recognition, growth, and development of the FFM. I was myself introduced to the FFM by Dr. Paul Costa. At the time I was serving as the Research Coordinator for the American Psychiatric Association's fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; [American Psychiatric Association, 1994](#)), with an office in New York City. I had collaborated on a number of projects with Allen Frances, Chair of *DSM-IV*. One such product was a review paper on personality disorders, arguing that the diagnosis and classification of the APA personality disorders should be informed by the research literature within psychology, including the research on dimensional trait models (e.g., [Widiger & Frances, 1985](#)). At that time, I was attempting to describe and differentiate the APA personality disorders with respect to the interpersonal circumplex (IPC), but was nevertheless having some difficulty adequately understanding the borderline, obsessive-compulsive, and schizotypal personality disorders with respect to the IPC ([Widiger & Frances, 1985](#); [Widiger & Hagemoser, 1997](#)). Paul Costa called me on the phone and asked if he could come for a visit. I agreed, and he introduced me to the FFM. In the course of this meeting it became readily apparent that the additional domains of Neuroticism, Conscientiousness, and Openness (i.e., beyond the interpersonal domains of Agreeableness and Extraversion) addressed extremely well the difficulties I was having with respect to the coverage of the borderline, obsessive-compulsive, and schizotypal personality disorders, respectively. Dr. Costa and I subsequently developed a productive collaboration (e.g., [Costa & Widiger, 1994](#); [Widiger & Costa, 1994](#)). It is with considerable pleasure that the first chapter is by Paul Costa and Robert McCrae.

The second section of the text is devoted to matters and issues concerning the construct validity of the FFM. Both junior and senior investigators were invited to provide chapters. Authors were free to express their own views and opinions, and it should become apparent that the authors are not simply advocates for the FFM. A variety of topics could be covered. Hopefully the reader will find that the key points of concern were indeed addressed, and in a manner that was objective, fair, thorough, and accurate. It is also apparent that each of the authors addressed key methodological, analytic, conceptual, and substantive issues that warrant further research and attention.

The second section begins with an overview of the robustness of the FFM by Brian O'Connor (O'Connor 2002, 2005), followed by the universality of the FFM by Jüri Allik and Anu Realo (Allik, 2006; Allik, Realo, & McCrae, 2013; McCrae & Allik, 2002), the lexical foundation by Boele de Raad and Boris Mlačić (De Raad, 2000; De Raad et al., 2010; De Raad & Perugini, 2002; Mlačić & Goldberg, 2007; Mlačić & Ostendorf, 2005), the factor analytic support by Aidan Wright (Wright & Simms, 2014; Wright & Zimmermann, 2015), childhood temperament and personality by Sarah De Pauw (De Pauw & Mervielde, 2010; Mervielde & De Pauw, 2012), animal personality by Alexander Weiss and Marieke Gartner (Gartner & Weiss, 2013; Weiss, Adams, Widdig, & Gerald, 2011; Weiss, Gartner, Gold, & Toinks, 2013), behavior and molecular genetics by Amber Jarnecke and Susan South (South & DeYoung, 2013; South & Krueger, 2014; South, Reichborn-Kjennerud, Eaton, & Krueger, 2012), and ending with personality neuroscience by Timothy Allen and Colin DeYoung (DeYoung, 2010a; DeYoung et al., 2010). It is evident from this series of chapters that there is an incredible body of research that supports and informs the validity of FFM personality structure. There are certainly gaps and differences of opinion, but the FFM is clearly a model of personality structure that is very heavily researched.

The third section of the text concerns applications of the FFM to a variety of social and clinical issues. The FFM is not just an abstract, academic model of personality structure. FFM personality traits have been associated with a wide array of important, consequential life outcomes (Ozer & Benet-Martinez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). Much of these outcomes and more are considered in some depth within this section.

Section Three begins with an overview of the assessment of the FFM by Leonard Simms, Trevor Williams, and Ericka Simms ([Simms et al., 2011](#); [Wright & Simms, 2014](#)). Central to any application of the FFM will be its proper assessment. This chapter is followed by a chapter on the application of the FFM to business and industry by Scott Seibert and David DeGeest ([DeGeest & Schmidt, 2010](#); [Seibert & Kraimer, 2001](#); [Zhao & Seibert, 2006](#)), health psychology by Margaret Kern and Howard Friedman ([Friedman, 2007](#); [Friedman & Kern, 2014](#); [Kern & Friedman, 2010](#)), marital and family therapy by Ralph Piedmont and Thomas Rodgerson ([Costa & Piedmont, 2003](#); [Piedmont, 1998](#); [Piedmont & Rodgerson, 2013](#)), personality disorders by Thomas Widiger, Whitney Gore, Cristina Crego, Stephanie Rojas, and Joshua Oltmanns ([Widiger & Costa, 2013](#); [Widiger, Crego, & Oltmanns, 2015](#); [Widiger, Samuel, Mullins-Sweat, Gore, & Crego, 2012](#)), adult psychopathology by Michael Bagby, Amanda Uliaszek, Tara Gralnick, and Nadia Al-Dajani ([Bagby, Quilty, & Ryder, 2008a](#); [Bagby et al., 2008b](#); [Costa, Bagby, Herbst, & McCrae, 2005](#)), and child psychopathology by Filip De Fruyt, Barbara De Clercq, and Marleen De Bolle ([De Bolle, Beyers, De Clercq, & De Fruyt, 2012](#); [De Bolle & Tackett, 2013](#); [De Clercq & De Fruyt, 2012](#); [De Fruyt & De Clercq, 2013, 2014](#)). The section ends with a discussion of the concept of clinical utility and its relevance to the application of the FFM to personality disorder conceptualization and treatment by Stephanie Mullins-Sweatt, Douglas B. Samuel, and Ashley C. Helle ([Mullins-Sweatt, 2013](#); [Mullins-Sweatt & Lengel, 2012](#); [Mullins-Sweatt, Lengel, & DeShong, 2015](#); [Samuel & Widiger, 2006](#)).

The fourth and final section of the book is a concluding chapter by myself. In this section I do my best to summarize interesting points from each chapter and discuss potential implications. Hopefully I represent each well, as I am very, very grateful for the willingness of these friends and colleagues to provide their chapters, and their outstanding success in having done so.

SECTION 1

The Five Factor Model



The NEO Inventories as Instruments of Psychological Theory

Paul T. Costa Jr. and Robert R. McCrae

Abstract

This chapter reviews the contribution of the NEO Inventories and the Five Factor Model to progress in personality psychology since Loevinger's 1957 essay. Personality structure is now viewed as a complex hierarchy of continuously distributed attributes; the content of this hierarchy consists of traits and their manifestations as needs, habits, and so on. The chapter also introduces the duality principle, according to which personality measures must be understood as both collections of characteristic adaptations and proxy measures of basic tendencies. Finally, the chapter considers the status of Five Factor Theory, a general theory of personality intended to account for research findings stimulated by the discovery and assessment of the Five Factor Model.

Key Words: history of psychology, personality assessment, personality theory, personality structure, traits

Reading [Loevinger's 1957](#) monograph, “Objective tests as instruments of psychological theory,”¹ is a bit like watching a documentary recreation of the evolution of mammals. In the film, we see recognizable prototypes of mice, horses, and monkeys, but the primordial landscape in which they move is alien to us. In Loevinger’s brilliant essay we can see the emerging form of modern psychometrics—the centrality of construct validity, the requirement (yet unnamed) of both convergent and discriminant validity, the importance of structural models—but all within the context of a psychology dominated by behaviorism and psychoanalysis. Loevinger took a realist stance with regard to the existence of traits, but said nothing about which traits are important; of today’s familiar domains only introversion and neuroticism are mentioned, both in passing. Because she wished to construe test responses as instances of behavior, Loevinger endorsed dichotomous item response formats and rejected Likert scales, which she saw as requiring judgment on the part of the respondent—a dubious business in those days before the cognitive revolution. Finally, she adopted unquestioningly the prevailing opinion that “self-reports concerning personality traits are subject to such massive distortion as to make them virtually worthless as direct measurements of personality traits” ([Loevinger, 1957](#), p. 646).

The psychological landscape has changed dramatically over the past 60 years, due in large part to research on, and using, objective personality tests. Loevinger would not have been surprised by this, because the fundamental premise of her monograph was that the enterprise of psychological assessment is intrinsically bound up with the development of psychological theory. Concepts and broader theories guide the initial development of tests; psychometric evaluations of the test lead to the refinement, or replacement, of conceptual interpretations; these in turn lead to revised measures. In this chapter we focus on how this dialectic has shaped both the NEO Inventories ([McCrae & Costa, 2010](#)) and our current understanding of personality.

Of course, the interplay of data and theory did not proceed in the orderly fashion that we will lay out here. In developing the NEO Inventories we frequently relied on intuitions that became codified as explicit theoretical premises only many years later, and revisions of the instrument sometimes lagged behind our conceptualizations—for example, we anticipated that there would be facet scales for the Agreeableness and Conscientiousness domains many years before we specified

and developed them. Readers interested in a chronological history can consult other chapters (e.g., Costa & McCrae, 2008).

Metatheoretical Premises Underlying the NEO Inventories

After several years of analyzing personality data (e.g., Costa, Fozard, McCrae, & Bossé, 1976; Costa & McCrae, 1978) from the ongoing Normative Aging Study (NAS; Bell, Rose, & Damon, 1972), we decided to create our own omnibus personality questionnaire, because (like everyone else who embarks on this project) we believed we could offer something better than the available instruments. Implicit in that decision was a set of assumptions about human nature (cf. Hjelle & Siegler, 1976) that we eventually articulated in terms of the premises of *knowability*, *variability*, *proactivity*, and *rationality* (McCrae & Costa, 1996). Knowability refers to the belief that human personality is an appropriate object for scientific research, not an ineffable metaphysical entity. This premise distinguishes psychologists from theologians, poets, and mystics. Variability asserts that people's personalities differ, and we chose to align ourselves with differential psychologists instead of those who—with equal legitimacy—seek universals of human nature. These two metatheoretical premises are hardly controversial, but in the intellectual climate of the 1970s, the premises of proactivity and rationality most certainly were.

Proactivity: The Reality of Traits

By proactivity we mean the idea that people are, in substantial measure, the origins of their own behavior. They are not empty organisms that merely react to their history of reinforcements, nor are they tabula rasa that take on the character imprinted by their family and the larger culture. They have an essential nature (whether innate, as in the classical concept of temperament, or acquired, as in Allport's 1937 notion of the functional autonomy of motives) that not only responds to the press of the environment, but also actively seeks out congenial circumstances. In short, people have traits. In the years following Loevinger's 1957 article, that belief had been challenged, most famously by Mischel's (1968) critique. A generation of psychologists had begun to assume that traits were mere attributions, social constructions with no objective basis in fact. In this view behavior was determined by the situation, and by the ways that people construed or misconstrued it. A self-report on a personality questionnaire might tell us something about how people thought of themselves, or how they wished to present themselves, but it told us nothing about what they were really like, because there was nothing to tell.

Creating a personality inventory in the 1970s was first and foremost a wager that this view was wrong. In retrospect this was a rather safe bet: Lay persons since antiquity and psychologists from Galton to Loevinger had believed that people could be characterized by their enduring dispositions. Yet so strong was the antitrait *zeitgeist* that we remained on the defensive for many years. We were emboldened to proceed chiefly because of a remarkable finding. We had inherited data collected years before at the NAS, and when we readministered the personality questionnaires, we found stability coefficients as high as .84 (Costa & McCrae, 1977a). As researchers hoping to uncover the origins of the profound developmental changes that everyone assumed must characterize adulthood, these results were disconcerting: If traits were fictions, why were they so durable? If they were real, why did they not vary in response to biological aging, midlife crises, epigenetic growth, and stressful life events? In place of the intriguing models of adult metamorphosis we had briefly entertained (Costa & McCrae, 1976), we began to think that William James had been right when he asserted that “by the age of thirty, the character is set like plaster” (1881/1890, p. 126).

Yet stability in self descriptions was not conclusive proof of the existence of traits; there were many alternative explanations for high retest correlations, including enduring response sets and a crystallized self-concept. We conducted a number of studies to rule out these possibilities (Costa, McCrae, & Arenberg, 1983; McCrae & Costa, 1982). But more direct evidence was needed—evidence that went beyond the questionnaire responses of the individual. Funder and colleagues (e.g., Funder & Sneed, 1993) pursued one form of validation, based on correlating trait scores with behavior observed in the laboratory. We choose a different approach: Cross-observer agreement. The lay conception of traits includes the assumption that traits are usually observable: Everyone can see that “John” is sociable and “Jane” is diligent. Of course, even laypersons acknowledge that there are differences of opinion, and that some people may on occasion conceal their true selves from everyone else. Still, substantial agreement among observers ought to be the rule. In the 1970s this very basic requirement for the existence of traits had been challenged, most notably by Fiske (1978). He believed that significant agreement could be obtained if at all only by aggregating across many observers, and that the resulting scores “would still have little conceptual value and would not refer to anything in the observable world. They are hardly more meaningful than the statement that the average women is .17 pregnant” (p. 109).

It was this need for empirical evidence on the degree of cross-observer agreement on personality traits that was behind our decision to create the NEO Inventories in two forms, S (for self-reports) and R (for observer ratings). Some earlier research (Jackson, 1974) had validated self-reports on questionnaire scales using global observer ratings, but that approach had certain limitations, including the unreliability of the single-item criterion. Our idea was to create parallel forms, using the same items phrased in first-person or third-person. Although Form R was initially created to validate Form S, we realized almost immediately that the same data would allow us to use Form S to validate Form R, and provide a second instrument. We quickly came to use both versions in the same study in order to provide multimethod replication of findings—for example, showing that the associations of personality traits with measures of psychological well-being were not mere artifacts of shared self-report methods (Costa & McCrae, 1984).

In 1980 we administered Form S of the 180-item NEO Inventory (assessing six facets for each of the three domains of Neuroticism, Extraversion, and Openness) to members of the Augmented Baltimore Longitudinal Study of Aging (BLSA; Shock et al., 1984), and 6 months later we administered Form R to their spouses. Results supported our hypotheses, with cross-observer correlations ranging from .30 to .58 ($N = 281$, all $p < .001$) for the 18 facet scales (McCrae, 1982). These were very substantial correlations indeed for a generation that had come to believe that trait correlations never exceeded the “.30 barrier.” Evidence of consensual validation was again crucial in expanding the three-domain NEO Inventory into the five-domain NEO Personality Inventory (NEO-PI; Costa & McCrae, 1985), because the two new domains, Agreeableness and Conscientiousness, were highly evaluative, and might have turned out to be nothing more than different evaluative biases in self-reports. Instead, correlations among peer raters and between mean peer ratings and self-reports ($rs = .28\text{--}.47$, $p < .01$) confirmed that these two factors were substantive characteristics of individuals (McCrae & Costa, 1987). Cross-observer agreement has subsequently been replicated in studies in adolescent (McCrae, Costa, & Martin, 2005), psychiatric (Yang et al., 1999), and cross-cultural (McCrae et al., 2004) samples. Combined with steadily accumulating evidence that traits, as assessed by instruments such as the NEO Inventories, are heritable (Jang, Livesley, & Vernon, 1996) and predictive of consequential life outcomes (Ozer & Benet-Martínez, 2006), these data demonstrate that traits are real features of persons. People have a real nature; they understand it, and others perceive it; it endures over decades; and it proactively helps shape people’s lives.

Rationality: The Interpretation of Self-Reports

If responses to a questionnaire are merely samples of behavior, then the manifest content of the item need bear no relation to the trait construct. That was the rationale for the development of the Minnesota Multiphasic Personality Inventory (MMPI; [Hathaway & McKinley, 1943](#)), whose scales were purely empirical. It was a rationale needed at a time when psychologists had a profound distrust of what people said, particularly about themselves. Psychoanalytic notions of defense had taught that blind spots in self-perceptions were the rule rather than the exception, and unconscious distortions were suspected not only with regard to Oedipal conflicts and latent homosexuality, but also about mundane topics such as neatness (an anal obsession?) and cheerfulness (reaction formation against feelings of maternal rejection?). We might hope to find items that distinguished groups high and low on a given trait, but the content would presumably be so disguised by defenses that attempting to understand the trait by reading the items would be as futile as trying to read a coded message without knowing the cipher.

Our approach to item writing was very different from that adopted by the authors of the MMPI. Our view was shaped primarily by our experience factor analyzing responses to a wide variety of questionnaires that had been administered to members of the NAS, such as the Cornell Medical Index (CMI) and the Strong Vocational Interest Blank (SVIB). Factor analysis shows which items covary, and the factor analyst must then make sense of the factors that are identified. It soon became abundantly clear to us that what the items in almost any factor chiefly shared was manifest content. The CMI, for example, had an Irritability factor with items concerning anger and frustration and a Depression factor with items concerning sadness and loneliness ([Costa & McCrae, 1977b](#)). The SVIB had a factor contrasting preference for sociable occupations such as YMCA Secretary and Social Worker with task-oriented occupations such as Architect and Farmer —a factor that was strongly correlated with self-report measures of Extraversion ([Costa, Fozard, & McCrae, 1977](#)). It was as if the respondents read and understood the items, and responded to them in a consistent and meaningful manner. That is what we mean by *rationality*, and it led us to write straightforward items for the NEO Inventories that embodied the constructs as we understood them. A few years later this decision was vindicated by analyses of the items of the MMPI itself ([Wrobel & Lachar, 1982](#)).

Of course, the fact that scale responses made rational sense did not, in itself, mean that they accurately described the respondent's traits. That was a question of construct validity, and hundreds of studies of NEO Inventory scales, using as criteria other measures, different observers, and alternative methods such as sentence completions ([McCrae & Costa, 1980, 1988a](#)), behavioral observations ([Sneed, McCrae, & Funder, 1998](#)), and clinical judgments ([Mullins-Sweatt, Jamerson, Samuel, Olson, & Widiger, 2006](#)), have provided supportive evidence. The NEO Inventories

Bibliography

(http://www4.parinc.com/WebUploads/samplerpts/NEO%20Biblio%202011_1.pdf) documents a vast nomological network that attests not only to the construct validity of the scales of the NEO Inventories, but more broadly to the rationality of respondents and the wisdom of Allport's advice: If you want to know what people are like, ask them.

Our commitment to rationality did not, of course, mean that we thought people were perfectly logical or absolutely consistent. For centuries philosophers have pointed to common fallacies in reasoning, and modern social psychology has made error in judgments one of its main concerns ([Ross, 1977](#)). We meant that respondents were reasonably rational, and that their responses were interpretable if we psychologists were equally reasonable. Do people tend to exaggerate their strengths and minimize their weaknesses? Of course. But we make allowance for that when we used normed tests, in which general evaluative biases are corrected. Do people sometimes misunderstand an item? Surely they do; that is why we ask a series of questions to assess any

single trait. Do people—or some people, at least—have a bias to agree (or disagree) with almost any statement? Acquiescent tendencies are well documented (McCrae, Herbst, & Costa, 2001), so we constructed an instrument with balanced keying, in which that bias is neutralized. Funder (1993) has made the point that error and accuracy are not logical opposites; we can be reasonably accurate without being error-free. Conversely, personality assessors (including clinicians) must always bear in mind that test scores never reveal the absolute truth about the individual; they are a useful approximation.

The Structure of Personality

The Five Factor Model (FFM) is a model of personality trait structure, and most surveys of the history of this topic address nothing more than the question of “How many factors are needed to describe personality traits?,” comparing older sixteen-factor models (Cattell, Eber, & Tatsuoka, 1970) or three-factor models (Eysenck & Eysenck, 1975) with the FFM, and perhaps mentioning rival contemporary models with more (Ashton et al., 2004) or fewer (De Raad & Peabody, 2005) factors. In 1957 many more possibilities were still in the running, and Loevinger coined the term *structural validity* to refer to the correspondence between the structure of the test and the intrinsic structure of the attributes it measured. Allport’s (1961) notion of personal dispositions and Kelly’s (1955) theory of personal constructs essentially claimed that there were as many structures of personality as there were persons. Guttman’s (1954) view of measurement in terms of scalability implied a structure in which trait manifestations were strictly cumulative. Although such a scalable structure has some desirable psychometric properties, there is no evidence that it is useful for assessing human personality.

In this section we review more current controversies. The bulk of the evidence suggests that personality attributes are best viewed as continuous dimensions, not discrete types or categories; that traits are hierarchically ordered, with multiple levels of specificity; and that the structure is neither simple nor neatly circumplex. Personality assessment instruments ought to be compatible with this understanding of structure.

Traits and Types

As an alternative to the usual rating format in which each individual’s response to an item was compared to the responses of others, Stephenson (1953) proposed the Q-sort method, in which the respondent compares items to other items to identify which are most and least descriptive. In personality research, this method was most fruitfully employed by Block (1961), who painstakingly assembled a set of items intended to cover the entire range of personality features. Each individual had a score on each of the 100 items of Block’s California Q-Set, and it was, of course, possible to factor these items in a sample of persons, just as it was possible to factor responses to items on the NEO Inventories. McCrae, Costa, and Busch (1986) reported such an analysis; it provided early evidence for the comprehensiveness of the FFM by showing that Block’s enumeration of personality features could be mapped by the FFM factors. The identification of FFM-like factors in the California Q-Set was subsequently replicated by Lanning (1994), although he also reported additional, smaller factors.

But the Q-sort methodology also lent itself to what appeared to be a very different kind of analysis. Two respondents with similar patterns of Q-sort responses would seem to be people with similar personalities, and person similarity could be quantified by correlating the two sets of 100 items. Such correlations could be computed for each pair of individuals in a sample, and the Q-correlation matrix could then be subjected to factor analysis. People who had high loadings on a given Q-factor could be seen as forming a *type*, a group of individuals with a similar personality

profile. To some researchers, this appeared to be a particularly fruitful way to conceptualize personality structure. If we could identify the type to which a person belonged, we knew immediately the entire configuration of their traits, just as knowing that an animal is a bird at once alerts us to the fact that the animal has feathers, lay eggs, is warm-blooded, and probably flies. Furthermore, this *person-centered* approach to personality (in contrast to the variable-centered approach adopted by the FFM) seemed to be more dynamic. What mattered in a Q-sort was not whether someone was agreeable or conscientious in an absolute sense, but whether someone was relatively more agreeable than conscientious, or vice versa. When faced with a situation that could elicit either agreeable or conscientious behavior, the Q-sort results seemed to predict which would prevail.

In the 1990s such considerations led to renewed interest in the use of Q-sorts and the investigation of types. Early results ([Asendorpf & van Aken, 1999](#); [Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996](#)) suggested that when types were based on the full range of personality attributes found in the FFM, three types reliably emerged, usually called Resilient, Undercontrolled, and Overcontrolled—types that Block himself had proposed years earlier. These findings provided a structural alternative to the standard FFM: The two models covered identical ranges of personality traits, but organized them in very different ways.

Enthusiasm for this approach quickly waned, however, as a number of limitations of types became apparent:

1. Types were not cleanly separated. Instead of discreet clusters of individuals, persons were smoothly distributed across the cluster space, with most people falling between cluster centers—for example, equally resembling a Resilient and an Undercontrolled type.
2. Types did not offer any predictive advantage. In fact, head-to-head comparisons showed that considerably more information was contained in the five factor scores on which types were based than in the three types themselves ([Asendorpf, 2003](#)). If types were the natural cleavages of distinct kinds of people, the opposite effect would be expected.
3. Subsequent attempts at replication, encouraged by a Special Issue of the *European Journal of Personality*, provided very mixed support ([Costa, Herbst, McCrae, Samuels, & Ozer, 2002](#); [McCrae, Terracciano, Costa, & Ozer, 2006](#)). Types resembling Resilient, Undercontrolled, and Overcontrolled were found in some samples and with some statistical methods, but they were far from robust.
4. The argument that person-centered approaches are inherently more dynamic than variable-centered approaches is specious, because they are interchangeable. It is possible, for example, to easily create a person-centered profile from the familiar variable-centered NEO Personality Inventory profile by simply ranking the individual's *T*-scores. For example, according to an expert rater, Jean-Jacques Rousseau had *T*-scores of 61 on Tender-Mindedness, 45 on Altruism, and 32 on Trust ([McCrae, 1996](#)). We might conclude from this that he was sympathetic with his fellow human beings in principle, but not particularly generous to the people around him, possibly because he had a deep distrust of them. This “dynamic” interpretation is made by comparing facet scores within a profile, but it is based on the usual normed scores of a variable-centered approach. A Q-sort that showed a higher ranking for Tender-Mindedness than for Trust would yield the same information.
5. In fact, person-centered and variable-centered approaches turn out to be statistically equivalent, as shown by [McCrae, Terracciano, Costa, and Ozer \(2006\)](#). When five person factors were extracted from standardized responses to the California Q-Set, they could be perfectly aligned with the usual FFM. The “types” discovered in this way were simply neurotic versus stable, extraverted versus introverted, open versus closed, agreeable versus antagonistic, and conscientious versus undirected collections of people.

Q-sort types are syndromes or configurations of many different traits, but the term *type* is also used to refer to discrete (e.g., bimodal) distributions in a single trait dimension. Most psychologists assume, with good reason, that traits are more or less normally distributed. We need only examine the distribution of scores on almost any personality scale to see the familiar bell shape. Occasionally theorists have argued that this apparent continuity masks an underlying discontinuity. The Myers-Briggs Type Indicator (MBTI; [Myers & McCaulley, 1985](#)), for example, is based on the premise that people can be divided into two discreet classes on each of four indices—for example, into introverts and extraverts. These discrete classes are then configured into 16 qualitatively distinct types. However, empirical studies have failed to find support for either the dichotomous classes or the MBTI types ([McCrae & Costa, 1989b](#); [Reynierse, 2012](#)).

The distinction between dimensional and categorical structures has figured most prominently in conceptualizations of normal versus abnormal personality traits. Normal personality traits are usually viewed as having a continuous distribution, whereas abnormal traits are often seen as qualitatively different from normal functioning, just as having polio is qualitatively different from not having polio. One of the most important applications of the FFM has been in understanding personality disorders (Widiger & Costa, 2013), and one of the clearest results of research has been the demonstration that personality disorders are not qualitatively distinct categories (Livesley, 2001). Instead, individuals who are diagnosed with personality disorders typically show extremely high or low levels of a trait or a set of traits, together with problems in living that are associated with these traits (McCrae, Löckenhoff, & Costa, 2005). The alleged structural difference between normal and abnormal is largely illusory, at least with regard to personality structure.

Levels of the Trait Hierarchy

The FFM is a hierarchical model, in which related groups of narrow and specific traits combine into broader and more general traits. Almost all research in support of the FFM structure has consisted of factor analyses of narrow traits; the truly remarkable finding in this body of literature is that five very similar factors emerge regardless of the narrow traits selected, as long as they constitute a wide sample of personality attributes. This is true of English language adjectives (Goldberg, 1990), California Q-Set items (Lanning, 1994), psychological needs (Costa & McCrae, 1988), measures of temperament (Angleitner & Ostendorf, 1994), facets of the Turkish translation of the Revised NEO Personality Inventory (NEO-PI-R; Gülgöz, 2002), or standard personality scales assessing normal and abnormal traits (Markon, Krueger, & Watson, 2005). This consistent finding has led to the current consensus on the value of the FFM, to its description as “the most scientifically rigorous taxonomy that behavioral science has” (H. Reis, personal communication, April 24, 2006), and, indeed, to this *Handbook*. Although some researchers still argue for more (Ashton et al., 2004) or fewer (De Raad & Peabody, 2005) factors, almost everyone agrees that the FFM is a reasonably close approximation to the true structure of personality, an “adequate taxonomy of personality attributes” (Norman, 1963).

Curiously, this is the only feature of the hierarchy of traits on which there is agreement. There is an ongoing controversy about whether the five factors themselves are orthogonal, and thus the topmost level of the hierarchy, or correlated, thus constituting yet higher levels. There is no doubt that most measures of the five factors (e.g., adjective scales, domains of the NEO Inventories) show intercorrelations, which usually (although not always; see Costa & McCrae, 1992a) contrast Agreeableness and Conscientiousness with Neuroticism, and link Extraversion and Openness. Digman (1997), who first pointed this out, called the former second-order factor *Socialization* and the latter *Personal Growth*. DeYoung, Peterson, and Higgins (2002) preferred the labels *Stability* and *Plasticity*. The question is whether the correlations between scales that lead to these superfactors are substantive or merely artifacts—in particular, evaluative biases of negative and positive valence, respectively. If evaluative biases generate the intercorrelations, they ought not to be seen across raters, and some studies have supported that prediction (Biesanz & West, 2004). However, the issues are extraordinarily complicated (see also the chapter by Wright), and even elaborate designs involving self-reports and observer ratings of monozygotic and dizygotic twins yield somewhat ambiguous results (McCrae et al., 2008). It appears that correlations among measures of the five factors are certainly inflated by method biases, if not entirely created by them, so any real higher-order factors that may exist are extremely subtle, and presumably of limited explanatory value. For the NEO Inventories, orthogonal factor scores consistently show higher convergent and discriminant cross-method validity than do correlated scores (McCrae & Costa,

1989a; McCrae et al., 2008). For practical purposes, it may be reasonable to assume that the five factors are truly independent.

The final step in this upward progression is the proposal that Stability and Plasticity are themselves correlated, leading to a single, general factor of personality (GFP; van der Linden, te Nijenhuis, & Bakker, 2010), combining the more desirable pole of each factor. This GFP is, of course, related to a wide variety of criteria, because its constituents are related to many outcomes. Whether anything is gained by adding them together is questionable. Of course, if the FFM is truly orthogonal, then the general factor must be pure artifact. In a sophisticated study of 1,615 German twins for whom self-reports and two peer ratings were available, Riemann and Kandler (2010) concluded that “the conjecture of a meaningful GFP is not supported in the analysis of variance shared by self- and peer reports and controlled for method specific effects” (p. 271; see also Ferguson, Chamorro-Premuzic, Pickering, & Weiss, 2013).

More fruitful controversies are found at lower levels of the hierarchy. The simplest strategy would be to subdivide each of the five broad domains into two subdomains, called *aspects* by DeYoung, Quilty, and Peterson (2007). If the six facets of each NEO-PI-R domain in the normative sample are factored, a single factor has an eigenvalue greater than 1.0, suggesting no natural subdivision. But a number of subdivisions have been suggested, either on rational grounds or based on factor analyses of a larger pool of facets than is provided by the NEO Inventories. Costa and McCrae (1980), for example, noted that the facets of NEO Extraversion can be conceptually classified as interpersonal (E1: Warmth, E2: Gregariousness, and E3: Assertiveness) and temperamental (E4: Activity, E5: Excitement Seeking, and E6: Positive Emotions), and McCrae and Costa (1987) pointed to inhibitive and proactive aspects of Conscientiousness. Glisky, Tataryn, Tobias, Kihlstrom, and McConkey (1991) divided Openness into Imaginative Involvement and Liberalism. Ashton and Lee (2005) have proposed a six-factor model that is (from our point of view) chiefly distinguished from the FFM by subdividing a broad Agreeableness factor into narrow Agreeableness and Honesty/Humility. The six-factor model of Jackson and Tremblay (2002) divides Conscientiousness into Methodicalness and Industriousness. Caprara, Barbaranelli, Borgogni, and Perugini (1993) created two scales for each of the five factors, based on an examination of Italian trait adjectives. For example, they offered Emotional Control and Impulse Control as aspects of Neuroticism (or rather its polar opposite, Emotional Stability).

One empirical study (DeYoung et al., 2007) dissected all five domains using a joint factor analysis of NEO-PI-R facets and the facets of the Abridged Big Five Circumplex (AB5C; Goldberg, 1999). In the latter instrument, each domain was represented by a pure indicator and eight blends (e.g., Openness has pure Openness, Agreeable Openness, and Disagreeable Openness facets, along with six other blends). The aspects of DeYoung and colleagues (2007) bear only a partial resemblance to previous suggestions. For example, their subdivision of Agreeableness into Compassion and Politeness corresponds to the Agreeableness and Honesty/Humility factors of Ashton and Lee (2005), and their Volatility and Withdrawal aspects of Neuroticism appear to resemble the Impulse Control and Emotional Control factors of Caprara and colleagues (1993). However, the Enthusiasm aspect of DeYoung and colleagues (2007) combines E6: Positive Emotions not with other temperamental facets of Extraversion, but with E1: Warmth and E2: Gregariousness, and they classify both the inhibitive C3: Dutifulness and the proactive C4: Achievement Striving as parts of an Industriousness aspect. There does not yet seem to be a compelling reason to adopt any existing classification at the aspect level (see also Judge, Rodell, Klinger, Simon, & Crawford, 2013).

Much more research has been conducted at the next lower level, *facets*. Although many instruments measure only the five factors (De Raad & Perugini, 2002), there is clear evidence that

assessment of more specific traits is worthwhile to increase predictive and discriminant validity (Paunonen & Ashton, 2001; Reynolds & Clark, 2001). In developing the NEO Inventories, we reviewed the personality literature in an attempt to identify the most important traits to represent each factor. Gorsuch (1974) had recommended that six variables be included to clearly define each factor in an analysis, so we identified six facets per domain (Costa & McCrae, 1980; Costa, McCrae, & Dye, 1991). We wrote items based on our rational analyses of the facet constructs, and used item factor analyses with targeted rotations to select items that showed convergent and discriminant validity with respect first to other factors and then to other facets within their domain—a fundamental application of the dialectic between theory and data that Loevinger had espoused. Subsequent analyses in independent samples confirmed that the facets of the NEO Inventories do in fact divide up the items in meaningful ways (McCrae & Costa, 2008a). Other studies have shown convergent and discriminant validity for NEO facets across observers and with respect to other measures (Costa & McCrae, 1992b).

The facets of the NEO Inventories thus constitute one possible and useful way to specify narrow traits within the five domains, but they are clearly not the only way. For example, Watson and Clark (1997) combined Warmth and Gregariousness into an Affiliation facet; Cheung and colleagues (Cheung et al., 2008) proposed a Diversity facet for Openness. At present there does not seem to be any natural way to carve up the domains in the way that the five factors consistently carve up the personality sphere.

What we can do is compare different proposals to determine the extent to which they agree, and to what new facet-level constructs they point. Table 2.1 offers a mapping of facet-level constructs across instruments and studies. The first column lists the facets of the NEO Inventories, together with an *Other* row for each domain. The second column shows corresponding scales in the Sixteen Personality Factor Questionnaire (16PF; Conn & Rieke, 1994), and the third column shows scales from the Eysenck Personality Profiler (EPP; Eysenck, Barrett, Wilson, & Jackson, 1992). For these two inventories, scales are aligned with the NEO facet with which they are most strongly correlated ($r_s = .38$ to $.81$, $p < .001$). The remaining columns in Table 2.1 report efforts to facet three of the domains. Watson and Clark (1997) suggested facets of Extraversion based on a review of the literature. Cheung and colleagues (2008) identified potential facets of Openness in Chinese culture, and Woo and colleagues (2014) factored scales from several inventories to suggest facets of Openness. Roberts, Bogg, Walton, Chernyshenko, and Stark (2004) based their facets of Conscientiousness on an analysis of trait adjectives, whereas Roberts, Chernyshenko, Stark, and Goldberg (2005) factored Conscientiousness-related scales from personality inventories. The alignment of these traits with NEO facets in Table 2.1 is conceptual, guided where possible by empirical findings in these studies—for example, Cheung and colleagues reported that the Social Sensitivity scale, intended as a facet of Openness, in fact loaded chiefly on an Extraversion factor.

There appears to be some degree of consensus across studies. For example, O6: Values is similar to Tolerance and to low Dogmatism, Conventionality, and Traditionalism. C2: Order has its counterparts in Perfectionism, Obsessive, Orderliness, and Order. Only six of the 30 NEO facets are not seconded in any other system: N5: Impulsiveness, N6: Vulnerability, O3: Feelings, A3: Altruism, A6: Tender-Mindedness, and C5: Self-Discipline. Inspection of the *Other* rows in Table 2.1 suggests that it might be desirable to add a Social Sensitivity facet to Extraversion, Diversity and Formalness facets to Openness, Interpersonal tolerance to Agreeableness, and Punctuality, Responsibility, and Virtue facets to Conscientiousness.

It is also noteworthy that the alternatives to the NEO system of facets do not agree among themselves. Punctuality emerges as a facet of Conscientiousness when adjectives are considered, but not personality scales. Diversity appears as a facet in the Chinese study, but not in an American study of Openness scales. Thus, the structure of personality at the level of facets appears to be ill-

defined; some system of facets is needed and useful, but which system is chosen is to some extent arbitrary.

[De Young and colleagues \(2007\)](#) noted in passing that there may be a level of trait attributes below facets, corresponding operationally to individual items. For example, a hostility scale may include one item that taps anger and another that taps bitterness. Anger and bitterness are both relevant to hostility, but they are not identical. [McCrae \(2015\)](#) has proposed the term *nuance* to describe characteristics at this lowest level, and argued that facet scales ought to sample a wide range of nuances, instead of seeking to maximize internal consistency through the selection of items with redundant content. If items express different nuances of a facet they must have item-specific variance, and [Mõttus, McCrae, Allik, and Realo \(2014\)](#) have demonstrated in a large Estonian sample that this item-specific variance is consensually valid. In that study, item residuals were created by partialling out the relevant facet score; residuals in self-reports were then correlated with residuals in observer ratings. All 240 items in the Estonian NEO-PI-3 showed small but statistically significant cross-observer agreement on residuals.

Table 2.1. Correspondence of Facet-Level Scales

NEO-PI-R Facet	16PF Scale^a	EPP Scale^b	E Facet^c	O Facet^d	O Facet^e	C Facet^f	C Facet^g
N1: Anxiety	Apprehension	Anxious, Hypochondriacal					
N2: Angry Hostility	Tension						
N3: Depression	-Emotional stability	Unhappy, Dependent					
N4: Self- Consciousness		Inferior, Guilty					
N5: Impulsiveness							
N6: Vulnerability							
<i>Other N</i>							
E1: Warmth			Affiliation				
E2: Gregariousness	-Self-reliance, Sociable Warmth		Affiliation				
E3: Assertiveness	Social boldness, Dominance	Assertive	Ascendance				
E4: Activity		Active	Energy				
E5: Excitement Seeking	Liveliness	Sensation seeking	Venturesomeness				
E6: Positive Emotions			Positive affectivity				
<i>Other E</i>				Social sensitivity			
O1: Fantasy	Abstractedness						
O2: Aesthetics	Sensitivity	-Tough-minded		Aesthetics	Aesthetics		
O3: Feelings							
O4: Actions	Openness to change		Novelty				
O5: Ideas		-Practical		Divergent thinking	Intellectual efficiency, Curiosity, Depth		
O6: Values		-Dogmatic			Tolerance	-Traditionalism	
<i>Other O</i>				Diversity		Conventionality	Formalness
A1: Trust	-Vigilance, - Privateness						
A2:		-Manipulative					
Straightforwardness							
A3: Altruism							
A4: Compliance		-Aggressive					
A5: Modesty							
A6: Tender- Mindedness							
<i>Other A</i>				Interpersonal tolerance			
C1: Competence					Decisiveness		
C2: Order	Perfectionism	Obsessive			Orderliness	Order	
C3: Dutifulness		-Irresponsible			Reliability		
C4: Achievement Striving		Ambitious	Ambition		Industriousness	Industriousness	
C5: Self-Discipline							
C6: Deliberation	Rule- consciousness	-Impulsive, - Risk-taking, Expressive			Impulse control	Self-control	
<i>Other C</i>					Punctuality	Responsibility, Virtue	

Note : Scales preceded by a minus sign are inversely related. NEO-PI-R = Revised NEO Personality Inventory. 16PF = 16PF, Fifth Edition. EPP = Eysenck Personality Profiler.

^a Conn and Rieke (1994).

^b Costa and McCrae (1995b).

^c Watson and Clark (1997).

^d Cheung et al. (2008).

^e Woo et al. (2014).

^f Roberts, Bogg, Walton, Chernyshenko, and Stark (2004).

^g Roberts, Chernyshenko, Stark, and Goldberg (2005).

Classical models of scale reliability assume that items are determined solely by the trait the scale measures and random error. But if items measure different nuances of a trait, there is also item-specific variance. One implication is that retest reliability should be higher than internal consistency, because item-specific variance detracts from internal consistency but contributes to retest reliability. And in fact, retest reliability is usually higher than internal consistency (McCrae, 2015). Because item-specific variance is shared by observers (Möttus et al., 2014), retest reliability ought to be a better predictor of cross-observer agreement on facet scores than is internal consistency, and that is indeed the case (McCrae, Kurtz, Yamagata, & Terracciano, 2011). But McCrae and colleagues also showed that retest reliability is a better predictor of facet heritability, suggesting by the same logic that nuances of facets are also themselves heritable—a hypothesis that has not yet been tested, but had been proposed (Harkness & McNulty, 2002). Much remains to be learned about nuances of personality.

The Shape of the Hierarchy

The FFM is often described as a taxonomy of traits, but that is true only in a very loose sense. In biological taxonomy, for example, each species is included exclusively in a single genus, and each genus in a single family. Werewolves aside, there are no animals that are part canine and part primate. Personality traits, however, are often related to more than a single factor. E3: Assertiveness, for example, is related to low Neuroticism, low Agreeableness, and high Conscientiousness as well as Extraversion. This is a well-established fact, supported by data from many cultures (McCrae & Costa, 1997). In factor analytic terms, this means that personality does not show simple structure, and structural equation models that impose simple structure do not fit the data (McCrae, Zonderman, Costa, Bond, & Paunonen, 1996).

One alternative to simple structure is circumplex structure, and there is ample evidence that interpersonal traits show such a circular order (Wiggins & Broughton, 1985). E3: Assertiveness is a disagreeable form of Extraversion, whereas E1: Warmth is an agreeable form. Some efforts have been made to assess traits by systematically crossing each pair of factors (Goldberg, 1999), but many combinations are poorly represented in trait descriptive adjectives. Judging from the pattern of loadings in the NEO-PI-R, there do not appear to be any neurotic facets of Openness, nor any stable facets. In short, personality traits, at least at the facet level, appear to show a rather messy hybrid of simple and circumplex structures. This structure can be adequately represented by a factor matrix, provided we pay attention to secondary and tertiary loadings as well as primary loadings.

Sixty years after Loevinger's essay we have a much clearer idea of the structure of personality traits. There are many trait-like attributes—stable, observable, and heritable—that are all more or less normally distributed. They vary in breadth, from subtle nuances up to the five broad factors, and possibly beyond. They are clustered hierarchically through their associations with each other, and all (or at least most of them) are influenced by one or more of the FFM factors.

Correspondingly, the NEO Inventories have items expressing nuances, each scored on a five-point Likert scale that recognizes the normal distribution of attributes; facets that load on one or more of the five factors; and factor scores that represent the essential orthogonality of the five. Scores are interpreted in terms of five levels (from *Very Low* to *Very High*) to emphasize the dimensional nature of traits. In a nod to circumplexity, there is even a provision for interpreting pairs of factors, which jointly define personality *styles* (Costa & Piedmont, 2003). It appears that the NEO Inventories show a fair degree of structural validity.

The Content of Personality and the Duality Principle

The success of the FFM is due in large measure to its comprehensiveness: It encompasses most, if not all, of the attributes of the personality sphere. Establishing comprehensiveness is a difficult task. Teams of mathematicians around the world spent decades discovering sporadic symmetry groups,² and then proving that there are exactly 26 of them, and that no more will ever be found (Ronan, 2006). Psychologists have a more difficult task, because there is in principle no way to prove that any proposed model is absolutely comprehensive: Any day, a hitherto undiscovered trait may pop up. Instead, psychologists must diligently seek out new traits and compare different lists to see what, if anything, is missing. Our present knowledge has evolved through successive approximations in which conceptions, assessment instruments, and empirical findings have led to their mutual evolution. For example, it is well known that the FFM can be traced to the lexical hypothesis, which asserts that all important traits have been codified in natural language terms (John, Angleitner, & Ostendorf, 1988). Adjective scales were created to represent the five lexical factors and were then correlated with other trait models, including the early three-factor NEO model (McCrae & Costa, 1985). Such research showed that lexical Factor V, sometimes called Intellect, was closely akin to Openness to Experience. But Openness is a broad and subtle factor, and it soon became clear that its facets are not adequately represented in English language trait terms (McCrae, 1990). In that sense, the lexical hypothesis is wrong—some important traits are *not* codified in natural language adjectives—but it had provided a crucial step in the right direction.

The BLSA proved to be an exceptionally valuable resource in this quest. As part of a broad and long-term biomedical and psychosocial study, several hundred volunteers (and their spouses and friends) agreed to complete personality questionnaires. Over the course of several years they provided data on most of the major personality inventories in use, from the MMPI to the Revised Interpersonal Adjective Scales (Wiggins, Trapnell, & Phillips, 1988). Correlations of these instruments with each other and with standard measures of the FFM, including the NEO Inventories, provided persuasive evidence that the FFM is reasonably comprehensive. This does not mean that personality traits can be reduced to five scores. Because traits are hierarchically structured, narrow traits include both variance that is common to the five factors and variance that is specific. The FFM is not a set of five factors; it is the complete matrix of five factors and the many lower-level variables that define them.

It is of course true that not all individual difference variables fall within even this broad definition of the FFM. There is an assortment of isolated variables that seems to be essentially independent of all five factors (Saucier & Goldberg, 1998), and proposals have been made for a few additional broad factors, including spirituality (Piedmont, 1999), interpersonal relatedness (Cheung et al., 2001), and gender diagnosticity (Lippa, 1991). It is not yet clear whether these are best thought of as new dimensions of personality traits, or whether they can be incorporated into the FFM (perhaps a somewhat broader FFM than the NEO Inventories assess). For example, some forms of spirituality, such as the self-transcendence scales of the Temperament and Character

Inventory (Cloninger, Przybeck, Svarkic, & Wetzel, 1994), load on an Openness factor (McCrae, Herbst, & Costa, 2001).

Or perhaps they do not belong in the category of personality at all. Historically, intelligence has sometimes been included in the personality sphere—indeed, one of the 16PF scales is a measure of intelligence—and early interpretations of the Intellect factor identified it with intelligence (Goldberg, 1981). But it is now well established that Openness is only weakly related to intelligence or academic achievement (Nofle & Robins, 2007), so if intelligence is to be included in the personality sphere, it is best regarded as a sixth factor (McCrae, 1994). However, most psychologists exclude abilities from personality per se.

The Nature of Traits

The distinction between dispositions and abilities raises the deeper question of what the attributes included in the FFM really are. That issue was far from resolved when the NEO Inventories were first developed. At that time, a number of terms were in common use to describe individual differences in personality, including *trait*, *need*, *motive*, *habit*, *temperament*, *personality disorder*, and *folk concept*. In the wake of Mischel's (1968) critique, *trait* was perhaps the least popular of these. Much careful thought has gone into distinguishing among these kinds of attributes. For example, Pervin (1994) argued that traits were overt patterns of behavior, whereas motives were deep-rooted tendencies that guided behavior in flexible ways. Allport (1937) had distinguished adaptive traits from expressive traits. Some traits were relational and some were temperamental; some were adaptive and some were maladaptive. Yang and colleagues (2014) argued that situations,³ behaviors, and explanations are the key ingredients of traits. These are all meaningful conceptual distinctions, but how they would map onto the FFM was unclear in the 1980s. The NEO Inventories are often said to assess “emotional, interpersonal, experiential, attitudinal, and motivational characteristics” (Costa & McCrae, 2014, p. 231). Do these five terms apply respectively to the five factors, such that Neuroticism consists of emotional traits, Extraversion consists of interpersonal traits, and so on? If so, it would provide a perfect alignment of conceptual and empirical classifications of traits.

But research relating the FFM to alternative measures of personality led to two less tidy conclusions. First, it established that regardless of the conceptualizations and labels used, most individual differences assessed in personality questionnaires fit within the FFM. The California Psychological Inventory (CPI; Gough, 1987), for example, was intended to assess folk concepts, not traits—yet CPI scales were substantially related to NEO-PI factors (McCrae, Costa, & Piedmont, 1993). The Personality Research Form (PRF; Jackson, 1984) measures Murray's needs, but a joint factor analysis of the PRF and NEO-PI factors showed that all those needs loaded on FFM factors (Costa & McCrae, 1988). The MBTI was designed to assess Jungian attitudes and functions, but its four scales corresponded directly and substantially to four of the five FFM factors (McCrae & Costa, 1989b). At least in one important sense, the conceptual distinctions among different kinds of individual difference variables are all moot: They all refer to aspects of the same FFM, and can be considered generically as *traits*.

The second conclusion is that there is no neat one-to-one correspondence between kinds of traits and their empirical clustering into factors. Many emotional traits (such as characteristic levels of anger, sadness, and guilt) fall within the Neuroticism domain, but positive emotions form a part of Extraversion, and love and sympathy are emotions tied to Agreeableness. Traditionally, Extraversion and Agreeableness have been considered interpersonal factors, but in fact all five factors have interpersonal implications (Costa & McCrae, 2010), perhaps most notably Openness, which affects friendships, marriage, social attitudes, and political behavior (McCrae, 1996).

Conscientious people are highly motivated, but each of the five factors is associated with a distinct set of Murray's needs ([Costa & McCrae, 1988](#)): All traits have implications for motivation. The jaunty step of extraverts is an expressive trait, but so is the erect posture of the conscientious ([Back, Schmukle, & Egloff, 2009](#)).

This insight was quantified by [Pytlak Zillig, Hemenover, and Dienstbier \(2002\)](#), who asked raters to judge the degree to which NEO-PI-R items had affective (including motivational), behavioral, and cognitive characteristics. Conscientiousness items were chiefly behavioral (70.2%) and Neuroticism items were chiefly affective (67.9%), but all five domains had some content from all three categories.

What does this say about the nature of FFM traits? One interpretation is that they are very deep and abstract entities that can become manifest in a variety of ways—expressive, emotional, motivational, and so on. [McCrae and Costa \(2003, p. 25\)](#) proposed a correspondingly abstract definition of traits as “dimensions of individual differences in tendencies to show consistent patterns of thoughts, feelings, and actions.” This definition could apply to goals, habits, attitudes, and so on. Conversely, questionnaire items about goals, habits, or attitudes can be employed as indicators of an underlying trait, as [Pytlak Zillig and colleagues \(2002\)](#) showed.

One important conceptual difference between traits and trait indicators such as goals, habits, and attitudes is that the latter are usually contextualized. The goals of a twenty-first century American woman might include buying a hybrid car, getting a law degree, or amassing a thousand friends on Facebook—none of which would have been goals for a sixteenth century Hungarian peasant. The daily routines of Japanese are not the daily routines of Bedouins. But traits are abstract enough to be similar now and yesteryear, here and anywhere.

The Duality Principle

These considerations—along with a number of empirical findings—led to the formulation of a fundamental distinction among psychological variables. [McCrae and Costa \(1996\)](#) proposed that traits and their indicators constituted two entirely different categories (or levels, as [McAdams, 1996](#), called them): Traits are *basic tendencies*, whereas goals, habits, attitudes, relationships, and so on, are *characteristic adaptations*. A similar distinction in cognitive psychology is seen between aptitude and achievement, and in fact McCrae and Costa argued that abilities, like personality traits, are basic tendencies, whereas skills are characteristic adaptations. The distinction thus applies broadly to contrast innate psychological *potentials* with their acquired and contextualized *realizations*.

The crucial distinction in understanding the content of personality, then, is not between motives and habits, or between expressive and adaptive traits, but between abstract dispositions (clustered into five broad domains) and the myriad of acquired adaptations that express them. Unfortunately, this clear conceptual distinction cannot be cleanly operationalized. There is no direct way to assess psychological potentials; we can know them only by their concrete manifestations.⁴ And these manifestations are characteristic adaptations that are also inevitably shaped by the environmental context, and are thus necessarily imperfect indicators of the trait.

Quantum physics teaches that objects have a dual nature: They are in a sense simultaneously waves and particles. A similar duality principle applies to trait indicators: They are at once characteristic adaptations and proxy measures of basic tendencies. Consider a vocabulary test. It can be considered a sample of knowledge, acquired in a particular family and educational context; but it can also be considered a measure of general intelligence, our abstract capacity for learning. No one inherits an understanding of the words *frenetic* or *ciekawość*, but vocabulary test scores are highly heritable in typical samples. Vocabulary tests have a dual nature.

The same is true for many of the individual difference variables relevant to personality, and the manifest content of items the NEO Inventories use to assess underlying traits consists of characteristic adaptations. “I prefer jobs that let me work alone” nominally concerns vocational interests, but it can be used to assess the trait of Gregariousness. Even the item “I am dominant, forceful, and assertive” is not a direct assessment of the trait of Assertiveness; it is an assessment of the respondent’s self-concept with respect to assertiveness, which is an acquired adaptation, and one that can be modified by the environment—at least briefly (Swann & Hill, 1982).

It is essential to understand the dual nature of trait indicators in order to make sense of some assertions about trait measures. How can situations, behaviors, and explanations be “key ingredients” (Yang et al., 2014) of traits when traits are highly heritable, and situations, behaviors, and explanations clearly are not? Situations are not even part of the person. We would prefer to say that situations, behaviors, and explanations are some of the ingredients of *indicators* of heritable traits.

Not all characteristic adaptations are relevant to traits (regional dialects, for example, have little to do with personality), and some are better suited than others to use as trait indicators. Items that implicitly aggregate across occasions (“I always enjoy meeting new people”) are usually better than highly contextualized items (“I enjoy meeting new people in train stations”), because the influences of the specific circumstances are neutralized in the former. One of the reasons for creating personality scales with many different, nonredundant, items is that by sampling diverse manifestations of a trait, the total variance in the scale becomes more reflective of the underlying trait and less influenced by the specific contextually influenced manifestations.

A TAXONOMY OF INDIVIDUAL DIFFERENCES

It may be useful to put these ideas of different kinds of individual differences into a broader perspective. After all, people also differ in age, wealth, religion, and physical attractiveness, and all these differences are enormously important, but they are not what we mean by personality—in fact, they are not even intrinsically psychological variables. Figure 2.1 presents an outline of different classes of individual differences. In this scheme, age and physical attractiveness would be classified as biomedical variables and wealth and religion as cultural variables, with both under the heading *extrapsychological*. Among psychological variables, we draw the distinction between adaptations and tendencies, and personality dispositions are nested within tendencies. This figure does not, of course, indicate anything about causal relations among these variables. The personality literature is replete with their correlations, but very few of these variables can be experimentally manipulated, so causal interpretations require a judicious consideration of a broad array of findings. We turn next to one attempt to make sense of the big picture.

Theoretical Implications of FFM Research

Characterizing the structure and content of personality attributes can be done simply by analyzing self-report responses to personality questionnaires administered on a single occasion. But to understand the workings of personality—its origins and development, its implications for human life—it is necessary to go far beyond that simple correlational design. Longitudinal, cross-cultural, epidemiological, and behavior genetic studies are all necessary. No single investigator or team of investigators could amass sufficient data in one career to learn all that is needed. Fortunately, the widespread adoption of the FFM has meant that in the past 30 years hundreds of researchers around the world have conducted thousands of studies that cumulate within its framework. As a result, we know a great deal about how personality operates, and with that knowledge we can formulate a new generation of personality theories.⁵

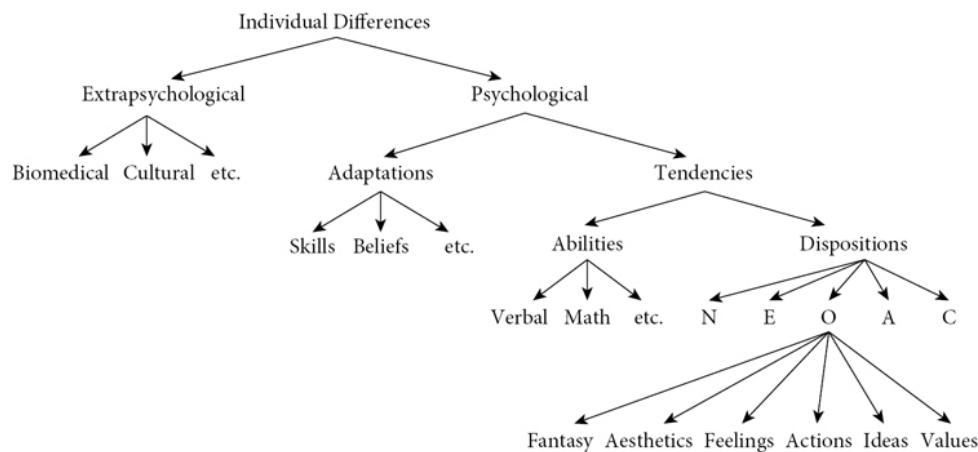


Figure 2.1. A sketch of a taxonomy of individual difference variables. Adapted with permission from “The Place of the FFM in Personality Psychology,” by R. R. McCrae, 2010, *Psychological Inquiry*, 21, p. 59. Copyright 2010 by Taylor & Francis.

Established Facts

In the discussion of proactivity, we noted extensive research showing that knowledgeable observers agree substantially on the description of FFM traits in individuals, a phenomenon most easily explained by assuming that all these sources are reasonably accurate. Different raters agree not only on the broad factors, but also on facets (McCrae, Costa, et al., 2005) and the specific variance within facets (McCrae & Costa, 1992), and on items and the specific variance within items (Mõttus et al., 2014). A rich variety of personality attributes appears to be an intrinsic aspect of each person.

The rank-ordering of these traits is remarkably stable, at least in adulthood. Retest correlations of .80 are not uncommon over intervals of 10 (Costa, McCrae, & Arenberg, 1980) or 20 years (Terracciano, Costa, & McCrae, 2006). Because the scales used to assess personality at each time are subject to retest unreliability, these observed values must be conservative estimates of the true stability. These high values seem to characterize all adults, regardless of the intervening life experience. For example, Costa, Metter, and McCrae (1994) examined the medical records of 273 BLSA participants who had self-reports or observer ratings of personality twice, across intervals of from 3 to 7 years. Participants were divided into two groups, those who had maintained or improved their health status over the interval ($N = 175$) and those who had shown minor or major declines in physical health ($N = 98$). The median retest correlation across all methods and factors was .79 for the first group and .80 for the second group. Physical health changes do not seem to affect personality traits (unless, of course, the changes are in the brain, as in Alzheimer’s disease) (Siegler et al., 1991).

There are notable changes in the mean levels of traits between adolescence and adulthood, and changes continue at a reduced rate throughout much of adulthood. In general, people decrease in Neuroticism, Extraversion, and Openness, and increase in Agreeableness and Conscientiousness (McCrae, Martin, & Costa, 2005). Most of the data on age differences comes from cross-sectional studies of American samples, and from these studies alone it would be impossible to divine the origin of age differences. They might be cohort effects, reflecting the successive impacts of different historical eras in which respondents grew up; or they might be cultural effects, a distinctively American way of growing older. Fortunately, there have also been longitudinal studies, less affected by cohort effects, and cross-cultural studies that permit comparisons of personality development in different contexts. Such studies show that cross-sectional age differences are very similar to longitudinal age changes (Terracciano, McCrae, Brant, & Costa,

2005), implying that historical eras leave little trace on personality. Cross-cultural comparisons show that age differences are similar in almost all cultures (McCrae et al., 1999), implying that personality development is not shaped by culture.

Or at least they are not shaped by features of culture that vary across nations (see also the chapter by Allik and Realo). Roberts, Wood, and Smith (2005) have argued that personality maturation (specifically, the decline in Neuroticism and the increases in Agreeableness and Conscientiousness that are typically seen between adolescence and full adulthood) is motivated by social expectations. According to their Social Investment Theory, individuals become more mature because they are pressured to do so by a society that requires stability, cooperation, and diligence in the adults who are responsible for raising a family and contributing useful work to the community. This suggests the hypothesis that maturation should be accelerated in those cultures (usually less developed) that require young men and women to join the adult world of work and family at an earlier age. Two large-scale tests of that hypothesis have been offered; they provided little (Bleidorn et al., 2013) or no (De Bolle et al., 2012) support. The rate of maturation does not seem to be driven by social investment.

Although cultures vary dramatically in their prescription of sex roles, sex differences in personality traits appear to be very similar everywhere, and this is true for self-reports of traits (Costa, Terracciano, & McCrae, 2001) as well as observer ratings (McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005). Even stereotypes of sex differences in personality are shared around the world (Löckenhoff et al., 2014). Women everywhere see themselves and are seen by others as being higher in Anxiety, Vulnerability, and Openness to Aesthetics; men are consistently higher in Assertiveness, Excitement Seeking, and Openness to Ideas.

Cross-cultural comparisons of age and sex differences are possible only if the same personality traits are found across cultures. After all, it would make no sense to ask how, say, Openness develops in a culture in which that construct did not make any sense. But there is by now ample evidence that the same personality traits are found everywhere. The NEO Inventories have been translated into dozens of languages, and although an occasional item resists meaningful translation, that process has been relatively easy. Bilingual psychologists readily find equivalent expressions for NEO items in languages as diverse as Croatian, Korean, and Telugu. Furthermore, when these translations are administered to indigenous samples, they typically yield the same factor structure seen in American samples (McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005).

The NEO Inventories have been used in a number of large-scale studies of heritability (see also the chapter by Jarnecke and South), with results confirming the general finding from behavior genetic studies that traits are substantially heritable but show little evidence of shared environmental effects (Plomin & Daniels, 1987)—that is, effects due to experiences children growing up in the same family share, such as parental role models, diet, religious training, schools, and neighborhoods. These environments may well affect the adjustment of the children when they are children, but seem to leave little or no enduring effect that shapes adult personality. There have been five notable contributions to the behavior genetics literature from studies of the NEO Inventories:

1. Because the FFM is comprehensive, it is now possible to assert that essentially *all* personality traits are heritable.
2. Because the NEO Inventories assess both domains and facets, it has been possible to test the hypothesis that facets, as well as domains, are heritable, and that the heritability of facets is due in part to the heritability of the specific variance in each facet (Jang, McCrae, Angleitner, Riemann, & Livesley, 1998). There is reason to hypothesize that the specific variance in nuances of each facet is also heritable (McCrae, 2015). People are not born with a few innate temperaments that are then differentiated by experience into the wealth of traits seen in adults; instead, the wealth of traits is already implicit in the infant's genome.

3. Because the NEO Inventories have been translated into a number of different languages, cross-cultural studies now provide evidence that heritability is universal, as is the differential heritability of facets. For example, Openness to Aesthetics is one of the most heritable traits in Canada, Germany, Japan, and Sardinia (mean $h^2 = .47$); Deliberation is one of the least heritable in all four countries (mean $h^2 = .28$).

4. Because the structure of the NEO Inventories is well established, it is possible to compare the phenotypic structure to the genetic structure of personality. Here research has shown that the phenotypic structure mirrors the genotypic structure, whether assessed through classic twin studies ([Yamagata et al., 2006](#)) or studies of non-twin family members ([Pilia et al., 2006](#)). There is also some evidence that the phenotypic structure is due solely to the genotypic structure, rather than to influences from the nonshared environment ([McCrae, Jang, Livesley, Riemann, & Angleitner, 2001](#)).

5. There are also some interesting, if tentative, suggestions of genetic influence from NEO Inventory studies of variance in populations. [Borkenau, McCrae, and Terracciano \(2013\)](#) reported that males show higher variance than females for traits in the domains of Extraversion, Openness, Agreeableness, and Conscientiousness. One possible mechanism is inheritance through the X-chromosome: Because males have only one copy, any personality-related allele on it will be fully expressed, whereas effects in females are likely to be tempered by the presence of alleles on two X-chromosomes. [Costa and colleagues \(2007\)](#) showed that personality trait variance was reduced in Sardinia compared to mainland Italy. Sardinia is a founder population, relatively isolated from other gene pools, and over the course of time, the phenomenon of genetic drift reflects the permanent loss of rare alleles from the pool. In consequence, there is greater genetic uniformity in Sardinia, which could account for the decreased variance in personality traits.

A Theoretical Synthesis

What do these facts imply for an understanding of the origins and functioning of personality—or at least personality traits? In one sense, the findings are mostly negative. In general, adult personality is *not* shaped by parental guidance ([McCrae & Costa, 1988b](#)), childhood environment, patterns of culture, or historical experiences shared by a generation. Personality trait levels in adults change gradually, but the rate of change is not predicted by features of culture. Individual differences are barely changed by intervening life events or changes in physical health. This litany of facts contradicts the basic premises of almost all the classic theories of personality—psychoanalytic, behavioral, and humanistic—and demands new theories of personality, several of which have been offered ([McCrae, 2011a](#)).

What does shape personality? Genes, which contribute to traits at all levels of the hierarchy; sex and aging; brain pathology, including Alzheimer's disease and major depression; pharmaceutical agents, including antidepressants ([Costa, Bagby, Herbst, & McCrae, 2005](#)) and perhaps hallucinogens ([MacLean, Johnson, & Griffiths, 2011](#)); malnutrition in infancy ([Galler et al., 2013](#)). In short, personality appears to be in substantial measure biologically based. It is, of course, not new to suggest that there is some temperamental or constitutional element to personality; many theories of personality nod to such a possibility. What is radically new is the idea that in a certain sense, biology is essentially the *only* determinant of traits. That is one of the basic tenets of Five Factor Theory (FFT; [McCrae & Costa, 2008b](#)), a general theory of personality proposed to account for research findings derived from studies of the FFM.

Two caveats must immediately be appended to the assertion that personality traits rest on an exclusively biological basis. The first is that FFT is a theory; it is intended to provide a broad-brush account of human nature and conduct, and, like every theory in the social sciences, it will certainly have exceptions. Indeed, identifying the particular environmental conditions that create exceptions may be the most fruitful way to gain a deeper understanding of personality. The second caveat is that the claim applies only to a particular conception of what traits are, namely, *basic tendencies*. The concrete manifestations of traits in habits, preferences, attitudes, and relationships are unquestionably shaped by personal experience, but these—by the definitions of FFT—are not traits, but *characteristic adaptations*.

The conceptual distinction between basic tendencies and characteristic adaptations allows a causal interpretation of the data supplied by FFM research: Basic tendencies (including traits at all levels of the hierarchy) are based in biology, whereas characteristic adaptations result from the

interplay of basic tendencies with external influences—the interaction of the organism with the environment.

This conception, represented schematically in [Figure 2.2](#), did not emerge fully formed. Our early longitudinal research had convinced us that personality was better construed as an independent variable than as a dependent variable. Personality was not shaped by adult life (as many theories of adult development had held); instead, personality itself affected the life choices people made and their responses to changing circumstances. We enshrined that insight in the title of our first book, *Emerging Lives, Enduring Dispositions* ([McCrae & Costa, 1984](#)). We certainly did not understand at the time where traits came from, and the basic idea that adult traits are best viewed as causes rather than consequences of life circumstances would have been consistent with many different accounts of early personality development.

The full-scale development of FFT coincided with our early cross-cultural research, beginning in the 1990s. Culture is, in a sense, the ultimate environment, a more-or-less consistent package of language, customs, kinship patterns, and religious beliefs. Anthropologists such as [Ruth Benedict \(1934\)](#) had argued persuasively that personality was little more than the internalization of culture, but early suggestions of the cross-cultural generalizability of the FFM ([Liu, 1991](#)) encouraged us to begin to think of personality traits as universal expressions of human nature. We could reconcile that view with the indisputable fact that people from different cultures had different habits, beliefs, values, and so on, because we already knew how to separate traits from their changeable manifestations. FFT and [Figure 2.2](#) were finalized by the mid-1990s ([McCrae & Costa, 1996](#)), with only minor clarifications and additions in later statements ([McCrae & Costa, 2008b](#)). In the intervening time we wrote a series of articles using FFT to illuminate topics such as trait explanations ([McCrae & Costa, 1995](#)), cross-cultural psychology ([Allik & McCrae, 2002](#)), and adult development ([McCrae & Costa, 2003](#)).

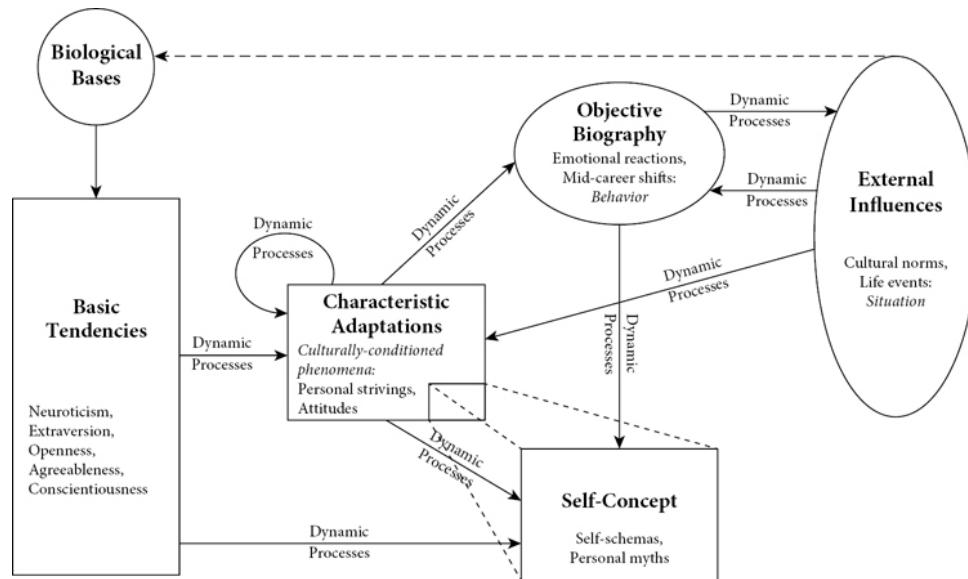


Figure 2.2. A representation of the Five Factor Theory personality system. Core components are in rectangles; interfacing components are in ellipses.
Adapted from [McCrae and Costa \(2008\)](#).

Theories are supposed to account for known facts, as FFT generally does, but they are also supposed to generate novel predictions. The most important tests of FFT conducted since it was proposed are from cross-cultural studies. We had preliminary evidence that the structure of

personality was the same in some other cultures, but subsequent work showed that the FFM could be identified in a very wide range of cultures ([McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#)). Fundamentally, FFT asserts that traits are transcultural, and therefore that most properties of traits ought to be universal. A series of studies confirmed that prediction with regard to age differences ([McCrae et al., 1999](#)); gender differences ([Costa et al., 2001](#)); stereotypes of age ([Chan et al., 2012](#)) and gender ([Löckenhoff et al., 2014](#)) differences; cross-observer agreement ([McCrae et al., 2004](#)); self/informant discrepancies ([Allik et al., 2010](#)); and the differential internal consistency, retest reliability, and heritability of NEO Inventory facet scales ([McCrae et al., 2011](#)). It is hard to imagine an alternative explanation for all these universals.

New Tests of FFT

In one sense, FFT is an attractive target. It makes sweeping claims, many of which fly in the face of traditional wisdom in psychology. In addition, many psychologists would prefer a theory that is more congenial to therapeutic and life-enhancing interventions ([McCrae, 2011b](#)). As a result, a number of researchers have begun to conduct tests of FFT. This is a welcome development; it will either confirm the theory or show the ways in which it should be modified.

Kandler and colleagues have conducted several studies examining FFT using German versions of the NEO Inventories in behavior genetic designs. In one ([Kandler, Bleidorn, Riemann, Angleitner, & Spinath, 2011](#)), they examined genetic and environmental origins of a set of characteristic adaptations, interests (e.g., domestic–manual, social–educational, cultural–intellectual) in relation to FFM domains. They argued that, as characteristic adaptations, interests ought to be related to personality traits, and that any heritable component in interests ought to be mediated by FFM traits. They did find associations with personality (especially Openness), and found that about a third of the genetic influences on interest could be accounted for by personality —leaving two-thirds unaccounted for. They noted that interests might also reasonably be caused by “other genetically-based cognitive and physical abilities and attributes (e.g., intelligence, attractiveness, athleticism)” ([Kandler et al., 2011](#), p. 1640)—that is, other basic tendencies—as well as by more specific personality facets not examined in their study. This is consistent with FFT.

In a second article ([Bleidorn et al., 2010](#)) they examined major life goals—Agency and Communion—and the FFM, assessed twice over a 5-year interval. As characteristic adaptations, goals might be assumed to be less heritable and less stable than traits, and this is just what they found. About one-third of the variance in goals could be attributed to genetic influences, and much of that (40% to 70%) was shared with FFM domains, as FFT would expect. However, there were genetic influences on goals that were not explained by either the five personality factors or by the 30 NEO facets, as a supplementary analysis revealed. They have reported similar results for sociopolitical attitudes ([Kandler, Bleidorn, & Riemann, 2012](#)) and religiousness ([Kandler & Riemann, 2013](#)) and concluded that attitudes, interest, and goals might be “discrete elements of the personality system” ([Bleidorn et al., 2010](#), p. 375) with a genetic basis outside that of traits.

That is one possibility, but there is another that is compatible with FFT. According to the duality principle, goals (like attitudes and interests) are both characteristic adaptations and indicators of basic tendencies. In other words, Agency and Communion might in one respect be considered facet-level personality traits. Both are clearly related to the FFM factors (Agency mainly to Extraversion and Openness, Communion to Extraversion and Agreeableness), but both also have specific variance that is independent of the five factors. In this respect, they are no different from other facets of the FFM, such as Excitement Seeking and Modesty. Such an interpretation would expand the range of FFM facets without seriously altering the premises of FFT.

A number of researchers have tested the FFT claim that traits are not influenced by the environment by seeking conditions under which change does occur. [Boals, Southard-Dobbs, and Blumenthal \(2015\)](#) assessed traits twice in a large (>1,000) college sample over a 3-month interval; they also ascertained which of their respondents had experienced a traumatic event in the interval. Those who had such an experience increased (nonsignificantly) in Neuroticism, whereas the others decreased (nonsignificantly). Together, these amounted to a significant interaction effect, with event status accounting for about 1% of the variance in Time 2 Big Five Inventory (BFI; [John, Donahue, & Kentle, 1991](#)) Neuroticism. Openness and Conscientiousness also increased in those who reported a life-changing stressful event.

[Leikas and Salmela-Aro \(2015\)](#) examined life changes in 500+ Finns between ages 20 and 23 years. Events included entering the workforce, university, or a relationship; onset of a chronic disease; and drug use. Of 30 moderated latent difference score analyses, three were significant: Incident chronic diseases increased Neuroticism and retarded the growth of Extraversion, and entry into the workforce increased Conscientiousness. Cross-lagged path analyses suggested that entering into the workforce, university, or a relationship led to higher Conscientiousness scores, as did experiencing a chronic disease; chronic disease and drug use led to higher Neuroticism, whereas entering the workforce led to lower Neuroticism. Standardized regression coefficients for these effects ranged from -.04 to .13.

[Jackson, Jonkmann, Lüdke, and Trautwein \(2012\)](#) examined personality change in German males who were recruited for military training or opted for civilian service. Military discipline might be expected to increase Conscientiousness, but the recruits did not change more than the controls, nor were there significant differential changes for Neuroticism, Extraversion, or Openness. However, those who entered military service increased less in Agreeableness than did their civilian counterparts.

[Löckenhoff, Terracciano, Patriciu, Eaton, and Costa \(2009\)](#) examined NEO-PI-R scores for nearly 500 urban adults assessed in 1993 and again 8 years later. A quarter of the sample reported “an extremely horrifying or frightening event” within 2 years of the second assessment. Significant ($p < .01$) effects were seen for Neuroticism and its N2: Angry Hostility facet, which increased, and for O6: Values and A4: Compliance, which declined. Traumatic events contributed 1% to 2% to the prediction of Time 2 personality scores.

[Sutin, Costa, Wethington, and Eaton \(2010\)](#) studied the same urban cohort but focused on a different issue. At Time 2, participants selected the single most stressful or upsetting experience since baseline, and were then asked if the event was a turning point in their lives (58% agreed) and if they had learned from the event (82% agreed). Events themselves did not predict personality change, except that those who reported problems with their children (6%) became lower in Agreeableness and A3: Altruism. However, subjective construals of the event did predict change: Those who saw the event as a turning point increased in Neuroticism and N4: Self-Consciousness, and those who claimed to have learned from it increased in Extraversion (and E6: Positive Emotions) and Conscientiousness (and C5: Self-Discipline). Standardized regression coefficients ranged from .08 to .11.

It would be fair to describe these as small and scattered effects, and sometimes contradictory: [Boals and colleagues \(2015\)](#) found life-changing events increased Openness, whereas [Löckenhoff and colleagues \(2009\)](#) reported that they decreased Openness to Values. Some trends do appear: There is fairly consistent evidence that stressful events increase Neuroticism, at least in the short term, and that entering into adult life roles increases Conscientiousness. However, the small magnitude of the effects is sobering, especially considering that the environmental influences—starting work, beginning a relationship, suffering a horrifying event—are presumably quite powerful in comparison to the usual therapeutic interventions familiar to psychologists.

Still, it could legitimately be argued that however small, they demonstrate that the strong form of FFT—the environment has no influence on traits—is wrong. But it is perhaps too soon to make that claim, because all of these studies are subject to an important limitation: They relied exclusively on self-reports. According to the duality principle, test responses can represent characteristic adaptations as well as basic tendencies, so it is possible that all the changes reported reflect modifications in the individuals’ *self-concepts*, not in their true underlying personality traits. Military training, for example, might encourage men to believe that they are tough and (slightly) less agreeable than their civilian counterparts. From the observer’s perspective, however, there might be no difference in personality.

This objection has some plausibility, because early research failed to find agreement across raters on personality changes over time (McCrae, 1993; Watson & Humrichouse, 2006). In a sense, this is not surprising, because change scores invariably include a great deal of error, and the signal—if there is one—is likely weak. It is therefore of particular note that Kandler and colleagues (2010) were able to conduct genetic analyses of the sources of personality change by combining self-reports and peer ratings in a large-scale twin study. They concluded that personality stability was largely genetic in origin, but that change was mainly attributable to environmental factors. The limitation of this study design is that it says nothing whatever about the nature of the environmental factors (other than that they were nonshared). It does not allow us to conclude that traumatic events or work experiences have a real influence on personality, because the changes attributable to those sources may not overlap with the consensually validated changes detected in this multimethod study. Still, it does suggest that it is worthwhile to look for environmental influences on personality development.

But environmental influences are not quite the same as FFT’s *external influences*, because to a behavior geneticist, *environmental* means anything that is not genetic. As Kandler and colleagues (2010) acknowledged, this includes biological influences, which are entirely consistent with FFT. The onset of Alzheimer’s disease, for example, has notable effects on personality that are not genetic; if a subset of twins in Kandler’s study had developed that kind of disorder, its effects would have been classified as environmental.

Where does this leave research on FFT, and in particular on the issue of environmental influences on personality development? Certainly it is unfinished, but we already know that the effects of interest are subtle and susceptible to artifacts. Future designs, whether of naturalistic occurrences or experimental interventions (Jackson, Hill, Payne, Roberts, & Stine-Marrow, 2012), need to use large samples, multiple occasions, and multiple methods of personality measurement. And researchers ought to widen the list of candidate causes to include biological factors (such as disease, diet, and environmental toxins) as well as social and psychological factors. Just as physicists have been obliged to build larger and larger accelerators to discover new particles, psychologists are discovering that the more we know about personality, the more challenging it is to advance knowledge.

Conclusions

In looking back over our research on the FFM, there is a certain irony. When we first proposed that traits were highly stable in adulthood, we were met with skepticism from adult developmentalists and were challenged to consider a host of alternative explanations, including the possibility that it was merely the individual’s self-concept that was stable (McCrae & Costa, 1982). Now we find ourselves in the position of defending FFT, challenging those who argue for environmental influences on trait development to consider alternative explanations, including the

possibility that it is merely the individual's self-concept that changes. This is the nature of scientific progress, and fortunately, there has been a great deal of it since [Loevinger's 1957](#) essay.

Acknowledgments

We thank Christian Kandler for helpful comments. Paul T. Costa Jr., and Robert R. McCrae receive royalties from the NEO Inventories.

Notes

1. The importance of Loevinger's article is attested to by the fact that Watson also paraphrased its title in a recent chapter:
Watson, D. (2012). Objective tests as instruments of psychological theory and research. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology. Vol. 1: Foundations, planning, measures, and psychometrics* (pp. 349–369). Washington, DC : American Psychological Association.
2. The largest of these groups occupies 196,883 dimensions—a humbling thought for personality psychologists, who struggle with a mere 5, 6, or 16 dimensions.
3. “Situations” may seem an odd ingredient of traits, but [Yang and colleagues \(2014\)](#) mean by it the context that evokes the expression of a trait. Trait theorists such as [Tellegen \(1991\)](#) have long recognized that traits operate conditionally: Extraverts usually do not chatter on during a ceremonial moment of silence.
4. In principle, we could also assess them through their biological basis, although present knowledge about genetics and neuroscience is far from adequate for that purpose. Note, however, that it would still be an indirect assessment, since biology is categorically distinct from psychological constructs.
5. It is useful to have multiple measures of psychological constructs (e.g., [De Raad & Perugini, 2002](#)) so that artifacts of a particular instrument can be identified or ruled out. But there are also advantages to the wide use of a single instrument, because direct comparisons are then feasible. For example, [McCrae and colleagues \(2011\)](#) used data from scores of different researchers to assess the generalizability across samples and cultures of the differential internal consistency, retest reliability, longitudinal stability, heritability, and cross-observer validity of NEO Inventory facets.

CHAPTER
3

Neuroticism

Jennifer L. Tackett and Benjamin B. Lahey

Abstract

This chapter provides a comprehensive review of the personality domain of Neuroticism. Neuroticism is not only one of the more salient higher-order personality domains across different trait models, it also includes great public health care significance. We begin by describing the domain, including its facets. We then consider genetic and environmental influences for its development. We also consider developmental considerations, including evidence for stability and change across the lifespan. We then turn to the importance of Neuroticism for predicting consequential outcomes in several relevant domains of functioning: psychopathology, physical health, and quality of life. We then summarize and end with suggestions for future directions in research and public health care application.

Key Words: neuroticism, negative affectivity, negative emotionality, Five Factor Model, Big Five

The purpose of this chapter is to provide a broad and comprehensive description of the broad personality trait of Neuroticism (N). In addition to representing one of the most salient higher-order personality traits across different trait models, N shows great public health significance because of its robust predictive validity for many consequential outcomes ([Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014](#); [Lahey, 2009](#)). We begin by describing the broader N domain, including evidence for genetic and environmental influences on N. We then briefly discuss developmental considerations of N, including evidence for stability and change across the lifespan. We then turn to the relevance of trait N for predicting consequential outcomes in several relevant domains of functioning: psychopathology, physical health, and quality of life. We then summarize and end with suggestions for future directions in research and application.

Description of Neuroticism

Neuroticism is one of the five higher-order domains in the Five Factor Model (FFM; [Costa & McCrae, 1992](#); [Goldberg, 1993](#)). It is typically one of the first factors extracted within clinical populations and generally reflects individual differences in tendencies toward negative affect (including sadness, anxiety, and anger) and individual responses to threat, frustration, or loss ([Widiger, 2009](#)). Neuroticism appears in almost all higher-order dispositional trait models, sometimes referred to as Negative Affectivity (NA) or Negative Emotionality (NE) ([Rothbart, Ahadi, Hershey, & Fisher, 2001](#); [Tellegen & Waller, 2008](#)).

Although the higher-order domain reflecting tendencies toward negative affect is broadly consistent across major trait models, more differences exist at the facet level. To some extent, such differences partially reflect the higher-order trait model being measured. Specifically, three-factor trait models ([Rothbart et al., 2001](#); [Tellegen & Waller, 2008](#)), which do not typically include a distinct Agreeableness domain, often incorporate facets of antagonism and aggression (reflecting disagreeableness) into the broader N/NA/NE domain ([Widiger, 2009](#)). Mid-level divisions of N often differentiate subdomains reflecting irritable versus withdrawn negative affect ([De Young, Quilty, & Peterson, 2007](#); [Shiner & Caspi, 2003](#)). One prominent lower-order facet model is that assessed by the NEO Personality Inventory-Revised (NEO PI-R; [Costa & McCrae, 1992](#)): Anxiety, Angry Hostility, Depression, Self-Consciousness, Vulnerability, and Impulsiveness. The NE domain measured by the Minnesota Personality Questionnaire (MPQ) also includes facets of alienation and stress reactivity ([Tellegen & Waller, 2008](#)). Differences in content assessed at the lower-order, or facet level likely account for many domain-level differences between measures ([Ormel, Bastiaansen, et al., 2013](#)).

Genetic Influences on Neuroticism

Understanding the causes of N is critical for better understanding the pathways by which N is related to various outcomes (some of which, including physical and mental health, are described further in this chapter). Numerous twin studies consistently indicate that N, like other major personality traits (and, indeed, most psychological constructs; [Turkheimer, 2000](#)), is substantially heritable (see also [Chapter 14](#) by Jarnecke and South). Specifically, approximately half the variance in observed, or phenotypic, N, is attributable to additive genetic influences ([Lahey, 2009](#);

Widiger, 2009). The robustness of this heritability estimate was impressively confirmed in a recent meta-analysis, which used item response theory methods to harmonize different measurements of N, resulting in a very large sample size of almost 30,000 twin pairs (van den Berg et al., 2014). An interesting literature has documented differentiation in heritability of N by age, with heritability estimates highest (about 50–60%) in early adolescence and, notably, an absence of sex differences at these developmental periods (Gillespie, Evans, Wright, & Martin, 2004; Lake, Eaves, Maes, Heath, & Martin, 2000; Rettew et al., 2006; Viken, Rose, Kaprio, & Koskenvuo, 1994). Heritability of N appears to decline across adulthood, but does so more substantially for males, which results in sex differences favoring higher heritability in females later in adulthood (Eaves, Eysenck, & Martin, 1989; Lake et al., 2000).

With few exceptions (e.g., van den Oord et al., 2008), genome-wide studies of the association of common single-nucleotide polymorphism with N have been notably unsuccessful in identifying specific molecular genetic risk factors (Fullerton et al., 2003; Nash et al., 2004; Shifman et al., 2008). Indeed, a meta-analysis of genome-wide association data on 17,375 adults across 10 different samples identified no significant results for N (De Moor et al., 2012). An even larger study of over 63,000 individuals comprising the Genetics of Personality Consortium similarly yielded no significant findings for common single-nucleotide polymorphisms (SNPs; De Moor et al., under review).

One possible reason for the consistent failure to identify significant associations of N with common SNPs is that a substantial proportion of the genetic variation in N may not be related to common SNPs. When the heritability of N was estimated based on similarity among individuals in common SNPs, the heritability of N was estimated to be 15% (De Moor et al., under review), which is substantially lower than heritability estimates from twin studies of about 50%. One reason for this large discrepancy could be that estimates of heritability from twin studies can reflect more than “main effects” of genetic variation, including some types of gene-environment interactions (Rijdsdijk & Sham, 2002), which were not addressed in the molecular genetic studies. Furthermore, the estimate of 15% heritability could reflect inadequate coverage of common SNPs or various kinds of sampling biases in these studies. Nonetheless, this low heritability estimate could indicate that less common SNPs or even other

kinds of genetic variants, such as repeat polymorphisms, are more important for N. It will be critically important for future work to examine all of these possibilities.

Candidate gene studies of N have largely focused on the 5-HTTLPR repeat polymorphism of the serotonin transporter gene based on the well-described role of the serotonergic system in emotion processing ([Leonardo & Hen, 2006](#)). The 5-HTTLPR polymorphism has received particular attention because it is a functional polymorphism that influences transcriptions, and because this transporter is a target of psychopharmacological interventions for internalizing disorders. Meta-analyses suggest small but significant differences on N scores between individuals with at least one short 5-HTTLPR allele and individuals with only long alleles ([Munafò, Clark, & Flint, 2005](#); [Schinka, 2005](#); [Schinka, Busch, & Robichaux-Keene, 2004](#); [Sen, Burmeister, & Ghosh, 2004, 2005](#)). Additional support for 5-HTTLPR comes from neuroimaging research, which has linked 5-HTTLPR alleles to variation in brain structures ([Brown & Hariri, 2006](#); [Hariri et al., 2002](#); [Passamonti et al., 2008](#)) also linked to differences in N ([Canli, 2004](#); [Haas, Omura, Constable, & Canli, 2007](#); [Omura, Constable, & Canli, 2005](#)).

Other potential candidates that have been linked to N include the 5-HT1A and 5-HTR2A serotonin receptors ([Golimbet et al., 2002](#); [Lesch & Canli, 2006](#)) and the G72 glutamate receptor ([Rietschel et al., 2008](#)). Still other hypothesized candidates have yielded mixed findings ([Hettema, An, et al., 2006](#); [Lang et al., 2005](#); [Sen et al., 2003](#); [Willis-Owen et al., 2005](#)).

Environmental Influences on Neuroticism

Of course, in addition to genetic influences, environmental factors influence trait N, as well. Behavioral genetic studies typically differentiate two sources of environmental variance—shared environmental influences, which act similarly on individuals growing up in the same environment, and nonshared environmental influences, which serve to differentiate such individuals from one another. Although environmental influences account for a substantial portion of the variance in trait N, studies suggest that this may be entirely accounted for by nonshared environment ([Fullerton, 2006](#); [Lake et al., 2000](#)). There are a number of caveats to such findings, however. Shared environmental influences are more difficult to detect, even when present, in part because they may operate through gene-environment

interactions (Johnson, 2007; Robinson, 2004). In other words, shared environmental influences may be moderated by genes, which effectively increases the heritability of the construct rather than reflecting unique shared environmental variance.

Very little work has been done on specific types of measured environmental factors that are likely to impact N. Adult N levels have been associated with retrospective recall of a variety of parenting and familial factors (e.g., Allen & Lauterbach, 2007; McCrae & Costa, 1988; Reti et al., 2002; Roy, 2002; Willemsen & Boomsma, 2007), although prospective designs, ideally that account for genetic factors as well, are needed to understand potential causal influences of such factors.

Developmental Considerations

Absolute and differential stability. Early N, as with other major personality traits, is relatively stable across development (Caspi, 2000; Caspi et al., 2003; Caspi & Silva, 1995; Nave, Sherman, Funder, Hampson, & Goldberg, 2010). This stability is largely accounted for by both genetic and nonshared environmental factors (De Fruyt et al., 2006), and is robust across community and clinical samples (De Bolle et al., 2009). Absolute, or mean-level, stability reflects the extent to which average trait levels are stable across time in the broader population. Meta-analytic work suggests that mean levels of N begin shifting in adulthood, whereby overall levels in the population decrease as individuals progress from early to later adulthood (Roberts, Walton, & Viechtbauer, 2006). Although adult shifts apparently reflect greater maturation across development, there have been some suggestions that early developmental changes may reflect a transition from more to less “maturity” during the developmental transition from childhood to adolescence (Soto, John, Gosling, & Potter, 2011). Much more work is needed to better understand how trait N levels might change across different developmental periods.

Another primary type of stability that is typically investigated in research on personality development is differential, or rank-order, stability, which refers to the extent to which individuals maintains their overall ranking on a given trait over time. Rank-order stability is moderate even in childhood, but shows slight increases across development, with lowest levels of stability manifest for trait N (Roberts & DelVecchio, 2000). This is true for both youth (De Fruyt et al., 2006; Tackett et al., 2008) and adults (Hampson

& Goldberg, 2006). In measuring any type of stability, it will be important for researchers to better account for measurement difficulties for trait N, particularly early in life, and the extent to which such measurement problems are likely to influence estimates of stability and change.

Another aspect of personality development that may be especially relevant for N is personality *variability*, or the extent to which an individual's level on a trait shows variance across situations and across time. This construct is related to emotional lability or reactivity, which is often considered a facet of N, particularly in personality disorder trait models (Widiger, 2009). One study found substantial intraindividual variability in N trajectories from mid to later adulthood, for example (Mroczek & Spiro, 2003), suggesting that it will be important to examine within-person fluctuations in N, as well as between-person and across-person continuity.

Conceptualization of N at younger ages. N is one of the most robust higher-order personality traits emerging across myriad personality frameworks, and this holds in childhood and adolescence, as well (see also Chapter 12 by De Pauw as well as Chapter 22 by De Fruyt, De Clercq, and De Bolle). As noted previously, developmentally sensitive approaches to conceptualizing individual differences (e.g., temperament and child personality) have often differed in their conceptualization of Neuroticism/Negative Emotionality when compared to adult models, and also when compared to one another (Lahey et al., 2008; Lahey, Rathouz, Applegate, Tackett, & Waldman, 2010). Developmentally sensitive approaches to characterizing N often place antagonism/aggression in a much more prominent role in trait definitions (De Pauw & Mervielde, 2010; Rothbart & Bates, 2006; Tackett et al., 2012), with potentially more difficulty in clearly defining more fearful/sad aspects of N in youth, as compared to adults. This is consistent with work on personality perception, which suggests that more observable traits will be perceived more accurately than less observable traits when relying on informants (Tackett, 2011; Vazire, 2010), which is most often the case when assessing personality in early life. This is also consistent with literature suggesting that interinformant agreement is higher for externalizing psychopathology (which is marked by antagonistic features) than for internalizing psychopathology (which is marked by sadness and fearfulness) in youth (Achenbach, 2006; Achenbach et al., 1987).

The distinction between fear and irritability aspects of N has been noted by developmental psychologists as especially relevant for early personality (Rothbart & Bates, 2006; Shiner, 2010; Shiner & Caspi, 2003). It is clear that lower-order personality traits are poorly understood in early life, with only sparse agreement across different frameworks (de Pauw, Mervielde, & van Leeuwen, 2009; Shiner & Caspi, 2003; Shiner & Tackett, 2014). Notably, these “mid-level” traits (fear and irritability) are largely represented across different youth models and are also analogous to the primary mid-level traits identified for N in adult samples (De Young et al., 2007). It is also possible to link the sizeable early literature on “difficult temperament” with early manifestations of N. Specifically, research on “difficult” or “hard to manage” temperament constructs typically incorporates aspects of negative affectivity alongside physiological features (e.g., disrupted eating and sleeping patterns) and aspects of disinhibition (e.g., Bates, Pettit, Dodge, & Ridge, 1998; Davies & Windle, 2001; Olson, Bates, Sandy, & Schilling, 2002).

Measurement considerations. Existing evidence seems to strongly suggest that measurement of N in young children is among the most challenging of all early personality traits (Durbin, 2010; Tackett et al., 2008, 2012). Specifically, interinformant agreement may be lower for N than for other early personality traits, particularly those aspects reflecting sadness and internalized negative emotions (Durbin, 2010; Tackett, 2011). When working with adults, it has been argued that it is especially important to utilize self-report for such constructs (Vazire, 2010), but this is of course challenging when working with younger populations.

There is some indication that examining informant *disagreement* regarding levels of N in youth may provide incremental information about consequential outcomes, such as psychopathology. For example, mother’s and father’s level of *disagreement* on their child’s N, after accounting for the child’s overall levels of N, incrementally predicted their child’s level of internalizing psychopathology (Tackett, 2011). Such findings indicate that variability in trait N may be reflected in informant differences, allowing a powerful method for capturing incremental information in trait N, even when it is more difficult to measure as it is in younger age groups.

Laboratory-based tasks are often used to elicit and measure temperament traits in children, but such measures also tend to show low correlations with parent-reported N (Durbin, 2010). The potential advantages of laboratory

tasks, however, include enhanced sensitivity to context and greater potential to capture characteristics of stability and change, all of which may be highly relevant to a thorough understanding of N ([Durbin, 2010](#)). Taken together, the challenges with measuring N, particularly in early life, call for multimethod, multiinformant approaches, as well as more sophisticated efforts to leverage potential information inherent in informant/method discrepancies.

Neuroticism and Psychopathology

Basic Associations

N demonstrates consistent and robust associations with mental disorders across the lifespan including various forms of internalizing psychopathology, externalizing psychopathology, and personality disorders ([Clark & Watson, 1991](#); [Klein, Kotov, & Bufferd, 2011](#); [Tackett, 2006](#); [Widiger & Smith, 2008](#)). Meta-analytic evidence supports “very large” effect sizes (Cohen’s $d > 1.0$; [Cohen, 1992](#)) across a range of Axis I disorders ([Kotov, Gamez, Schmidt, & Watson, 2010](#); [Malouff et al., 2005](#)) and “small” to “medium” effect sizes for Axis II disorders (Cohen’s $d = 0.02$ for Narcissistic to $d = 0.55$ for Borderline; [Saulsman & Page, 2004](#)). This is even the case in children and adolescents using measures of N that do not contain items referring to synonyms and antonyms of symptoms of psychopathology ([Lahey et al., 2008, 2010](#)). Thus, it is clear that N shows a moderate to strong association with all major forms of psychopathology.

In addition to associations between N and single mental disorders, variance in N is also associated with greater comorbidity among different disorders ([Barlow et al., 2014](#); [Khan et al., 2005](#); [Lahey, 2009](#)). Individuals with comorbid diagnoses are at higher risk for a range of consequences, including greater disorder persistence and severity and higher consumption of high-cost mental health services ([Kessler, Chiu, Demler, Merikangas, & Walters, 2005](#)). Thus, understanding mechanisms underlying comorbidity is critical. Toward that end, recent evidence has suggested that a bifactor modeling approach, which positions a “general factor” accounting for covariance among all specific disorders, may be a useful way of reconceptualizing the now-common internalizing–externalizing disorder framework (such that remaining internalizing and externalizing covariance is captured in specific factors; [Caspi et al., 2014](#); [Lahey et al., 2012](#)). This

general factor of psychopathology appears to largely overlap with trait N, at both phenotypic and etiologic levels (Tackett et al., 2013), which implicates N as a particularly crucial transdiagnostic mechanism underlying disparate forms of psychopathology (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014).

Causal Mechanisms

There are a variety of potential explanations for personality trait associations with psychopathology, which have been reviewed elsewhere (Klein et al., 2011; Lahey, 2009; Littlefield & Sher, 2010; Tackett, 2006; Widiger & Smith, 2008). Importantly, various explanations for personality–psychopathology associations largely tend not to be mutually exclusive. Especially in the case of trait N, it is likely that multiple mechanisms explain links between N and various disorders in different individuals (Ormel, Jeronimus, et al., 2013). Vulnerability explanations posit personality traits as independent constructs that increase the risk for later psychopathology (thus showing prospective associations). Although sometimes distinguished from one another, we position spectrum and common cause explanations as largely overlapping concepts, which suggests that personality traits and mental disorders lay on related spectra, and such spectra share core etiologic features that transcend personality/psychopathology boundaries. The spectrum model is largely consistent with a recent shift toward focusing on transdiagnostic mechanisms in psychopathology research, such as the Research Domain Criteria (RDoC) project (Insel et al., 2010).

A number of studies have also examined evidence for the predictive utility of trait N in prospective studies of psychopathology, which is consistent with a vulnerability model perspective. The most impressive evidence has amassed for N prospective prediction of later major depression onset (Fanous, Neale, Aggen, & Kendler, 2007; Kendler, Neale, Kessler, Heath, & Eaves, 1993). Such research has used impressively large samples, with longitudinal prediction extending to 25 years later (Kendler, Gatz, Gardner, & Pedersen, 2006). Other research has similarly demonstrated predictive utility of N for later schizophrenia (van Os & Jones, 2001) and suicide (Fergusson, Woodward, & Horwood, 2000).

Evidence supporting a spectrum conceptualization comes from studies demonstrating shared etiologic factors underlying trait N and various forms

of psychopathology (e.g., Carey & DiLalla, 1994; Fanous, Gardner, Prescott, Cancro, & Kendler, 2002; Hettema, Neale, Myers, Prescott, & Kendler, 2006; Mikolajewski, Allan, Hart, Lonigan, & Taylor, 2013; Silberg, Rutter, Neale, & Eaves, 2001; Stein & Stein, 2008; Tackett et al., 2012, 2013). Research has also suggested that N may mediate associations between the 5-HTTLPR polymorphism and depression (Jacobs et al., 2006; Munafò, Clark, Roberts, & Johnstone, 2006). Similarly, work has identified amygdala overactivation as common to many different forms of internalizing psychopathology, as well as to high levels of N (Barlow et al., 2014; Ormel et al., 2013). Thus, common genetic and neurobiological mechanisms may account for associations between N and multiple forms of psychopathology. Although cross-sectional correlations between phenotypic constructs (i.e., measures of N and psychopathology) have been occasionally used to promote a spectrum framework, such evidence does not provide a particularly stringent test of the spectrum model and could reflect other explanatory mechanisms.

Although existing evidence supports both vulnerability/risk and spectrum/common cause explanations of N–psychopathology associations, it is often difficult to disentangle these explanations from one another. In particular, studies examining prospective associations often cannot rule out the possibility that common causes account for longitudinal prediction, unless such common causes are simultaneously measured and controlled for. Longitudinal relationships between early N and later psychopathology may in fact reflect *heterotypic continuity*, whereby similar underlying factors (e.g., genetic influences) are linked to phenotypically distinct constructs at different points in time. However, other evidence suggests that N does show bidirectional relations with mental disorder over time, suggesting that N also shows dynamic interplay with features of psychopathology across the life course.

Work that is especially relevant to this idea demonstrates that underlying genetic factors may interact with environmental stress to increase the risk for later disorders. For example, the risk variant of the 5-HTTLPR polymorphism already discussed as relevant to both N and psychopathology may increase depression risk primarily in individuals who have also encountered stressful life events (Caspi et al., 2003; Lotrich & Pollock, 2004; Uher & McGuffin, 2010), with some evidence for mixed findings (see Rutter, 2008). Importantly, some evidence also supports such an

interaction between 5-HTTLPR status and stressful life events in the prediction of N (Caspi & Moffitt, 2006), and other molecular genetic candidates may show similar patterns (e.g., the G72 gene; Rietschel et al., 2008; Shi, Badner, Gershon, & Liu, 2008). Other research suggests that 5-HTTLPR status interacts with earlier depressive symptoms to predict stress generation (Starr, Hammen, Brennan, & Najman, 2012), implicating possible mechanistic pathways strengthening such associations. Of course, environmental factors may also buffer individuals at higher psychobiological risk against the development of psychopathology. For example, one recent study found that social support moderated the association between threat-related amygdala reactivity and anxiety (Hyde, Gorka, Manuck, & Hariri, 2011).

There has been extensive work looking at longitudinal, bidirectional associations between N, stressful life events, and other environmental variables such as relational conflict, physical health, and occupational status. This literature has offered support for the directional hypothesis that individuals with higher N have an increased likelihood of experiencing later negative outcomes across these domains (Bolger & Zuckerman, 1995; Gleason, Powers, & Oltmanns, 2012; Gunthert, Cohen, & Armeli, 1999; Hankin, Fraley, & Abela, 2005; Kendler, Gardner, & Prescott, 2002; Magnus, Diener, Fujita, & Pavot, 1993; Suls & Martin, 2005; van Os, Park, & Jones, 2001). The implications of this are critical, given the extent to which exposure to life events increases the subsequent risk for psychopathology (Ehring, Ehlers, & Glucksman, 2006; Kendler et al., 2004; Parslow, Jorm, & Christensen, 2006). One pronounced example of this effect is evidence suggesting that premarital levels of N predict subsequent marital dissolution (Donnellan, Conger, & Bryant, 2004; Karney & Bradbury, 1997; Kelly & Conley, 1987; Roberts et al., 2007; Rogge, Bradbury, Hahlweg, Engl, & Thurmaier, 2006; Tucker, Kressin, Spiro, & Ruscio, 1998), alongside evidence that divorce predicts a number of mental and physical health problems (Hemström, 1996; Ikeda et al., 2007; Lee & Gramotnev, 2007; Lee et al., 2005; Overbeek et al., 2006; Perreira & Sloan, 2001). There is additional evidence that high N predicts lower social support (Kendler, Gardner, & Prescott, 2002, 2006), and that social support partially mediates associations between N and depression (Finch & Graziano, 2001; Kendler et al., 2002; Kendler, Gardner, & Prescott, 2006). Such evidence leads to the suggestion that high N may indirectly promote

adverse health outcomes by increasing the likelihood of divorce and/or decreasing social support networks ([Lahey, 2009](#)).

The possibility of these causal pathways linking N, relational functioning, and psychopathology outcomes can be further understood by examining research on the associations between N and emotional responding. Research suggests that individuals higher on N demonstrate more negative affect in response to both controlled and naturalistic stressors ([Larsen & Ketelaar, 1991](#); [Zautra, Affleck, Tennen, Reich, & Davis, 2005](#)). In addition, individuals high on N may be more likely to find the experience of negative affect distressing ([Barlow et al., 2014](#)) and more likely to show impaired sympathetic regulation (as indexed by heart rate variability) in the face of negative emotional challenge ([Di Simplicio et al., 2012](#)). This is consistent with evidence that individuals with higher levels of N are at increased risk for internalizing psychopathology following exposure to stressful life events than individuals with lower levels of N who are exposed to the same events ([Fanous et al., 2002](#); [Hutchinson & Williams, 2007](#); [Jacobs et al., 2006](#); [Kendler et al., 2004](#); [Parslow et al., 2006](#)). This may be, in part, due to differences in coping, such that individuals with higher levels of N are more likely to use inefficient forms of coping, such as avoidance ([Bolger, 1990](#)), and to show deficits in disengaging attention ([Bredemeier, Berenbaum, Most, & Simons, 2011](#)). It may also partially reflect a more generalized cognitive response in individuals high in N to both ambiguous and negative stimuli. For example, individuals higher in N show an exaggerated neurobiological response to uncertain stimuli, even in comparison to their heightened response to negative stimuli, relative to individuals lower in N ([Hirsh & Inzlicht, 2008](#)). Other relevant evidence suggests that individuals who report more negative appraisals of stressful life events show an increased risk for internalizing disorders ([Espejo, Hammen, & Brennan, 2012](#)). Most work in this domain has investigated internalizing psychopathology, but shared genetic factors between N and alcohol use disorders are, similarly, largely accounted for by an individual's endorsement of coping motives ([Littlefield et al., 2011](#)). More work is needed to understand the extent to which the vast literature on N-internalizing disorder associations might generalize to N-externalizing disorder associations.

A recent study directly compared competing temporal ordering of N, an intermediate cognitive response (anxious arousal), and stressful life events

in predicting later depressive symptoms (Barrocas & Hankin, 2011). Specifically, the authors tested the hypothesis that early levels of higher N increased perceived exposure to stressful life events, which then increased anxious arousal, culminating in higher levels of depressive symptoms, versus an alternative pathway whereby early levels of higher N increased anxious arousal, which increased perceived exposure to stressful live events, ultimately increasing depressive symptoms in a sample of 350 sixth-grade to tenth-grade students. The authors found support for the initial model, linking higher N → perceived life stressors → anxious arousal → depressive symptoms, which was not moderated by gender or age. This type of integrative, longitudinal research design will be particularly helpful in delineating pathways between N, cognitive processes, stressful life events, and psychopathology outcomes.

Neuroticism and Physical Health

Basic Associations

In addition to links with mental health, trait N is also associated with both subjective and objective indicators of physical health (Lahey, 2009). Individuals higher in N report more somatic complaints without medical support (Chaturvedi, 1986; Costa & McCrae, 1987; Magee, Heaven, & Miller, 2013; Powers & Oltmanns, 2013) and demonstrate distorted cognition regarding symptoms, which results in greater use of medical services (Goubert, Crombez, & Van Damme, 2004). Such evidence suggests that higher levels of N result in stronger perceptions of physical health problems, but research has also demonstrated connections that go beyond subjective concerns. N is associated with many different types of physical health problems (Brickman, Yount, Blaney, Rothberg, & De-Nour, 1996; Drossman et al., 2000; Smith & MacKenzie, 2006; Suls & Bunde, 2005).

Some associations are suggested by indirect evidence, such that many physical health problems are more common in individuals with internalizing psychopathology (which, itself, is highly correlated with high N; Currie & Wang, 2005; Robles, Glaser, & Kiecolt-Glaser, 2005; Sareen, Cox, Clara, & Asmundson, 2005; Watkins et al., 2006). Such concerns include problems with cardiac functioning (Barger & Sydeman, 2005), increased mortality (Penninx et al., 2001; Robles et al., 2005; Simonsick,

Wallace, Blazer, & Gerkman, 1995), and disrupted immune functioning (Maier & Watkins, 1998; Pace et al., 2006; Robles et al., 2005).

Indirect evidence is complemented by a growing body of work demonstrating direct associations between N and objective measures of physical health (Smith & MacKenzie, 2006). Direct associations have been demonstrated between N and asthma (Huovinen, Kaprio, & Koskenvuo, 2001), atopic eczema (Buske-Kirschbaum, Geiben, & Hellhammer, 2001), cardiovascular disease (Suls & Bunde, 2005), and irritable bowel syndrome (Spiller, 2007). Furthermore, such associations hold even when depression and social support are controlled for (Bouhuys et al., 2004; Russo et al., 1997). This research provides an especially stringent test of links between N and physical health, demonstrating incremental contributions beyond internalizing psychopathology and associations that are not purely reflective of potential cognitive distortions associated with higher levels of N.

Causal Mechanisms

Evidence has also emerged regarding the predictive validity of trait N for physical health problems. Prospective longitudinal studies have demonstrated links between earlier trait N and longevity in the general population (Smith & MacKenzie, 2006). One representative study of British adults found a 10% higher mortality rate for each +1 standard deviation difference in trait N, even after controlling for multiple covariates (e.g., age, sex, socioeconomic status, substance use, physical activity, and health status; Shipley, Weiss, Der, Taylor, & Deary, 2007). Another population-based study demonstrated that individuals with higher initial levels of N accounted for 33% more deaths (from all causes) than individuals with lower levels of N, again controlling for a number of key covariates (Wilson et al., 2005). A longitudinal study of elderly clergy found evidence suggesting that individuals with high levels of N manifested a nearly doubled risk of death relative to individuals with lower levels of N (Wilson, Mendes de Leon, Bienias, Evans, & Bennett, 2004). However, one longitudinal study of individuals with compromised health did not show incremental predictive utility of trait N (Weiss & Costa, 2005).

N also shows predictive utility for longevity in populations of individuals diagnosed with chronic diseases and cancer. For example, higher levels of N predicted renal deterioration in individuals diagnosed with Type I diabetes (Brickman et al., 1996) and cardiac disease (Murberg, 2004).

Individuals diagnosed with chronic renal insufficiency who also had high levels of trait N manifested a 38% higher mortality rate than individuals with lower levels of N, even when controlling for multiple covariates (Christensen et al., 2002). Similarly, among individuals treated for cancer, higher levels of N were associated with a 130% greater death rate than those lower in N (Nakaya et al., 2006).

Underlying causal mechanisms explaining associations between N and physical health may be similar to those underlying associations between N and mental health. For example, it is possible that shared genetic factors account for covariation between higher levels of N and greater physical health problems. One twin study found that genetic influences accounted for a substantial portion of the covariation between N and self-reported somatic complaints (Vassend, Røysamb, & Nielsen, 2012). In addition, it is likely that the influence of high N on variables such as stress exposure and social support also increases the risk for physical health problems, as it does for mental health problems (Contrada, Cather, & O'Leary, 1999; Holt-Lunstad, Smith, & Uchino, 2008; Smith & MacKenzie, 2006). Research does suggest that social support is inversely associated with greater physical health problems (Uchino, 2006). Similarly, stress is linked to higher levels of physical health problems, as well (Schneiderman, Ironson, & Siegel, 2005).

There may also be unique causal mechanisms underlying N and physical health problems that do not apply to mental health problems. For example, higher levels of N may have an impact on individuals' physiology, such as their stress response and aspects affiliated with immunity, such as inflammation (Futterman, Kemeny, Shapiro, & Fahey, 1994; Gillespie et al., 2004), which in turn impacts their physical health outcomes (Contrada et al., 1999; Friedman, 2000; Smith & MacKenzie, 2006). A growing literature implicates N as a moderator in individual's physiological response to stressors. For example, some research shows that those higher in N may have sympathetic stress responses that are greater in magnitude and longer in duration (Norris, Larsen, & Cacioppo, 2007; Riese et al., 2007; Vogeltanz & Hecker, 1999), higher levels of morning cortisol (Portella, Harmer, Flint, Cowen, & Goodwin, 2005), higher levels of daily cortisol output (Nater, Hoppmann, & Klumb, 2010), higher levels of cardiovascular reactivity (Muth, Koch, & Stern, 2000), and lower levels of blood pressure recovery following interpersonal stress (Hutchinson & Ruiz, 2011). Furthermore,

research has found blunted cortisol reactivity to stress exposure for individuals higher in N (Oswald et al., 2006; Phillips, Carroll, Burns, & Drayson, 2005), which may reflect down-regulation of the hypothalamic–pituitary–adrenocortical axis following prolonged cortisol elevation (McCleery & Goodwin, 2001; Zobel et al., 2004). However, discrepant findings have also emerged in this literature, either in finding no evidence of associations (Hennig et al., 1996; Schommer, Kudielka, Hellhammer, & Kirschbaum, 1999), or associations opposite to the predicted directions (LeBlanc, Ducharme, & Thompson, 2004; see Ormel et al., 2013, for another review of these findings). Methodological limitations prevent clear conclusions at this point, although further work into moderators such as gender may prove fruitful (Hennig et al., 1996; Ormel et al., 2013; Oswald et al., 2006).

Research has linked N to disrupted circadian rhythms (Murray, Allen, Trinder, & Burgess, 2002) and immune system abnormalities (Bouhuys et al., 2004). Specific studies have identified associations between higher N and increased leukocyte counts (Daruna, 1996), diminished antibody response to vaccination (Phillips et al., 2005), disrupted response of natural killer cells to stress (Borella et al., 1999), disrupted secretory immunoglobulin response following a stressor (Hennig, Pössel, & Netter, 1996), and telomere attrition, which is a marker of cellular aging (van Ockenburg, de Jonge, van der Harst, Ormel, & Rosmalen, 2014). Such indicators have direct relevance for immune system functioning and physical health outcomes, including mortality. One study of infant rhesus monkeys found that higher N (nervous temperament) monkeys showed a disrupted pattern of association between increased cortisol levels and neutrophils, a leukocyte subset, compared to monkeys lower in N (Capitanio, Mendoza, & Cole, 2011). Such findings may indicate that individuals higher in N evidence desensitization of immune cells via increased glucocorticoid levels. The extent to which N moderates physiological reactivity and physical health may partly be reflective of shared genetic influences on these constructs. For example, individuals with at least one short allele of 5-HTLPR manifest higher resting cortisol levels (Jabbi et al., 2007) and a higher incidence of irritable bowel syndrome (Yeo et al., 2004). Thus, it remains important for future work to better understand the mechanisms underlying associations between N and physical health.

A second unique causal pathway to consider is the extent to which individuals high in N show greater involvement in health-risk behaviors, which in turn leads to poorer physical health outcomes (Contrada et al., 1999; Smith & MacKenzie, 2006). Individuals higher on N are more likely to smoke nicotine (Breslau, Novak, & Kessler, 2004; Malouff et al., 2006; Morissette, Tull, Gulliver, Kamholz, & Zimering, 2007; Terracciano & Costa, 2004) and abuse other substances such as alcohol and illicit drugs (Larkins & Sher, 2006). Such behaviors carry with them a very high risk for a number of important physical health outcomes including cancer and cardiovascular disease, and further impact mortality rates. Other health-risk behaviors associated with high N include unprotected or risky sex (Cooper, Agocha, & Sheldon, 2000; Hoyle, Fejfar, & Miller, 2000; Trobst et al., 2000). Such behaviors carry with them an increased risk for physical health outcomes such as HIV/AIDS, cervical cancer, and sexually transmitted disease. Health-risk behaviors may be related to trait N via coping or avoidance-motivated pathways (Cooper et al., 2000), which are more likely to be used by individuals with higher levels of N.

Neuroticism and Quality of Life

In addition to associations with maladaptive outcomes, trait N has been robustly linked to positive outcomes as well (Lahey, 2009). Perhaps the best studied link is between trait N and quality of life, or subjective well-being (Boyce, Wood, & Powdthavee, 2013; Ozer & Benet-Martínez, 2006; Steel, Schmidt, & Shultz, 2008). Low levels of N, also referred to as trait “Emotional Stability,” are associated with higher marital satisfaction (Gattis, Berns, Simpson, & Christensen, 2004), greater occupational success (Ozer & Benet-Martínez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), and quality of life (Arrindell, Heesink, & Feij, 1999; Lynn & Steel, 2006; Ozer & Benet-Martínez, 2006). Higher levels of N are also linked to social impairment, beyond what is accounted for by other traits such as extraversion and agreeableness (Mullins-Sweatt & Widiger, 2010). Low levels of N have been prospectively linked to lower levels of burnout and emotional exhaustion (Armon, Shirom, & Melamed, 2012). Levels of N outperform socioeconomic status in predicting overall well-being and emotional health, and states with lower proportions of high N individuals show higher levels of well-being outcomes (McCann, 2011). Similarly,

change in personality (particularly N, but also extraversion) shows greater prediction of changes in life satisfaction than demographic and economic variables (e.g., household income, employment status) combined (Boyce et al., 2013). There is also evidence that overlapping genetic influences at least partly account for associations between N and subjective well-being (Weiss, Bates, and Luciano, 2008).

Conclusions and Future Directions

The potential utility of trait N in future prevention/intervention efforts relies on an increased understanding of how and why N is related to the various outcomes reviewed here. An understanding of the specific underlying mechanisms resulting in links between N and depression, anxiety, substance use disorders, diabetes, cancer, cardiovascular disease, and mortality will result in enhanced knowledge about each condition itself, as well as more nuanced insight into the potential role trait N might play in prevention and intervention efforts for each condition (Klein et al., 2011; Lahey, 2009). Early screening efforts could include measures of trait N on a large-scale basis with relative ease, given the resource efficiency of administering a trait measure of N (Lahey, 2009). Not only would such efforts help identify those at potentially high risk for a range of adverse outcomes, information about levels of N could be incorporated into more personalized and, ideally, more effective treatments. Such large-scale efforts would need to be carefully considered regarding the actual incremental value provided by N above other information already available (e.g., existing health status) and the potential for false positives and stigmatization (Lahey, 2009).

Personality assessments could also more routinely be administered in clinical psychological settings prior to treatment planning and commencement, in order to better understand how existing personality traits such as N may play a role in an individual's mental health and potential intervention course (Barlow et al., 2014; Widiger & Trull, 2007). It might also be possible for large-scale preventive interventions to focus on directly modifying levels of trait N (Lahey, 2009). Although purely speculative, adaptations of psychotherapeutic and psychopharmacological interventions may ultimately prove useful for those high on N in increasing their chances for adaptive outcomes. Of course, such efforts would require careful

consideration of possible iatrogenic effects. Trait N, as with all broad personality traits, is adaptive in certain contexts and at certain levels. Those with particularly low trait N may not be served well by attempts to lower their levels of N even further, and may then fail to benefit from adaptive features of N when called for.

Current psychological treatments, which have been largely driven by the fragmented categorical approach embodied in the DSM ([American Psychiatric Association, 2013](#)), may have become overly specialized, focusing on disorder-specific symptoms and manifestations ([Barlow et al., 2014](#)). Thus, interventions targeting broader measures of underlying N may require a new approach and fresh way of thinking about intervention mechanisms of change. It is likely that some aspects of existing interventions can be leveraged toward a dimensional personality framework, but other aspects may be less relevant and new aspects may emerge as meaningful. For example, even individuals who benefit from psychotherapeutic treatment for internalizing disorders show high temporal stability for N trait levels ([Eaton et al., 2011](#)). Contradictory evidence has also emerged, however, such that trait levels of N showed the highest level of temporal change following treatment in another sample ([Brown, 2007](#); [Brown & Barlow, 2009](#)). Thus, in addition to more mechanistic investigations of potential interventions, clear differentiation between state and trait levels of N will be needed for such work, moving forward.

Research directly targeting temperamental components is beginning to emerge in the literature. Indirect support for this idea comes from evidence in psychopharmacological research that has indicated that medications targeting serotonin appear to reduce levels of N (e.g., [Quilty, Meusel, & Bagby, 2008](#)). In addition, growing evidence suggests that personality traits, including N, show response to treatment ([Klein et al., 2011](#)). [Barlow and colleagues \(2014\)](#) have devoted considerable effort to developing a comprehensive treatment protocol specifically aimed at transdiagnostic temperamental traits underlying internalizing psychopathology. This cognitive-behavioral intervention was designed to target negative emotional experiences and the individual's responses to such experiences, and early evidence on efficacy has been promising.

Individuals with comorbid mental and physical health problems show more severe variants of health concerns, increased demand for health services, and more severe prognosis ([Baune, Adrian, & Jacobi, 2007](#); [Druss](#)

(et al., 2009; McCaffery et al., 2006). Furthermore, research suggests that interventions targeting one internalizing disorder frequently yield improvements in other comorbid internalizing disorders that were not actually targeted in treatment (Barlow et al., 2014). This overlapping treatment response implicates the potential role of shared underlying features such as high N, and suggests that interventions directly targeting high N may yield cascading effects on any number of related mental and physical conditions. Research reviewed here positions N as a particularly likely candidate for understanding the mechanisms underlying mental and physical health problem cooccurrence, and thus underscores the potential public health significance of trait N across these conditions.

Summary

In sum, N is a higher-order personality trait that encompasses a tendency to experience negative affect and emotions, including feelings of sadness, anxiety, and anger. N is one of the most robust of higher-order personality traits, emerging across different personality trait frameworks, as well as different populations (e.g., based on age or culture). Although many conceptualizations of N include antagonistic negative affect as well, this represents one of the most conflicting aspects of N conceptualization across different trait models and in different populations. N is associated with myriad adverse health outcomes, including different types of psychopathology and physical health concerns. Low N is also associated with positive outcomes such as quality of life.

As has been emphasized throughout this chapter, the personality trait of N has enormous consequences for public health. The myriad mental and physical health outcomes summarized here underscore its potential impact on individual adaptation. Furthermore, economic costs associated with N are substantial, exceeding even those for common mental disorders (Cuijpers et al., 2010). The extent to which trait N will ultimately hold public health significance will depend on the extent to which the literature summarized here translates into more effective prevention and intervention efforts (Lahey, 2009).

In terms of future directions, one important next step for research in this area is to move toward more sophisticated tests of causal mechanisms underlying associations between N and mental and physical health

outcomes. Evidence for these associations is robust and numerous causal pathways have been articulated, but are rarely tested in explicit and powerful research designs. In particular, integrated models should be developed that directly account for physical and mental health outcomes alongside one another to more fully explicate the common associations among such outcomes and N (Lahey, 2009). For example, one recent study examined the risk for depression and anxiety across multiple adult cohorts with multiple predictors (e.g., trait N, physical health, cognitive functioning, level of disability, body mass index, and socioeconomic status; Gale et al., 2011). This examination demonstrated incremental unique associations between N, various aspects of physical health, and depression/anxiety. Although this study was not well situated to address causal mechanisms, it exemplifies the type of integrative approach needed in order to better understand how N associations with psychological and physical health manifest within individuals. It is also anticipated that research will continue moving toward better evidence for common underlying genetic and neurobiological factors that may partially account for associations between N and these outcomes, as well as the extent to which such factors are moderated by contextual features in influencing the likelihood for adverse outcomes. Although such work is growing, research explicitly integrating multiple levels of analysis will be needed to fully chart causal pathways to pathological outcomes (Kendler, 2014).

Joshua Wilt and William Revelle

Abstract

This chapter provides a review of extraversion, defined as a dimension of personality reflecting individual differences in the tendencies to experience and exhibit positive affect, assertive behavior, decisive thinking, and desires for social attention. Extraversion is one of five basic tendencies in the Five Factor Model (FFM) of personality. In the FFM, basic tendencies are conceptualized as including the following characteristics. They are organized hierarchically, based in biology, develop over time according to intrinsic maturation principles, are manifested in characteristic adaptations (i.e., are expressed in affective, behavioral, and cognitive tendencies), influence one's objective biography, are reflected in the self-concept, and have both adaptive and maladaptive variants. This chapter is organized around the theory and research on extraversion relevant to each of the aforementioned characteristics.

Key Words: extraversion, surgency, gregariousness, friendliness, assertiveness, leadership, sociability

Personality trait dimensions are abstractions used to describe and explain consistency and coherence in affect, behavior, cognition, and desire—the “ABCDs” of personality ([Ortony, Norman, & Revelle, 2005](#); [Revelle, 2008](#))—over time and space. Introversion–extraversion (referred to from here on as extraversion) is a higher order dimension of personality reflecting tendencies to experience and exhibit positive affect, assertive behavior, decisive thinking, and desires for social attention ([Wilt & Revelle, 2009](#)). More extraverted individuals are characterized by energy, dominance, spontaneity, and sociability, whereas more introverted individuals tend to be described as more lethargic, inhibited, reflective, and quiet.

Generally speaking, it is important to study extraversion due to its emergence as one of the basic and fundamental dimensions in almost all current theories and taxonomies of normal personality traits ([Ashton & Lee, 2007](#); [Costa & McCrae, 1992](#); [Eysenck & Himmelweit, 1947](#); [Goldberg,](#)

(1990; Hogan, 1982; Norman, 1963), its role in contributing to effective functioning and well-being in a number of different domains (Lucas & Fujita, 2000; Magee, Heaven, & Miller, 2013; Ozer & Benet-Martinez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), and its relations to various forms of psychopathology (Krueger, Caspi, Moffitt, Silva, & McGee, 1996; Widiger, 2005). This chapter focuses in particular on extraversion from the framework of the Five Factor Model (FFM; Costa & McCrae, 1992; McCrae & Costa, 2008) of personality.

Although it is recognized that extraversion in the FFM is similar to the extraversion constructs in other theories of personality in terms of its conceptual and operational natures (McCrae & Costa, 2008), and indeed all studies of extraversion are likely tapping into common features of the trait, it is worth noting that the FFM provides a unique perspective from which to view and organize current theory and research on extraversion. FFM categorizes Extraversion as one of the five *basic tendencies* (along with Neuroticism, Openness, Agreeableness, and Conscientiousness). In the FFM, basic tendencies are conceptualized as being organized hierarchically, biologically based, developing over time according to intrinsic maturation principles, being manifested in characteristic adaptations (i.e., are expressed in affective, behavioral, and cognitive tendencies), influencing our objective biography, being reflected in the self-concept, and possibly having both adaptive and maladaptive variants. This chapter is organized around the research relevant to each of the aforementioned characteristics as they apply to extraversion with the aim of providing an overview of what is known about this important trait.

Extraversion as a Basic Tendency

Extraversion Is in All Prominent Models

C. G. Jung (Jung, 1921/1971) first introduced the term extraversion, describing more extraverted individuals as being more focused on the outer world, in contrast to more introverted individuals who were thought to be focused more on their own inner mentality. Extraversion for Jung was engaging with the world, whereas introversion was being drawn inward into thought. Although Jung originated the name, Gerard Heymans and Wilhelm Wundt perhaps did more to establish the empirical basis for studying extraversion. Heymans and Wiersma (1909), using early techniques that

were crude cousins of factor analysis, identified extraversion along a continuum of “strong” and “weak” functioning (Eysenck, 1992). Reanalysis of the original data using factor analysis has confirmed the presence of a factor similar to extraversion, ranging from energetic to submissive (Van der Werff, 1985). Wundt (1897) reorganized the temperaments of Hippocrates and Galen into two dimensions, changeability and excitability; the choleric and sanguine temperaments were thought to be more changeable, whereas the melancholic and phlegmatic temperaments were conceptualized as being less changeable. The changeability dimension was later conceptualized as extraversion by Hans Eysenck (Eysenck, 1981; Eysenck & Himmelweit, 1947).

Perhaps nobody has done as much for extraversion as Eysenck, and he demonstrated the importance of extraversion as a fundamental dimension of personality in a series of experimental and taxometric studies (Eysenck, 1952; Eysenck & Himmelweit, 1947). He was one of the first to attempt a thorough description and measurement of extraversion that evolved with the development of several inventories—the Maudsley Personality Questionnaire (MPQ; Eysenck, 1959), the Eysenck Personality Inventory (EPI; Eysenck & Eysenck, 1964), the Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1975), and the Eysenck Personality Profile (EPP; Eysenck & Wilson, 1991)—the content of which included items mainly assessing sociability and impulsivity in varying proportions depending on the inventory (Rocklin & Revelle, 1981). Another early measure that also went through several versions (Guilford & Guilford, 1934) and that deserves mention is the Guilford–Zimmerman Temperament Survey (GZTS; Guilford & Zimmerman, 1949). The GZTS included a dimension defined at one end by the tendency for quiet reflection and at the other end by impulsivity (named introversion–extraversion), and it included yet another dimension that contained sociability content similar to Eysenck’s extraversion. The differences between Eysenck’s and Guilford’s conceptualizations of extraversion led to an influential debate about the appropriate content of extraversion (Eysenck, 1977; Guilford, 1975, 1977).

Extraversion consistently emerged from early lexical analyses aimed at determining the fundamental dimensions of personality (see also the chapter by De Raad and Mlačić). Allport and Odber's (1936) list of trait words extracted from an unabridged dictionary formed the basis for Raymond Cattell's Herculean efforts to catalogue and organize the trait domain (e.g.,

Cattell, 1943a,b, 1947). Over a number of years, Cattell narrowed Allport and Odbert's (1936) list of trait adjectives to 171 paragraph descriptors, then 35 paragraph descriptors, and finally through factor analysis to 12 factors and four additional scales that in turn were measured by the 16PF inventory of primary personality factors (Cattell, 1947). In the 16PF, a higher order factor of extraversion encompasses five of the primary factors that together contain content reflecting impulsivity, sociability, and ascendancy (Cattell, 1957). The work of Fiske (1949) and Tupes and Christal (1961) examined the structure of peer ratings based on the paragraph descriptors of Cattell and consistently found five factors, one of which was labeled surgency or extraversion. This work laid the foundation for Warren Norman's (1963) seminal factor analysis on what he considered to be the best marker scales from Tupes and Christal (1961) that revealed what are now known as the Big Five factors of personality (Goldberg, 1990).

Each of the Big Five is conceptualized as a broad factor subsuming a number of narrower traits. The first factor in the Big Five, Surgency (also called extraversion), consists of more specific traits such as talkative, energetic, assertive, and adventurous. Lewis Goldberg (1993) and John Digman (1990) have perhaps conducted the most rigorous and influential research attesting to the validity of the Big Five structure, which was replicated in the languages of many different cultures (Goldberg, 1990, 1992). A wide range of inventories has been developed over the past 20 years to assess the Big Five (e.g., Goldberg, 1992; Hofstee, de Raad, & Goldberg, 1992; John, Donahue, & Kentle, 1991; Rammstedt & John, 2007; see also the chapter by Simms, Williams, and Simms). The most extensive assessment of the Big Five is the Abridged Big Five Circumplex (AB5C; Hofstee et al., 1992); the adjectives included in this inventory have high loadings on two factors¹ (each adjective has a primary loading on one factor and a secondary loading on the second one) such that pairs of the Big Five dimensions have a circumplex structure. Facets including items with their primary loadings in the extraversion domain in this inventory are gregariousness, friendliness, assertiveness, poise, leadership, provocativeness, self-disclosure, talkativeness, and sociability.

The FFM (McCrae & Costa, 2008) identifies personality dimensions similar to the Big Five and has also been replicated across many cultures. Although often used synonymously with the Big Five, the FFM was derived

from factor analysis of questionnaires rather than adjectives. The most comprehensive instrument used to assess the traits in the FFM, the NEO Personality Inventory-Revised (NEO PI-R; Costa & McCrae, 1992), assumes a hierarchical structure with each higher order factor seen as the aggregate of six lower order facets. Extraversion's lower order facets in this inventory are warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotion. DeYoung, Quilty, and Peterson (2007) recently contributed an important addition to the assessment of Big Five/FFM traits by developing the Big Five Aspects Scales (BFAS), an inventory that was empirically derived from the NEO PI-R and an open-source measure of the AB5C included in the International Personality Item Pool (IPIP) (Goldberg, 1999; Goldberg et al., 2006). In the BFAS, extraversion is represented by the lower order aspects of enthusiasm and assertiveness.

Various other models of traits identify extraversion as a basic dimension of personality. Also relying on factor analysis of adjectives from the dictionary, Tellegen (1985) developed a seven-factor taxonomy including five factors that resemble the Big Five and two additional factors of positive and negative evaluation. Tellegen's (1982) inventory, the Minnesota Personality Questionnaire, operationalizes extraversion hierarchically as well, with its lower order facets termed well-being, social potency, social closeness, and achievement. Hogan's (1982) Socioanalytic Theory includes a higher order factor similar to extraversion that consists of the facets sociability and ambition, and the HEXACO model of personality (Ashton & Lee, 2001, 2007; Lee & Ashton, 2004) represents extraversion with four lower order facets termed expressiveness, liveliness, sociability, and social boldness.

Defining Extraversion's Lower Order Structure

The idea from FFM that basic tendencies are hierarchically organized is borne out in the previous description of theories and inventories including extraversion, as most of the inventories include lower order facets that together comprise the higher order trait of extraversion. There is clearly quite a bit of overlap across inventories in terms of what content is included in the extraversion domain, although there are also differences in which content is emphasized as well as the overall breadth of coverage. The difficulty of defining facets in a nonarbitrary way (Costa & McCrae, 1998)

perhaps contributes to some of the inconsistency in the operationalization of extraversion across inventories. This presents a challenge for moving toward a better understanding of extraversion because a detailed and precise knowledge of lower order constructs is necessary in order to achieve a greater comprehension of the broad trait (McCrae & Costa, 1992).

Notwithstanding the inherent difficulties in generating a comprehensive list of lower order constructs within a trait domain, the NEO PI-R (Costa & McCrae, 1992) may be viewed as a prototypical example of a traditional hierarchical representation of facet structure. The NEO PI-R was rationally derived through extensive literature reviews, theory building, and intuition, and it shows good convergent and discriminant validity (McCrae & Costa, 1992). The NEO PI-R (and many other inventories designed to assess the hierarchical structure of traits described earlier) assumes a simple structure, in which lower order facets are thought to associate with only one higher order trait and are empirically associated with each other only through the shared variance of the latent, higher order trait that they have in common. In the case of the NEO PI-R extraversion, this implies that the facets of warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotion are all thought to be connected through some common process.

Advocates of the FFM have proposed that the common process is the disposition to engage in social behavior (McCrae & Costa, 1997), whereas other theorists have posited that the core of extraversion is positive emotionality (Tellegen, 1985; Watson & Clark, 1997) or the propensity to seek social attention (Ashton, Lee, & Paunonen, 2002). However, as Hofstee, de Raad, and Goldberg (1992) showed in their development of the AB5C, personality inventories do not typically show simple structure empirically, as lower order constructs across different traits tend to be associated with one another even when controlling for the variance of higher order factors (see also the chapter by Wright). Additionally, the use of simple structure as applied to personality data leads to imprecise and inaccurate solutions (Pettersson & Turkheimer, 2014). These findings raise questions about the traditional way of thinking about the hierarchical structure of extraversion (and traits in general), and so alternative ways of representing traits at different levels of breadth deserve consideration.

Eysenck (1970) proposed an intriguing multilevel representation of extraversion that consisted of four distinct levels of abstraction. Specific

responses are the most narrow level in this schematic and comprise individual behaviors such as flirting on a single occasion. One level above are *habitual responses* such as behaving in a lively manner at various parties on recurring occasions. At the next level are facet-level constructs, such as gregariousness, and finally at the highest level of the hierarchy is the broad trait of extraversion. This hierarchy is unique in at least two respects. First, constructs at lower levels are specified as residing within only one higher order level. Second, Eysenck did not specify links between constructs included at the same level of a hierarchy nor between constructs across levels. This type of hierarchy may be a useful way of understanding how extraversion manifests at different levels of specificity; however, little research has examined whether this elegant hypothetical structure can be operationalized reliably.

Another unique perspective on higher order traits is provided by the increasingly popular network perspective ([Borsboom & Cramer, 2013](#); [Cramer et al., 2012](#); [Goekoop, Goekoop, & Scholte, 2012](#); [van Os, Lataster, Delespaul, Wichers, & Myin-Germeys, 2014](#)). The network perspective proposes that higher order traits such as extraversion emerge from the interactions between lower order affective, behavioral, and cognitive (ABC) states. In contrast to the latent variable view of traditional trait hierarchies, the lower order constructs are thought to be correlated due to their influences on each other over time rather than sharing a common, higher order factor. This view therefore shifts the focus of organization away from the trait level to the trait's more narrow aspects. As applied to extraversion, the network approach, in stark contrast to Eysenck's hierarchy, posits strong associations between specific ABC constructs within the domain of extraversion. For an empirical example of how NEO PI-R extraversion can be visualized from the network perspective, see [Cramer et al. \(2012\)](#). This approach is appealing due to its ability to accommodate the complexity of associations between lower order levels of personality, but issues regarding how best to model network variables and the relegation of higher order traits such as extraversion to summary variables with no causal or organizing influence demand attention.

In addition to issues pertaining to how best to organize the traits residing in the extraversion domain, there is also debate about just which traits should be considered a part of extraversion. Perhaps the most longstanding and lively debate has centered around whether constructs similar to

impulsivity should be thought of as lower order features of extraversion ([Revelle, 1997](#)). Eysenck included impulsivity content in his original inventories, yet he appeared to be ambivalent about whether impulsivity should be thought of as a central feature. Analyses of the structure of the EPI and the EPQ showed that the greatest difference between the inventories was that the EPI contained a substantial amount of both sociability and impulsivity, whereas the EPQ contained much more sociability than impulsivity ([Rocklin & Revelle, 1981](#)). Jeffrey Gray's original version of Reinforcement Sensitivity Theory (Gray, [1970, 1981, 1982](#)) conceptualized Eysenck's extraversion as impulsivity minus anxiety; specifically, Gray believed that impulsivity graphically rotated 45 degrees in conceptual space from extraversion.

[Zuckerman \(1991\)](#) likewise included a construct similar to impulsivity in his general theory of personality, identifying a factor of sensation seeking that reflects a lack of planning, impulsive decision making, and taking risks for the sake of novelty. In yet another model of personality to grapple with issues about distinguishing among the aforementioned constructs, [Cloninger, Svrakic, and Przybeck \(1993\)](#) considered impulsivity to be part of a factor labeled novelty seeking that also contained approach behavior, high responsivity to reward, and a quickness to lose one's temper. Although still far from settling this debate, studies including a wide array of scales covering the terrain of extraversion, impulsivity, and sensation seeking have been making progress toward delineating the structure of these constructs. Factor analyses of the NEO PI-R and various impulsivity and sensation-seeking scales showed that some forms of impulsivity were more similar to NEO PI-R conscientiousness, whereas sensation seeking emerged as more highly associated with NEO PI-R extraversion ([Whiteside & Lynam, 2001](#)). Additionally, a recent study ([Quilty, DeYoung, Oakman, & Bagby, 2014](#)) used confirmatory factor analysis to show that sensation seeking is related to but not subsumed by extraversion's aspects of assertiveness and enthusiasm.

The ABCD Approach as an Organizing Framework

The disagreements about extraversion's content should not be discouraging to those hoping for rapprochement regarding the scope of the extraversion domain; rather, it is just this type of healthy scientific debate that produces advancement in knowledge. Steps toward a synthesis of

current ideas will likely arise out of an organizing framework that is capable of sorting out the differences among prominent theories' conceptualizations of extraversion. The aforementioned affect, behavior, cognition, and desire (ABCD) approach to personality might be one way of integrating different theories and operationalizations of traits (Ortony et al., 2005; Revelle, Wilt, & Condon, 2011; Wilt, Oehlberg, & Revelle, 2011). Putting this approach to the test, Rauthmann and Will (2011) showed that recurrent themes in the scientific literature pertaining to the trait of Machiavellianism can be organized coherently into ABCD aspects. To understand this approach, it is useful to first define the ABCD domains.

Despite its ostensibly intuitive nature, there have been inconsistencies in the way the term behavior has been applied in the field of personality. Adopted herein is the definition of behavior offered by (1) Furr (2009)—“behaviour may be defined as verbal utterances (excluding verbal reports in psychological assessment contexts) or movements that are potentially available to careful observers using normal sensory processes” (p. 372)—and added to it (2) the observation of Ortony et al. (2005) that behavior encompasses physical actions that may not be observable through normal sensory processes (e.g., contractions of the gut). Behavior is how the mental processes of affect, cognition, and motivation manifest themselves and become tangible and concrete (Shweder, 1999). Descriptions of affect tend to converge on the definition of affect as a higher order category subsuming valenced condition such as moods, emotions, feelings, feeling-like states, and preferences (Ortony et al., 2005; Pytlik Zillig, Hemenover, & Dienstbier, 2002; Scherer, 1995). Cognition, or cognitive activity, is also thought of as a higher order category and encompasses mental contents and processes (Gruszka, Matthews, & Szymura, 2010). Attention, memory, knowledge, problem solving, beliefs, appraisals, interpretations, representations, and expectations are all included in the domain of cognition (Cervone, 2004; Ellsworth, 1994; Ortony et al., 2005; Revelle, 1995). The domain of desire refers to people's (conscious or unconscious) goals, needs, wants, and wishes (Winter, John, Stewart, Klohnen, & Duncan, 1998). What binds these constructs in common is that they represent states that people would like to bring about or to prevent (Chulef, Read, & Walsh, 2001).² By relying on basic dimensions of phenomenological experience, the ABCD approach defines, clarifies, and explicates the meaning of traits in terms of psychological content. Thus, it can bring a more logical and

meaningful organization to the characteristics that together characterize extraversion.

Across the inventories summarized previously, extraversion is defined by themes such as enthusiasm, assertiveness, sociability, dominance, agency, gregariousness, and warmth. Although these terms together do well to describe the landscape of extraversion, they provide little insight into the dynamic ABCD processes that differentiate individuals residing at different levels of the extraversion continuum. In contrast, take, for example, the results of an initial effort to delineate extraversion by its ABCD components ([Wilt, 2014](#)). Extraversion items from the International Personality Item Pool ([Goldberg, 1999](#); [Goldberg et al., 2006](#)) versions of the NEO PI-R and AB5C that were rated by experts as containing relatively high amounts of A, B, C, and D content were aggregated into scales reflecting the ABCD components of extraversion (see [Table 4.1](#)). These items together paint a coherent psychological portrait of the extraversion continuum as comprising positive affects (especially around people), gregarious and talkative behaviors, spontaneous and decisive cognitions, and desires for attention and influence.

Table 4.1. Extraversion Items and ABCD Content

	AB5C Primary	NEO Domain	A	B	C	D
<i>Affect items</i>						
Love surprise parties.	E		90	2	3	5
Love excitement.	E		77	10	7	7
Feel comfortable around people.	E	E	76	4	13	8
Have a lot of fun.	E	E	74	10	10	6
Express childlike joy.	E	E	72	26	2	1
Dislike neighbors living too close.	E-		72	9	4	15
Often feel uncomfortable around others.	E-	E-	70	10	13	8
<i>Behavior items</i>						
Make a lot of noise.	E		6	83	6	6
Speak loudly.	E		7	82	5	7
Start conversations.	E		7	81	5	8
Speak softly.	E-		10	79	3	8
Am the first to act.	E		7	79	4	10
Don't talk a lot.	E-		8	78	7	7
Never stop talking.	E		7	78	7	8
<i>Cognition items</i>						
Come up with a solution right away.	E		6	27	59	10
Know no limits.	E		13	23	48	16
Know how to captivate people.	E		13	29	45	13
Can take strong measures.	E		11	35	43	12
Know what I want.	E		9	1	36	54
React quickly.	E		23	39	34	3
Let things proceed at their own pace.	E-		15	37	33	15
<i>Desire items</i>						
Seek to influence others.	E		6	15	21	58
Seek adventure.	E		11	23	9	57
Demand to be the center of interest.	E		14	26	5	55
Know what I want.	E		9	1	36	54
Seek quiet.	E-	E-	9	35	11	45
Try to lead others.	E	E	5	43	8	44
Can easily push myself forward.	E		14	26	20	40

Note: The second and third columns show trait domains for each item for the IPIP-AB5C and IPIP-NEO PI-R. Trait domain indicators with a “-” sign next to them signify that the item was reverse-scored with respect to extraversion. Numbers indicate the average percentage of ABCD content for each item calculated across independent raters.

The ABCDs are just one possibility for organizing the facet-level constructs of extraversion in meaningful ways. Another conceptualization about the nature of traits that shows promise is the division of traits into the *situations* in which trait-relevant *behaviors* are carried out and the *explanations* for those behaviors (Yang et al., 2014). For example, the

situation of meeting new people at a party might elicit conversation for the more extraverted individual, because she or he believes that will facilitate social connections. For individuals who are more introverted, a party might send them in search of a quiet spot alone because they are overwhelmed by the pressure to interact socially. [Read et al. \(2010\)](#) provide an excellent review and simulation study showing how these scenarios may play out in dynamic fashion. Future research may seek points of contact and departure between this approach, the ABCD approach, and other intriguing explanatory models of traits (e.g., [DeYoung, 2015](#); [Fleeson, 2012](#); [Read et al., 2010](#)), with the overarching and related aims of refining the conceptual definition of extraversion and devising more accurate assessment techniques for all levels of the extraversion hierarchy.

Evolution, Genetics, and Biology

Interest in the physiological bases of human personality dates back at least 2,500 years to the linking of bodily humors to the four temperaments described by Hippocrates and Galen: blood for sanguine, yellow bile for choleric, black bile for melancholic, and phlegm for phlegmatic ([Stelmack & Stalikas, 1991](#)). Current theories of the evolutionary, genetic, and neurophysiological underpinnings of personality, however, differ dramatically from their origins. The fundamental notion that any logical explanation of traits needs to be consistent with basic biology though remains as true now as it did then. The FFM ([McCrae & Costa, 2008](#)) proposes that the five basic tendencies all have a strong biological foundation. We now review research on the topic of the evolutionary, genetic, and biological basis of extraversion.

Evolutionary Perspectives

The idea that traits evolved as strategies to meet adaptive challenges in the social environment is a popular notion among evolutionary psychologists (e.g., [Buss, 2009](#); [Denissen & Penke, 2008](#); [Nettle, 2006](#)). Genetic polymorphisms that relate to variations in traits, such as extraversion, can be maintained by natural selection in a number of ways ([Buss, 1991, 2009](#); [Nettle, 2006](#)). Selection pressures vary over time or geographic location; as such, different phenotypes may become more or less adaptive. Natural selection can also maintain variation in traits in the

case of frequency dependent selection, in which the fitness of a phenotype depends on its frequency relative to other phenotypes in a given population. As applied to extraversion, the evolutionary result of any or all of these circumstances would be between-person variations in genes that bias individuals toward developing more extraverted or introverted phenotypes.

Studies showing that extraversion is moderately heritable, $h^2 = 0.45\text{--}0.50$, with little if any shared environmental influence (Bouchard & Loehlin, 2001), support the idea that extraversion has a substantial genetic basis (see also the chapter by South). Establishing heritability is the first step in uncovering specific genetic pathways, with optimistic theorists positing that extraversion may eventually be linked to specific polymorphic genes (Munafò, 2009; Penke, Denissen, & Miller, 2007). There has been some progress on this front, as extraversion has been associated with several genetic polymorphisms (Canli, 2006; Ebstein, Benjamin, & Belmaker, 2003; Luo, Kranzler, Zuo, Wang, & Gelernter, 2007).

Compelling evidence for the genetic basis of extraversion also comes from studies of nonhuman animals. If extraversion was simply a byproduct of human culture, traits similar to extraversion would not be expected to be found in other species. However, Gosling and John (1999) synthesized research on personality factors in nonhuman animals and found that factor labels that reside in the domain of extraversion were nearly ubiquitous across species. For example, individual differences in pigs and rhesus monkeys can be described by sociability, dogs and cats by energy, and octopi by approach-avoidance tendencies. In a vivid example, it was noted that more introverted octopi tend to stay in their dens and hide themselves by changing color and releasing ink.

The variation in extraversion across a multitude of species raises questions about how different levels of extraversion contribute to fitness. Nettle (2005, 2006) has proposed that there are fitness trade-offs at the poles of the extraversion continuum. A potential fitness benefit of higher extraversion may be the enhanced ability to form and sustain interpersonal relationships (Ashton & Lee, 2007; Nettle, 2005). Indeed, extraversion promotes social status and more extraverted individuals may enjoy the benefits of greater social influence and dominance (Anderson, John, Keltner, & Kring, 2001). Importantly, for arguments about whether the social benefits of extraversion actually increase fitness, extraversion is related to having more sexual partners (Nettle, 2005). So, why don't we live

in a world of all extraverts? For one, more extraverted individuals may expose themselves to more safety risks as indicated by being hospitalized more for injuries (Nettle, 2005), perhaps due in part to engaging in increased antagonistic competition (Schaller & Murray, 2008). Introversion is also a protective factor against exposure to infectious illness, and thus geographic regions with high infectious disease prevalence may select for genetic polymorphisms that bias individuals toward introversion (Nettle, 2005; Schaller & Murray, 2008).

An example of how different levels of extraversion may be more or less adaptive depending on the environment comes from a study conducted by Camperio Ciani, Capiluppi, Veronese, and Sartori (2007) that assessed the personality of people living on the mainland in Italy and on the small islands off the mainland. It was found that compared to people living on the mainland and recent immigrants to the islands, individuals from families that inhabited the islands for 20 generations or more were less extraverted. Furthermore, emigrants from the islands were more extraverted than islanders who never emigrated. Camperio Ciani et al. (2007) proposed that selective emigration from the islands based on genetic differences is the underlying cause for these population differences in extraversion. More generally, genetically driven selective emigration might be one plausible contributor to differences in extraversion (or any personality trait) across regions within the same country (Rentfrow et al., 2013) as well as across countries (McCrae & Terracciano, 2005).

In contrast to the view of traits as evolutionarily adaptive, Tooby and Cosmides (1990) described an alternative model in which individuals engage in facultative calibration of their traits to personal and environmental cues over the course of development. That is, given a certain set of environmental conditions or physical characteristics, individuals will differ in their behavioral strategies based on which strategies are most adaptive for those specific circumstances. An example of how this might play out comes from a study showing that physical attractiveness and strength explained a large portion of the variance in extraversion scores (Lukaszewski & Roney, 2011). Lukaszewski and Roney reasoned that because reproductive success rates for extraverted behavioral strategies are likely to depend in part on these physical qualities, stronger and more attractive individuals tend to favor extraversion so as to increase their likelihood of obtaining mates.

Have different levels of extraversion contributed to adaptive fitness across phylogenetic history, or has extraversion simply calibrated over the course of ontogeny? Questions such as these are likely to stir controversy, but they are also likely to keep areas of study related to evolutionary personality psychology moving forward rapidly. After overcoming early criticisms that evolutionary topics were not amenable to empirical tests, researchers have found creative ways to operationalize hypotheses based on evolutionary theories. Future research will require even greater innovation, but it will be critical to meet the many challenges that lie in wait if personality is to realize the aspiration of having evolutionary theory as its meta-theoretical anchor ([Ashton & Lee, 2001](#); [Buss, 1995](#); [McAdams & Pals, 2006](#)).

Brain Systems Underlying Variation in Extraversion

Evolutionary and genetic influences represent the most distal steps in tracing the biological underpinnings of extraversion. Genes do not act directly on behavior; rather, their effects are mediated by brain structure and function. Research investigating how individual differences in brain systems may lead to variations in extraversion has a rich history, starting with two titans (Eysenck and Gray) in the history of biological theories for extraversion (see also the chapter by [Allen and DeYoung](#)).

Eysenck and Gray

The now famous debate between Hans Eysenck and Jeffrey Gray marks the beginning of contemporary theories about the neurobiological basis of extraversion ([Matthews & Gilliland, 1999](#)). Eysenck laid the groundwork for biological theorizing with his arousal hypothesis of extraversion ([Eysenck, 1967](#)). The basis of Eysenck's theory was the idea that a person's extraversion was dependent upon their threshold for arousal in the ascending reticular activating system, or ARAS (the ARAS is a feedback loop connecting the cortex to the reticular activating system). Eysenck chose the ARAS because of its known roles in attention and learning ([Eysenck, 1973](#)), two processes that he had long believed were integral sources of individual differences in extraversion ([Eysenck, 1957](#)). Eysenck posited that extraversion was related to higher thresholds for arousal and thus to lower levels of cortical arousal at baseline. Based on Wundt's notion

that people try to maintain moderate arousal (Wundt, 1897), Eysenck believed that this low arousal at baseline could explain the relations between extraversion and the pursuit of stimulating activities such as stimulant drugs (cigarettes), sexual activities, and social interaction. However, problematic for Eysenck's theory are studies showing that resting brain activity rarely differs as a function of extraversion (Stelmack, 1990, 1997), as well as electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) studies finding that the association between extraversion and cortical arousal is sometimes positive and sometimes negative (Matthews & Gilliland, 1999; Zuckerman, 2005). Additionally, arousal-based frameworks are limited in capturing key components of extraversion concerning reward processing, incentive motivation, and behavioral approach (Depue & Collins, 1999; Gray, 1981; Smillie, Pickering, & Jackson, 2006).

Jeffrey Gray proposed an alternative causal theory of extraversion that was well-suited to explain extraversion's relations to approach processes, termed Reinforcement Sensitivity Theory (RST; Gray, 1970, 1981, 1982). The original formulation of RST, which was based on animal research, postulated the existence of three separate neural systems underlying behavior: (1) the Behavioral Approach System (BAS), (2) the Behavioral Inhibition System (BIS), and (3) the Fight–Flight System (FFS). The primary emphasis was on the effects of the BIS and BAS. Sensitivity of the BAS was thought to underlie trait impulsivity, and sensitivity of the BIS was thought to underlie trait anxiety. These traits were conceptualized as primary traits that together could explain Eysenck's extraversion. Specifically, Eysenck's extraversion was thought to be impulsivity minus anxiety.

Gray's theory has undergone drastic revisions that are beyond the scope of this chapter (Corr, 2008; Gray & McNaughton, 2000; Smillie, 2015; Smillie et al., 2006),³ but it is worth mentioning that the BAS is thought to mediate reactions to all appetitive stimuli and to produce various characteristics associated with extraversion: the emotion of anticipatory pleasure and the pursuit of rewarding, impulsive, and risky behaviors (Corr & Cooper, 2015). Indeed, although Gray described only one system for approach, he did not rule out the possibility that approach processes are multidimensional. From an evolutionary standpoint, the diversification of approach systems would be consistent with an evolutionary arms race in

which predators must evolve multiple strategies for catching their prey (Dawkins & Krebs, 1979). The penalty for a failed approach is not as severe as for failed avoidance according to the so-called “life-dinner” principle; as the predator loses a meal, the prey would lose its life (Dawkins & Krebs, 1979). Psychometric assessments of the BAS (Carver & White, 1994; Corr, 2008) reflect the complexity of approach, with scales assessing varied components such as interest in rewards, emotional reactivity to rewards, persistence in obtaining rewards, pleasure-seeking behavior, and impulsive obtainment of an incentive.

Given their conceptual similarities, it is surprising that more research has not explored the associations between BAS-related characteristics and extraversion. In the first study examining the relationships between Carver and White's (1994) BIS/BAS scales and extraversion, Smits and Boeck (2006) found that the overall BAS scale and all three of the subscales (drive, fun-seeking, and reward-reactivity) were positively associated with extraversion. Likewise, Keiser and Ross (2011) found a positive relationship between Carver and White's (1994) total BAS scale and extraversion. In the only study to examine links between Carver and White's (1994) BAS scales and the NEO PI-R, Segarra, Poy, López, and Moltó (2014) showed that BAS fun-seeking was uniquely related to the facets of warmth, gregariousness, activity, excitement-seeking, and positive emotions; reward responsivity was related to warmth, activity, excitement-seeking, and positive emotions; and drive was related only to assertiveness. Further specification of the associations between approach-related phenomena and extraversion has the potential to better situate revised-RST (Gray & McNaughton, 2000) as a viable biological foundation for the FFM of extraversion (Wilt & Revelle, 2009).

Reward Processing and Dopaminergic Functioning

Gray's efforts were just the starting points in relating extraversion to brain mechanisms engaged in reward processing. Depue (1995) proposed a neurological Behavioral Facilitation System (BFS) as the causal basis for agentic components of extraversion (Depue, 1995; Depue & Collins, 1999).⁴ The neuroanatomical correlate of the BFS is hypothesized as the mesocorticolimbic dopaminergic system, which is integral in desire and reward and is thought to facilitate behavioral approach by increasing the

salience of positive stimuli. Depue's model of behavioral facilitation is a threshold model in that dopamine must reach a certain level for approach behavior to be elicited. Thus, approach behavior is thought to depend on tonic level of dopamine as well as on phasic level (Depue, 1995). A growing body of evidence directly implicates dopaminergic function in extraversion (e.g., Depue & Collins, 1999; Wacker, Chavanon, & Stemmler, 2006). DeYoung (2010) and Smillie (2008) reviewed seminal work that has linked extraversion to genetic variations in dopamine function and reward-seeking behavior (Reuter, 2007), size of brain structures involved in reward processing (Omura, Constable, & Canli, 2005; Rauch et al., 2005), brain activity in response to rewarding stimuli (Canli, 2004; Rauch et al., 2005), and responses to psychotropic drugs that influence the functioning of dopamine (Rammsayer, 1998; Wacker et al., 2006).

Animal studies have also generated evidence in support of dopamine's involvement in reward processing. Drugs that increase dopamine (dopamine agonists), such as amphetamines, have been shown to increase the degree to which rats pursue rewards (Wyvell & Berridge, 2000). In contrast, drugs that block dopamine (dopamine antagonists) decrease reward-seeking behaviors (Wise, 2004). Mice bred without the ability to synthesize dopamine show deficits in reward-seeking behavior; however, if dopamine production is restored in the dorsal striatum of those mice via gene therapy, they exhibit increases in goal pursuit (Robinson, Sotak, During, & Palmiter, 2006).

It is notable that the studies on animals have concerned the role of dopamine in the pursuit of reward without mentioning consumption of rewards. Indeed, this is consistent with descriptions of separate reward systems for mediating appetitive, incentive-seeking behaviors ("wanting"), as opposed to consummatory behaviors ("liking") (Berridge, 2007, 2012). The idea that dopaminergic functioning underlies reward-seeking behaviors rather than reward-liking behaviors emerges from this distinction. Taking another step forward in this line of reasoning leads to the hypothesis that extraversion, due to its association with dopaminergic functioning, should in turn be associated specifically with features of reward-seeking behavior instead of reward-liking behavior. That is, more extraverted people should respond with energized and excited affects when in appetitive situations; conversely, extraversion should not be related to increases in pleasantness when simply enjoying a reward. These two predictions have been supported

across a series of recent studies ([Smillie, Cooper, Wilt, & Revelle, 2012](#); [Smillie, Geaney, Wilt, Cooper, & Revelle, 2013](#)). More extraverted people consistently responded with higher levels of energy and vigor to situations meant to elicit reward-pursuit behavior (e.g., imagining buying a lottery ticket and winning); however, extraversion did not relate to an experience of pleasantness when people were presented with merely pleasant scenarios that lacked a reward-pursuit component (e.g., imagining lying on a beach on a pleasant day). These findings led to the specification and narrowing of the affect-reactivity model of extraversion ([Larsen & Ketelaar, 1991](#); [Strelau, 1987](#)), which originally stated that extraversion should relate to reacting more strongly to *all* forms of positive stimuli. These studies also illustrate how biologically informed theories can generate fruitful predictions at the behavioral level.

Development

Evidence indicating that extraversion has a strong biological component indicates that early forms of what will later be called extraversion should appear when people are relatively young. Indeed, according to the FFM, genetic and biological factors influence the development of extraversion across the lifespan ([McCrae et al., 2000](#)) and are much more important than social/environmental factors for shaping the trajectory of trait development in general [but see [Bleidorn, Kandler, Riemann, Angleitner, and Spinath \(2012\)](#) and [Wood and Roberts \(2006\)](#) for opposing viewpoints]. To begin tracking the development of extraversion, we first examined first its temperamental origins (see also the chapter by [De Pauw](#)).

Childhood Temperament

In the study of children, temperament refers to individual differences in reactivity and self-control that arise from a constitutional basis ([Durbin, Klein, Hayden, Buckley, & Moerk, 2005](#); [Rothbart, 1981](#)). Observational studies of infants in the laboratory show that temperamental precursors of extraversion appear as early as 3 months, and by 6 months the familiar smiling, laughing, and approach behaviors of extraversion are readily apparent ([Rothbart, Derryberry, & Hershey, 2000](#)). In preschool-aged children, observational studies ([Wilson, Schalet, Hicks, & Zucker, 2013](#)) yielded a dimension termed “anxious introversion,” which reflects

differences on a dimension characterized at one pole by shyness and inhibition and at the other by liveliness and activity. A factor reflecting extraversion emerges in studies of parent-reported temperament in childhood as well (Rothbart & Bates, 1998); this factor includes activity level, sociability, and enjoyment. In a testament to the prominence of extraversion, parent reports identify an extraversion factor in youth as young as 3 years and up to age 20 years (Soto & John, 2014).

Throughout childhood, features related to extraversion appear to be important in determining how children interact with their peers. From ages 5 to 12 years, children who are more sociable and less withdrawn are more popular and are less likely to experience rejection (Newcomb, Bukowski, & Pattee, 1993). More extraverted children and adolescents also tend to enjoy higher degrees of peer support (Asendorpf & van Aken, 2003). Although this seems to be good news for extraverted youth and their parents, it has been noted that findings such as these highlight the importance of attending more closely to the social needs of more introverted individuals during their formative years (Cain, 2013).

Adolescence Through Adulthood

Questions regarding how extraversion changes from adolescence through adulthood have received a considerable amount of attention. During late adolescence (around ages 16–20 years), extraversion increases slightly (Bleidorn et al., 2013; Lüdtke, Roberts, Trautwein, & Nagy, 2011). Obtaining a job during this time, however, is related to decreases in extraversion (Bleidorn et al., 2013), perhaps suggesting that entering roles in which responsibility is valued is conducive to introversion among adolescents. Extraversion continues to increase during the years spent at university, at least on average (Vaidya, Gray, Haig, & Watson, 2002). Analyses looking at change in extraversion at the level of the individual rather than group-level change show that whereas some individuals increase in extraversion during college (about 17%), most stay the same (80%), and a small minority (3%) of people show decreases in extraversion (Vaidya et al., 2002).

After emerging from adolescence and entering adulthood, extraversion exhibits high differential stability, or rank-order stability (Lucas & Donnellan, 2011; Specht, Egloff, & Schmukle, 2011). This means that a person's level of extraversion will remain relatively stable in relation to the

extraversion levels of others. That is, on average, more extraverted younger adults tend to be more extraverted older adults. Differential stability tends to be highest among middle-aged individuals (around ages 40 to 60 years), with lower levels found in younger and older people.

Although the rank ordering of individuals with regard to extraversion remains relatively stable throughout adulthood, there are still interesting patterns of change in extraversion throughout the lifespan. In a national sample of over 10,000 American adults, cross-sectional analyses showed a linear decrease in extraversion between individuals in their thirties and in those in their eighties ([Costa et al., 1986](#)). Cross-cultural studies of individuals between college age and middle age have corroborated the finding that over time, extraversion decreases slightly and in a linear fashion ([McCrae et al., 1999](#); [McCrae & Terracciano, 2005](#)).

A more nuanced story emerges when considering change in extraversion among different birth cohorts and when examining change at the facet level. In a study of three birth cohorts of men (1897–1919, 1920–1929, and 1930–1945) over the span of 12 years (people in the study were initially ages 43 to 91 years), [Mroczek and Spiro \(2003\)](#) found that the overall trajectory of extraversion by age showed the same small linear decrease reported in previous studies. Yet the two younger cohorts showed slight increases in extraversion, whereas the oldest cohort showed a slight decrease.

Extraversion's facets have distinct patterns of age-related change. [Roberts, Walton, and Viechtbauer \(2006\)](#) summarized the results of 113 longitudinal studies involving over 50,000 people and concluded that social dominance (i.e., independence, dominance) increases from adolescence to the thirties and then levels out through the fifties, whereas social vitality (i.e., sociability, positive affect) increases from adolescence to young adulthood, stays stable throughout the fifties, and then declines slightly in old age. These findings, in conjunction with the analyses of individual-level change in extraversion during college ([Vaidya et al., 2002](#)), emphasize the importance of carefully investigating what at first may appear to be relatively straightforward findings about the development of extraversion.

Are Societies as a Whole Becoming More Extraverted?

At least in select western societies, the answer to this question is a resounding yes. From the late 1960s to early 1990s, cross-temporal meta-analyses done on 59 studies involving over 16,000 American college

students revealed that for both men and women, extraversion has increased by nearly one standard deviation ([Twenge, 2001](#)); however, this finding should be treated with caution as it may be an artifact of using different scales to measure extraversion at different times. In a study of nearly 9,000 college students in The Netherlands, mean extraversion scores show a clear, positive trend from 1982 to 2007 ([Smits, Dolan, Vorst, Wicherts, & Timmerman, 2011](#)). Various reasons have been put forward for the increased prevalence of extraversion in western cultures, such as more opportunity for contact with a wider variety of people, less strict parenting styles, and an increase in service jobs in relation to industry ([Smits et al., 2011](#)). It has also been suggested that western societies increasingly value outgoing and assertive traits over more reflective and quiet characteristics ([Cain, 2013](#)). As it seems as if these trends will continue for the foreseeable future, so may the societal shift upward in extraversion.

Extraversion Characteristic Adaptations

The FFM proposes that basic tendencies such as extraversion should be expressed in characteristic adaptations ([McCrae, 2009](#)). It is worth noting again, as discussed in previous chapters, that characteristic adaptations are not simply observable trait content. Rather, they are conceptualized as the manifest affective, behavioral, and cognitive products of the interactions between biologically based traits and the environment ([McCrae & Costa, 2008](#)). As noted earlier in this chapter, desire or motivation can be added to the aforementioned affective, behavioral, and cognitive domains, and in so doing a comprehensive “ABCD” description of the psychological terrain of traits as they interface with different social environments over time and space can be formed. Thus, the issues addressed in the sections on characteristic adaptations concern whether and how extraversion is related to different ABCDs.

The most general answer to the question of whether extraversion is related to ABCDs in daily life can be found by examining whether the dispositional *trait* of extraversion is related to the personality *state* of extraversion. Personality states are short-term, concrete and contextualized patterns of ABCDs compared to the more stable and decontextualized ABCD components of personality traits ([Bleidorn, 2009; Fleeson, 2001](#)). Personality states may be described in the same way as personality traits,

and so extraversion states broadly encompass short-term manifestations of vitality, assertiveness, spontaneity, and desires for social attention. Experience-sampling studies suggest that trait measures of extraversion indeed correlate highly with aggregate mean levels of extraversion states (Ching et al., 2014; Fleeson & Gallagher, 2009; Heller, Komar, & Lee, 2007; Schutte, Malouff, Segrera, Wolf, & Rodgers, 2003; Wilt, Noftle, Spain, & Fleeson, 2011), to single extraversion states, and also to the median, mode, maximum, and minimum of the distribution of extraversion states (Fleeson & Gallagher, 2009). These findings might be taken to indicate that those scoring highly in extraversion are always found in extraverted states (and more introverted individuals are always found in introverted states), but in fact this is far from true. In actuality, people display a wide variability of extraversion states throughout the course of their lives; sometimes highly extraverted people act very introverted and vice versa (Fleeson, 2001). This makes good sense when extraversion states are thought of as characteristic adaptations reflecting the output of dispositional extraversion in combination with environmental variables—different situations facilitate extraversion to varying degrees—even the most extraverted individuals might remain quiet at church, whereas the most introverted individuals will likely have a laugh (or two) at a lively party.

We next turn to a review of the relationship between extraversion and each individual ABCD domain of characteristic adaptations. As there are literally thousands of studies that could be categorized as addressing the ABCDs associated with extraversion, the following sections cannot even come close to providing an exhaustive summary of this research. Rather, they are necessarily a focused attempt to highlight findings in each area that are potentially important, and in sum represent a selective overview of how extraversion is manifested in ABCDs.

Affect

One of the best-known findings in all of personality is the robust relationship between extraversion and positive affect. Trait extraversion is related to trait levels of positive affect (Lucas & Baird, 2004; Lucas & Fujita, 2000; Watson & Clark, 1992), aggregated ratings of momentary positive affect (Ching et al., 2014; Flory, Manuck, Matthews, & Muldoon, 2004; Spain, Eaton, & Funder, 2000; Wilt, Noftle, et al., 2011), and even to

single ratings of current positive affect (Lucas & Baird, 2004; Uziel, 2006). Trait extraversion appears to be specifically more strongly related to activated positive affect—feeling happy and energetic, as opposed to deactivated positive affect—feeling relaxed or at ease (Smillie, DeYoung, & Hall, 2014). A growing number of studies have also shown that being in extraverted states over the course of daily life is conducive to experiencing higher levels of state positive affect (Ching et al., 2014; Heller et al., 2007; Lischetzke, Pfeifer, Crayen, & Eid, 2012; Wilt, Noftle, et al., 2011). Moreover, experiments in which participants were instructed to act extraverted or introverted revealed a causal effect of extraversion states on positive affect, even for introverts (Fleeson, Malanos, & Achille, 2002; McNeil & Fleeson, 2006; McNeil, Lowman, & Fleeson, 2010). The experience of positive feelings is no doubt a core characteristic of both trait and state extraversion (Watson & Clark, 1997). These findings raise the more fundamental question of why extraversion is related to positive affect.

A number of explanations have been put forward for the association between trait levels of extraversion and positive affect. The original affect-reactivity hypothesis (Gross, Sutton, & Ketelaar, 1998) posited that extraverts, due to their more reactive reward processing system, should exhibit stronger positive reactions in all forms of positive situations. This hypothesis received mixed support across a number of studies (Lucas & Baird, 2004). Studies that assessed positive affect using terms reflecting energy and arousal found support for the affective-reactivity hypothesis, but those that favored affective terms reflecting pleasantness and happiness did not (Smillie et al., 2012). This led to a specification of the affective-reactivity hypothesis (discussed previously) indicating that extraverted people should exhibit stronger activated positive reactions in rewarding situations, which has been replicated consistently in experiments (Smillie et al., 2012, 2013) and which has received initial support in natural environments (Oerlemans & Bakker, 2014). Yet as these results concern only activated positive feelings, they fail to explain why extraversion is then related to pleasantness and happiness.

Another explanation for the extraversion-positive affect association that has been put forward is the social activity hypothesis (Watson, 1988; Watson, Clark, McIntyre, & Hamaker, 1992), which states that extraversion is related to positive affect due to greater participation in social activities. Although sensible, this hypothesis has achieved only weak and inconsistent

support across a number of studies (Argyle & Lu, 1990; Diener, Sandvik, Pavot, & Fujita, 1992; Lucas & Diener, 2001; Lucas, Le, & Dyrenforth, 2008; Oerlemans & Bakker, 2014; Srivastava, Angelo, & Vallereux, 2008). A revision of the social activity hypothesis, that extraversion is related to positive affect due to the quality (rather than the quantity) of social experiences, has received some initial support (Smillie, Wilt, Kabbani, Garratt, & Revelle, 2015), but awaits further replication. Additionally, studies have identified specific mediators of the extraversion-positive affect association, such as mood regulation abilities (Lischetzke & Eid, 2006), resilience (Lü, Wang, Liu, & Zhang, 2014), and perceived uniqueness (Koydemir, Şimşek, & Demir, 2014). Further theoretical advances are necessary to integrate these seemingly disparate findings into a coherent conceptual framework.

A further explanation for the extraversion–happiness association is that trait extraversion increases the likelihood of being in extraverted states (Fleeson & Gallagher, 2009) that lead directly to more positive affect states (Fleeson et al., 2002). The accumulation of positive states might therefore lead individuals higher in extraversion to report higher levels of positive affect in general (Wilt, Noftle, et al., 2011). Aspects of this hypothesis have been supported in multiple experience sampling studies (Wilt, Noftle, et al., 2011) and even across multiple cultures, including the United States, Venezuela, the Philippines, China, and Japan (Ching et al., 2014). If the association between trait extraversion and trait positive affect can be explained by the association between state extraversion and state positive affect (i.e., it is what extraverts do that leads to higher levels of positive affect), then explaining the state-level association between extraversion and positive affect becomes necessary to understanding the trait-level association. Little research has explored the mechanisms connecting state extraversion to state positive affect (but see Lischetzke et al., 2012 for evidence that state extraversion is related to state positive affect through intentional mood regulation), but a recent article (Smillie, 2013) nicely summarized a number of potential explanations. Briefly, Smillie (2013) reviewed research suggesting that state extraversion may be associated with state positive affect through increased reward-processing states, social reinforcement, the social desirability of extraverted behavior, the perception that extraversion states are effective at producing progress toward goals, the physical actions involved in extraversion states, and the psychological

significance of bodily states associated with extraversion. It is clear that the study of extraversion and positive affect has been enormously fruitful, and it is not difficult to predict that this topic will continue to stimulate innovative investigations for a long time to come.

Behavior

Evidence for the role of extraversion in behavior comes from a variety of different methodologies. Investigations relying on self-report show that extraversion associates with the content of behavior as well as specific behaviors. More extraverted individuals describe their behaviors as bold, socially adept, and secure ([Funder, Furr, & Colvin, 2000](#)), and they report consuming more alcohol, going to more parties, dating more people, and exercising more often ([Paunonen, 2003](#)). These studies suggest that extraversion may be highly relevant to a wide spectrum of interpersonal behaviors. Findings from a recent study ([DeYoung, Weisberg, Quilty, & Peterson, 2013](#)) supported this idea by showing that the aspects of extraversion are uniquely associated with the dimensions of the interpersonal circumplex ([Wiggins, 1996](#)): assertiveness was related to the interpersonal dimension of dominance-submissiveness, whereas enthusiasm was related to the dimension running from gregarious to aloof.

The social nature of extraversion may act as a cue allowing people to accurately assess others' levels of extraversion. Acquaintances, experimenters, and confederates are able to correctly identify more extraverted people after observing a number of short tasks involving social activities ([Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004](#)). Perhaps one characteristic that signifies extraversion is a greater use of gestures. In an experiment that involved describing the meaning of words to another person, more extraverted people tended to accompany their speech with physical movements meant to convey meaning ([Hostetter & Potthoff, 2012](#)). Another feature that seems to be emblematic of extraversion is simply the propensity to talk more frequently. Judges listening to recordings of random samples of activity throughout the course of people's daily lives rated those who were more talkative as more extraverted ([Mehl, Gosling, & Pennebaker, 2006](#)). This turned out to be a good heuristic, as coding the recordings revealed that self-described extraverts did indeed spend more time talking to people and more time with others in general ([Mehl et al., 2006](#)).

Differences in the communication styles depending on extraversion extend from talking and gesturing to writing and electronic communication. When asked to write in a stream of consciousness mode about their feelings related to being in college, more extraverted university students include more positive emotion words as well as more socially relevant words—such as references to communicating or being with other people—in their written descriptions (Pennebaker & King, 1999). Similarly, the online blogs of more extraverted people contain more positive emotions and social references to friends, family, and sexual behaviors (Yarkoni, 2010). Breaking down the relation between extraversion and blog content by NEO PI-R facets showed that friendliness, gregariousness, and cheerfulness accounted for these findings rather than the facets of excitement seeking, assertiveness, or activity level (activity level was, however, related to more achievement-related references). The text messages that extraverted college students send surprisingly do not contain more positive words but, similar to the blogs of more extraverted people, they do include more social and sexual references (Holtgraves, 2011). Extraversion is also related to more total time spent texting (Butt & Phillips, 2008).

It should come as no surprise, given the foregoing discussion, that more extraverted individuals report a higher quantity of social participation when asked to recall their daily activities (Srivastava et al., 2008). There are also differences in the quality of the social participation of extraverts. In a laboratory study of dynamic social interactions (Eaton & Funder, 2003), it was found that not only did extraverts behave in more social ways, but they also influenced the emotions, behaviors, and cognitive interpersonal judgments of their conversation partners to create a more positive social environment. Recent work suggests that extraversion is so ingrained with positive social interactions that more extraverted people automatically and implicitly associate people with rewards (Wilkowski & Ferguson, 2014). Extraverts seem to reap the benefits of their social adroitness, as they exhibit levels of social well-being higher than introverts (Hill, Turiano, Mroczek, & Roberts, 2012; Smillie et al., 2015; Wilt, Cox, & McAdams, 2010).

It is obvious that extraversion is related to sociability, but this does not mean that introverts do not value social interactions nor that introverted behavior is inherently asocial. Introverts actually talk as much as extraverts in one-on-one situations, but, as group size increases, more extraverted

individuals spend a disproportionately large amount of time talking ([Antill, 1974](#)). More introverted individuals might also value quality rather than quantity when it comes to socializing, preferring a few good friends to a large number of acquaintances ([Cain, 2013](#)). A mixture of extraverted and introverted behaviors might be more valuable in the literal, monetary sense when it comes to sales. In a study of outbound call representatives, it was found that *ambiverted* individuals, those toward the middle of the distribution of extraversion scores, generated the most sales revenue ([Grant, 2013](#)). As [Grant \(2013\)](#) suggests, perhaps listening has been underrated as a social skill.

Cognition

As people navigate their daily lives, they encounter a range of environments that might present positive and/or negative consequences. Broadly speaking, people are motivated to engage with positive stimuli and avoid negative stimuli, but many situations are ambiguous with regard to their objective valence. For example, is a job interview objectively rewarding due to the chance to have intellectually stimulating conversations, or is it punishing because of the potential for being negatively evaluated by a possible employer? The answer, of course, is that a job interview, like so many other complex social environments, contains a mixture of positive and negative (and neutral) elements. Individual differences further complicate the landscape, as what some see as positive or neutral, say, public speaking, might be viewed as an extremely negative situation by others. Individual differences in how people perceive and categorize their environments (i.e., individual differences in cognition) will to a large extent determine their engagement with the world.

The section outlining the associations between extraversion and positive affect suggested that extraversion should relate to judging the environment more positively. This notion is borne out in a number of studies. Extraversion is associated with judging neutral events more positively ([Uziel, 2006](#)) and with recognizing positive stimuli more quickly after an initial positive prime ([Robinson, 2007](#)). Extraverts judge positively valenced words (“hug” and “smile”) as more similar than negatively valenced words (“grief” and “death”) and as more similar than words that are related by semantic quality (“smile and face”) ([Rogers & Revelle, 1998](#); [Weiler, 1992](#)). The section describing extraversion’s association with social

behaviors hints at the idea that extraversion should associate with more favorable cognitions regarding social situations. Indeed, extraversion's association with more positive and less negative beliefs about interacting with others in extraverted ways ([Zelenski et al., 2013](#)) perhaps explains why introverts do not engage in high levels of extraverted behavior even though they experience the positive affective benefits of acting extraverted (e.g., [Fleeson et al., 2002](#); [Wilt, Noftle, et al., 2011](#)).

Moving past the general idea that extraversion relates to seeing the world in a rose-colored tinge are studies of information processing tasks that vary as a function of extraversion. There is considerable evidence that extraversion is associated with superior recall on traditional, verbal short-term memory tasks ([M. Eysenck, 1981](#); [Matthews, 1992](#)) and with poorer vigilance ([Beauducel, Brocke, & Leue, 2006](#); [Koelega, 1992](#)). An excellent integrative review ([Matthews, Deary, & Whiteman, 2003](#)) concluded that extraverts show advantages with regard to dividing attention between tasks, resisting distractions, and short-term memory. Introverts, in contrast, are better at sustained attention tasks, solving complex problems, and long-term recall. These findings, taken together, suggest that extraversion may relate to excelling in complex environments where a variety of stimuli are competing for attention, whereas introversion might be better suited to quiet tasks requiring persistence. It is perhaps due to these differences in cognition that dynamic social environments seem to be the extravert's natural habitat.

Desire

People with different levels of extraversion pursue and relate to their goals in different ways. Echoing previous discussions about the integral relationship between extraversion and reward pursuit, extraversion is associated with attaching more importance to goals, more intense goal pursuit, greater optimism about achieving goals, and higher expectations for happiness when goals are achieved ([Romero, Villar, Luengo, & Gómez-Fraguela, 2009](#)). These findings add to the already large amount of evidence reviewed linking extraversion to heightened engagement with rewarding stimuli. It is therefore clear that extraversion is associated with approach motivation ([Elliot & Thrash, 2002](#); [Heller et al., 2007](#)), an energizing drive that directs behavior toward rewards ([Elliot, 2006](#)). The following discussion focuses on the specific rewards that extraverts desire to attain.

Extraversion relates to higher general motivation for social contact, intimacy, and interdependence, as well as to drives for power, status, and positive affect (Emmons, 1986; King, 1995; King & Broyles, 1997; Olson & Weber, 2004). These findings suggest that extraversion is associated with the broad motivations for affiliation and agency (Depue & Morrone-Strupinsky, 2005), or *getting along* and *getting ahead* (Hogan, 1982). These motives permeate the lives of extraverts. With regard to getting along, extraversion is related to the pursuit of communal life goals and careers in the social domain; with regard to getting ahead, extraverts desire lives in which they accomplish more goals related to personal agency, in domains such as economics, aesthetics, politics, and hedonism (Bleidorn et al., 2010; Larson, Rottinghaus, & Borgen, 2002; Roberts & Robins, 2000, 2004). Extraverted states may also facilitate goals related to getting along and getting ahead. People with higher levels of affiliation and achievement goals enact more extraverted states over time (Bleidorn, 2009). Additionally, the short-term goals of being more sociable, enthusiastic, and assertive are associated with state extraversion (McCabe & Fleeson, 2012).

Objective Biography

The characteristic adaptations just described are psychological structures and patterns that bridge the gap between basic traits and *objective biography*—a person’s factual life story. Objective biography brings personality traits back to the person by describing the real successes, struggles, failures, and redemptions that people experience as they navigate their lives.

A person’s level of extraversion in late adolescence is an important determinant of subsequent life events in the near future. Magnus, Diener, Fujita, and Pavot (1993) determined that extraversion in a sample of college undergraduates prospectively predicted the occurrence of objective, positive life events over the course of 4 years. In this study, the composite of positive life events included 20 events that received high ratings on the dimensions of objectivity and positivity. This list included seminal events in the domains of relationships, education, career, and leisure (e.g., getting engaged, getting married, getting into graduate school, receiving a promotion or raise, beginning a hobby). Extraversion was unrelated to the occurrence of objective, negative life events (e.g., divorce, death of a loved one, getting fired, being the victim of a crime). Vaidya et al. (2002) used

similar lists of positive/negative life events and found that in a sample of undergraduates, not only was extraversion related to a higher occurrence of positive events over 2.5 years, but the occurrence of positive events over that time was also related to increases in extraversion. In a study tracking German high school students for 4 years, Lüdtke et al. (2011) pinpointed specific, positive events that were most highly related to extraversion; this list included getting promoted, starting a job, going abroad, and starting a relationship.

In adulthood, extraversion remains a robust predictor of social outcomes. People with higher levels of extraversion have a greater number of social relationships and greater social support (Berkman, Glass, Brissette, & Seeman, 2000). As noted in the section on evolutionary costs and benefits, extraversion is associated with having more sexual partners (Nettle, 2005). Extraversion is related to greater marriage satisfaction with (Watson et al., 2004) but also to higher rates of infidelity (Nettle, 2005). Extraversion is also particularly powerful in predicting occupational outcomes. Extraverted individuals are more satisfied with their jobs (Thoresen, Kaplan, Barsky, Warren, & de Chermont, 2003) and show higher levels of job performance (Sackett & Walmsley, 2014); adolescent ratings of extraversion predict higher income and job status 46 years later, even after controlling for cognitive ability (Judge, Higgins, Thoresen, & Barrick, 1999). All of these findings attest to the conclusion that extraversion is highly relevant to the lives that people lead (Ozer & Benet-Martinez, 2006; Roberts et al., 2007), and thus people with different levels of extraversion have very different objective biographies.

Self-Concept and Identity

Self-concept refers to how people think about, perceive, and evaluate themselves (Baumeister, 1999). It includes memories and evaluations of past, present, and future selves (Markus & Nurius, 1986). In the FFM, self-concept is defined as being consistent with traits, and is also influenced by characteristic adaptations and objective biography (McCrae & Costa, 2008). Said differently, when answering the question “Who am I?,” people draw on information from their basic tendencies, their characteristic ABCD patterns, and actual events and circumstances in their lives. Indeed, extraversion is pertinent to how we define ourselves.

In support of the claim that self-concept is consistent with our traits, introversion is related to describing the “true” or “authentic” self as more introverted, whereas people who are more extraverted endorse an extraverted true-self concept (Fleeson & Wilt, 2010). Extraversion is also relevant to evaluative aspects of the self-concept. Higher levels of extraversion are associated with higher self-esteem (Aluja, Rolland, García, & Rossier, 2007; Watson, Suls, & Haig, 2002), which refers to a global evaluation of general worth as a person (Crocker & Luhtanen, 2003). This finding is sensible given the generally positively valenced characteristic adaptations and objective biographies of more extraverted people. Positive affect and social support have been identified as mediators of the association between extraversion and self-esteem (Swickert, Hittner, Kitos, & Cox-Fuenzalida, 2004).

Self-concept includes a person’s identity, which is a sense of coherence and unity based on self-defined investments in life choices (Erikson, 1963). An increasingly influential theory conceptualizes identity as internalized life stories that together comprise what has been termed *narrative identity* (McAdams, 1993; Singer, 2004; Thorne & Nam, 2009). Life stories are self-authored and psychologically constructed integrations of the remembered past, experienced present, and imagined future that represent one way in which people potentially instill their lives with unity, meaning, and purpose. Life stories are constructed within the narrative mode of human cognition (Bruner, 2004), and thus narrative terms (e.g., imagery, plot, theme, scene, setting, conflict, character, ending) are thought to be the best way to describe and characterize life stories (McAdams, 2008).

Few studies have examined the links between extraversion and narrative identity, but the results from those that have done so suggest that they are indeed linked. Research has shown that extraversion relates to the structure and contents of life stories as well as the ways that the different scenes in the life story are classified (McAdams et al., 2004; McLean & Fournier, 2008; Raggatt, 2006; Thomsen, Olesen, Schnieber, & Tonnesvang, 2013). More extraverted individuals tell stories with a high degree of positive emotions, see events as having more positive connections to the self, and organize scenes from their stories by characteristics such as status, optimism, sociability, and activity. People with higher levels of extraversion are more concerned with interpersonal trust when describing life story scenes from childhood and adolescence, and they are concerned with giving

back to society, or generativity, in scenes from their adulthood. The social nature of extraversion is apparent in the way that they communicate their life stories. More extraverted people share important memories with others more often and report a high degree of comfort in doing so (McLean & Pasupathi, 2006).

Extraversion and Psychopathology

Thus far, extraversion has been discussed in the context of “normal” personality functioning as opposed to “abnormal” or clinical manifestations of the trait. Yet Eysenck had very early recognized the importance of extraversion in psychiatric disorders (e.g., Eysenck & Himmelweit, 1947) and continued to emphasize the application of normal personality traits to psychopathology (Eysenck, 1957). In the FFM, basic tendencies are also conceptualized as having both adaptive and maladaptive variants (McCrae & Costa, 2008). Provided next is a brief summary of how both low and high levels of extraversion relate to psychopathology.

A variety of studies show that categorically defined personality disorders (PDs) may be conceptualized as maladaptive or “extreme” variants of traits included in models of normal personality (e.g., Bagby, 2013; Gore & Widiger, 2013; Samuel, Carroll, Rounsville, & Ball, 2013; Sellbom, Anderson, & Bagby, 2013; Van den Akker et al., 2013; see also the chapter by Widiger, Gore, Crego, Rojas, and Oltmanns). Extreme introversion is defined by characteristics such as social withdrawal, social detachment, intimacy avoidance, restricted affectivity, and anhedonia (Gore & Widiger, 2013; Skodol et al., 2011; Watson, Stasik, Ro, & Clark, 2013), all of which may be relevant to maladaptive personality functioning. Indeed, Skodol et al. (2011) theorized that these features may represent core components of the schizoid, schizotypal, and avoidant PDs. Low levels of extraversion and related traits reflecting low levels of social connection have additionally been related to problems with anxiety and depression (Jylhä & Isometsä, 2006; Krueger et al., 1996; Trull & Sher, 1994; Watson, Gamez, & Simms, 2005). However, extremely high extraversion poses risks for personality pathology as well, as people falling at this end of the continuum are more likely to be sexually promiscuous, emotionally intrusive, and engage in excessive self-disclosure and thrill-seeking behaviors (McCrae, Löckenhoff, & Costa, 2005). People with high levels of extraversion are also more likely to have difficulties with substance abuse (Atherton, Robins, Rentfrow, &

Lamb, 2014; Krueger et al., 1996), possibly due to their elevated reward-seeking tendencies.

Conclusions

Several years ago, we (Wilt & Revelle, 2009) highlighted three areas of research on extraversion about which we were particularly enthusiastic: the role of extraversion in ongoing functioning, the integration of psychological and biological theories of extraversion, and the use of public domain personality assessment to study the structure of extraversion and its predictive validity in important domains. We were optimistic at the time, but we did not anticipate just how quickly progress would occur in these and many other areas, as reviewed in this chapter. The rapid accumulation of research on an already expansive topic makes even more important the existence of an overarching theoretical framework. The FFM provides a comprehensive and parsimonious organizational architecture by which to classify and group the myriad findings emerging from this exciting field. We are confident that in the next decade and beyond we will see many more such advances.

Notes

1. There were few adjectives that had substantial loadings on up to three factors.
2. Desire is chosen over the term “motivation” due to desire’s more specific connotation of referring to what people want, as compared with motivation’s more general connotation of referring to the factors that energize, direct, and select behavior (Atkinson & Raynor, 1978; Heckhausen, 1991; Humphreys & Revelle, 1984). Whereas the factors that guide behavior may include affect, cognition, desire, and even behavior itself, desire links more naturally to goals, wants, and wishes.
3. The main change to the theory is that the system formerly referred to as the FFS (now FFFS —“Fight, Flight, Freeze System”) has been given a greater role, mediating responses to all aversive stimuli and generating the fear response.
4. Depue has also proposed that “affiliative extraversion,” encompassing warmth and social closeness, may be related to opiate functioning (Depue & Morrone-Strupinsky, 2005)

Angelina R. Sutin

Abstract

Despite its early struggles to survive, openness is now recognized as a personality trait with far-reaching consequences. This chapter is an overview of how individual differences in cognitive flexibility, sensitivity to aesthetics, depth of feeling, and preference for novelty contribute to important domains of functioning. Briefly reviewed will be conceptualizations of openness, some measurement considerations, and where it fits within the nomological net of related constructs. The chapter is then devoted to the nature and consequences of openness, arranged from the biological to the societal. Research on the biological roots of openness and its developmental trajectory from early childhood through old age are then covered. Also considered is how openness contributes to nearly every aspect of functioning, including health and well-being, employment, person presentation and perception, marriage and family, and its geographic implications.

Key Words: openness, intellect, unconventionality, imagination, creativity, Five Factor Model

Openness is perhaps the most resilient trait within the Five Factor Model (FFM) of personality. In contrast to traits such as neuroticism, which are well represented in most models of personality, openness has traditionally struggled to be recognized, first as replicable and then as meaningful. Indeed, there was no early consensus on this trait, and this disagreement contributed to the ambiguity of openness and the question of its relevance. In the early days of the FFM, when openness was retained as a meaningful trait, it was variously labeled intellect, culture, imagination, and unconventionality. The diversity of labels underscores both the heterogeneous nature of this trait and the need for a unifying theoretical framework. Openness did survive, and the triumph of this struggle indicates that individual differences in imagination, sensitivity to aesthetics, depth of feeling, preference for novelty, cognitive flexibility, and social and political values are universal and consequential.

The initial research on openness focused on its definition, measurement, and links with related constructs, such as creativity. It soon became clear, however, that the consequences of openness stretched far beyond intellectual and artistic pursuits (e.g., [McCrae, 1996](#)). This chapter is primarily devoted to highlighting the significance of openness to a range of important life outcomes. Because others have conceptualized openness at length (e.g., [DeYoung, Grazioplene, & Peterson, 2012](#); [McCrae & Costa, 1997](#)), how openness has been defined, some measurement considerations, and its placement within the nomological net of related constructs will be considered only briefly. The bulk of the chapter will be devoted to its nature and consequences, arranged from the biological to the societal. Research on the biological roots of openness and its developmental trajectory from early childhood through old age will first be described. Then the importance of openness for nearly every aspect of functioning, including health and well-being, employment, how it is perceived by others, how it shapes personal relationships, and its geographic implications will be reviewed. This chapter is not meant to be exhaustive but rather is a survey of some of the vast literature that illustrates the extent of openness's reach.

Openness: An Overview

Definition

The most cited definition of openness comes from [McCrae and Costa \(1997\)](#), who argued that “Openness must be viewed in both structural and motivational terms. Openness is seen in the breadth, depth, and permeability of consciousness, and in the recurrent need to enlarge and examine experience” (p. 826). The breadth of openness refers to the wide range of interests that is so characteristic of open people. Open people like to try new things and go to new places. Their hobbies and interests are many and varied. Closed individuals, in contrast, tend to be more set in their ways and prefer familiarity to learning new things. The depth of openness refers to the density of associations that open individuals hold between ideas. That is, ideas and concepts are associated in the brain; open people easily make more remote and creative connections between ideas, whereas individuals lower in openness tend to make more literal and concrete connections. This ability is reflected in the correlates of openness, such as better divergent thinking skills. Finally, permeability refers to

malleability of mental boundaries. This malleability is seen in everything from nuanced and well-differentiated political beliefs to synesthesia (e.g., seeing music). And from a motivational perspective, open individuals are inherently curious and have a real need for variety and novelty and actively seek out such experiences.

Openness, perhaps more than any other of the FFM traits, has inspired debate and controversy over how it should be defined. Like all FFM traits, openness emerged and converged across the lexical tradition and from factor analysis of psychological questionnaires. These two traditions historically emphasized different aspects of openness (Connelly, Ones, & Chernyshenko, 2014). McCrae and Costa (1997) derived their conception of openness from psychological questionnaires, and thus focus relatively more on the experiential aspects of openness. The lexical approach, in contrast, gives relatively more weight to the intellectual aspects of this trait. When measured with adjectives, openness is defined by words such as intelligent, clever, intellectual, thoughtful, and ignorant (reverse scored), which clearly reflect intellectual engagement (Goldberg, 1990). And, indeed, there are moderate correlations between aspects of cognitive functioning and openness (DeYoung, Quilty, Peterson, & Gray, 2014). These connections have led some to argue that intelligence is best construed as a facet of openness (DeYoung, Grazioplene, & Peterson, 2012). Others contend that openness and intelligence are best conceptualized as separate but related individual differences (Connelly, Ones, & Chernyshenko, 2014; McCrae & Greenberg, 2015).

Despite the debate, there is more consistency than differences in the way that openness is typically conceptualized. One commonality across approaches is the recognition that openness is a heterogeneous trait, with many separate tendencies sharing an overall openness core. As such, it is helpful to distinguish more specific components, or facets, of openness. As operationalized by the NEO Personality Inventory-Revised (NEO-PI-R; Costa & McCrae, 1992), openness is defined by a vivid imagination (O1: Fantasy), an appreciation of art and beauty (O2: Aesthetics), depth of emotions (O3: Feelings), an eagerness to try new things (O4: Actions), intellectual curiosity (O5: Ideas), and being liberal (O6: Values). Other approaches to the facets have revealed a slightly different structure. Connelly and colleagues (Connelly, Ones, Davies, & Birkland, 2014), for example, used a critical incidents methodology to identify four distinct

facets—aestheticism, openness to sensations, nontraditionalism, and introspection—as well as a number of “openness compounds” or facets with moderate correlations with other FFM traits (e.g., thrill-seeking from extraversion, tolerance from agreeableness). An exploratory factor analysis of 36 openness-related scales revealed six facets—intellectual efficiency, ingenuity, curiosity, aesthetics, tolerance, and depth—that replicated across samples and had good cross-cultural equivalence ([Woo et al., 2014](#)). There may also be an intermediate level between the broad openness domain and the more specific facets, with facets related to cognitive flexibility grouped together under intellect and the more experiential facets grouped together under openness ([DeYoung, Quilty, & Peterson, 2007](#); [Woo et al., 2014](#)). Despite disagreement about the number and exact content of each facet, there is considerable overlap among the facets derived from these different measurement approaches.

The debate over how openness should be conceptualized is not limited to models of normal personality. The most recent revision of the *Diagnostic and Statistical Manual of Mental Disorders* (i.e., the *DSM-5*) of the American Psychiatric Association ([APA, 2013](#)) rekindled discussion about the utility of a dimensional approach to personality disorders and where to place openness within a model of abnormal personality. It has long been argued that maladaptive personality disorders can be interpreted as variants of normal personality functioning (see also the chapter by [Widiger, Gore, Crego, Rojas, and Oltmanns](#)). Although the categorical approach to personality disorders was retained in the current *DSM* revision, the APA did include a hybrid model with a dimensional assessment in Section III for emerging models and measures. From this dimensional perspective, personality disorders are viewed as maladaptive or extreme variants of normal personality structure. Four of the proposed dimensions map almost directly to the FFM factors: Negative affectivity resembles neuroticism, detachment resembles (low) extraversion, antagonism resembles (low) agreeableness, and disinhibition resembles (low) conscientiousness.

A fifth (and sometimes sixth) factor typically emerges in factor analyses of scales that measure maladaptive personality functioning. This factor has been variously labeled oddity ([Watson, Clark, & Chmielewski, 2008](#)), peculiarity ([Tackett, Silberschmidt, Krueger, & Sponheim, 2009](#)), and psychoticism ([APA, 2013](#)). Although the exact content of the factor varies depending on what scales are analyzed, this fifth dimension, labeled

psychoticism in the *DSM-5*, typically reflects cognitive and perceptual dysregulation. Given that openness does not correlate strongly with *DSM* personality disorders, psychoticism is thought by some to reflect yet another dimensional trait that is more specific to abnormal, than normal, personality.

Accumulating evidence, however, suggests that psychoticism belongs on the same factor as openness. For example, a factor analysis of scales with items that assess unconventionality, eccentricity, and peculiarity, which are thought to be the maladaptive variants of openness, revealed that these scales load more strongly on a factor with openness than on any of the other factors (Gore & Widiger, 2013). Gore and Widiger (2013) point out that one reason openness may be correlated only weakly with personality disorders is that items on standard personality instruments, such as the NEO-PI-R, reflect the adaptive aspects of high openness, not the potentially pathological aspects of this trait. And indeed, when items on the NEO are changed to reflect maladaptive variants of openness (e.g., “I have an excessive imagination” versus “I have an active imagination”), openness is correlated with the *DSM* personality disorders (Haigler & Widiger, 2001). And using scales that included items that tapped into both positive and negative aspects of openness, Piedmont and colleagues (Piedmont, Sherman, & Sherman, 2012; Piedmont, Sherman, Sherman, Dy-Liacco, & Williams, 2009) identified two maladaptive variants of both low and high openness (i.e., superficial, rigid and odd/eccentric, excessively unrestricted, respectively). Thus, the association between openness and personality disorders may be more limited by measurement issues than by conceptual ones.

Measurement Considerations

There are many scales that measure the FFM personality traits, including openness. A thorough discussion of these scales is beyond the scope of this chapter (see also the chapter by Simms, Williams, and Simms), but there are some measurement considerations to keep in mind. As described above, there are many facets of openness, and different personality measures emphasize different components of this trait. Care should be taken when selecting a measure to ensure that the scale includes the components of openness most relevant to the research question. Likewise, because all openness scales are not equivalent, care needs to be taken when evaluating

the correlates of openness. Different scales may produce different correlates, depending on which aspects of openness are captured on each of the scales.

Several questionnaire scales, such as the full NEO PI-R and the shorter NEO-FFI, offer a comprehensive assessment of openness and the more specific facets. Despite this good domain coverage, there are also limitations to using these measures. Of all the traits, the items that measure openness tend to be the most complex and require a higher level of literacy to comprehend. Indeed, the items that measure openness on the NEO require a 2.5 grade level higher literacy than items that measure the other four factors, and literacy is a strong predictor of data quality ([Sutin, Costa, Evans, & Zonderman, 2013](#)). In addition, the content of the items may not be relevant for all demographic groups ([Salva, Davey, Costa, & Whitfield, 2007](#)). Openness is the most complex of the five traits to assess, and the expression of openness may be more context dependent than items that measure the other traits. Despite these limitations, there still tends to be adequate convergence with the normative structure across diverse groups ([McCrae & Terracciano, 2005a](#)).

Nomological Net

It is helpful to place openness within the nomological net of related constructs ([McCrae, 1996](#); [McCrae & Sutin, 2009](#)). Openness shares conceptual and empirical links with a number of constructs, including authoritarianism, need for cognition, need for closure, emotional intelligence, and traits from other conceptually similar models of personality.

Openness is strongly inversely related to authoritarianism. Individuals who score low on openness tend to be conventional and conservative, and their political attitudes tend to align with their psychological orientation. And indeed, there is a strong negative association between openness and measures of “right wing authoritarianism” ($r = -.50$, $p < .001$). This negative association tends to be stronger for the more cognitive components of openness, rather than its more experiential components ([Onraet, Van Hiel, Roets, & Cornelis, 2011](#)).

Openness is also strongly related to constructs commonly used in social psychology, such as the need for cognition and the need for closure. The need for cognition is defined as the extent to which people engage in and

enjoy activities that require cognitive effort (Petty, Briñol, Loersch, & McCaslin, 2009). Individuals high in the need for cognition seek out cognitively challenging activities, whereas those low in this trait prefer activities that require less thought. Given that open individuals and those high in the need for cognition share an interest in intellectual engagement, there tends to be a moderate correlation between the two ($r = .41$, $p < .01$; Fleischhauer, Enge, Brocke, Ullrich, & Strobel, 2010). This correlation is higher than the correlation between the need for cognition and any of the other four traits ($r \leq |.26|$). Individuals high in openness tend to score lower on the need for closure, defined as the desire for definite and final answers (Webster & Kruglanski, 1994).

One defining feature of openness is the experience of more differentiated emotional states. This greater intrapersonal sensitivity to emotions may extend to identifying emotions in other people. And, in fact, openness is associated with better emotion recognition (Terracciano, Merritt, Zonderman, & Evans, 2003). Open individuals are also more aware of their emotional states, express those feelings to others, and are better able to regulate emotions in themselves and others, all key components of “emotional intelligence” (Downey, Lee, & Stough, 2011).

A number of other models of personality have traits conceptually similar to openness. For example, openness is strongly associated with the intuition type, as defined by the Myers-Briggs Type Inventory (Costa & McCrae, 1992): Open individuals prefer abstract and theoretical information (intuition), whereas closed individuals prefer concrete and tangible information (sensing). The Experience Seeking subscale of the Sensation Seeking scale is strongly related to openness (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). Openness is also related to several scales from the Temperament and Character Inventory, including Self-Transcendence, (low) Harm Avoidance, and Novelty Seeking (de Fruyt, van De Wiele, & van Heeringen, 2000).

These constructs should not be construed as equivalent to openness. They are all only moderately correlated with openness at best and each has a specific content that gives it unique correlates. When considered together, however, the core of each of these constructs would be defined primarily by an openness factor (McCrae, 1996).

Openness: From Biology to Society

Biological Basis

Genetics. Estimates derived from twin studies routinely suggest that approximately half of the variance in openness can be attributed to genetic factors (e.g., [Kandler & Myers, 2010](#); [Riemann, Angleitner, & Strelau, 1997](#); [Vernon, Villani, Vickers, & Harris, 2008](#)). Of the five traits, openness tends to have the highest estimate of additive genetic effects and the lowest estimate of nonshared environmental effects (see also the chapter by [Jarnecke and South](#)). Similar to the other traits, there appears to be minimal shared environmental associations. The comparatively larger additive genetic association with openness may be due, in part, to the shared genetic association between openness and general cognitive ability ([Wainwright, Wright, Luciano, Geffen, & Martin, 2008](#)).

Findings from behavioral genetics inspired the search for the actual genes associated with personality. There are two approaches to this search: candidate genes and genome-wide association studies (GWAS). Within the candidate gene approach, specific single nucleotide polymorphisms (SNPs) are hypothesized a priori to be related to the trait. The candidate genes are usually selected based on knowledge of the known biological action of the gene and its theoretical relevance to the trait in question. Much of the research using this approach has focused on neuroticism, but some work has addressed whether openness is associated with genes within the dopaminergic system that have been implicated in exploratory behavior. In a sample of children and adults, the associations between openness and the dopamine D4 receptor gene (*DRD4*) and the catechol-O-methyltransferase gene (*COMT*) were qualified by gene–gene interactions and interactions with both demographic and environmental factors ([DeYoung et al., 2011](#)). These interactions suggest that there is no straightforward association between these SNPs and openness.

In contrast to the candidate gene approach, the GWAS approach is atheoretical and completely data driven. GWAS scan the entire genome for common genetic variation associated with the trait of interest. In general, findings from GWAS have not supported the candidate genes hypothesized to be associated with personality. In the first GWAS of openness, none of the top SNPs passed the commonly accepted threshold for significance ($p < 10^{-8}$), and neither *DRD4* nor *COMT* was among the top hits ([Terracciano,](#)

Sanna, et al., 2010). The largest GWAS meta-analysis to date (>17,000 participants) also did not support the hypothesized candidate genes (de Moor et al., 2012). This study did find an association between openness and two SNPs located downstream from *RASA1*, a gene that is expressed weakly in the brain. Although these associations passed the genome-wide significance threshold in the discovery sample, neither SNP was significant in the replication sample (de Moor et al., 2012). A recent GWAS also failed to replicate either the candidate genes or the top hits for openness in previous GWAS (Bae et al., 2013). As such, consistent genetic associations have yet to emerge for this trait.

The evidence for the molecular genetic basis of openness from large meta-analyses, such as the one from de Moor and colleagues (2012), has been disappointing. The scarcity of findings points to the critical need for larger samples and the necessity of replication. It is possible that there are complex interactions between individual SNPs that contribute to openness, and that these interactions may differ across different demographic groups. At the same time, interactions are difficult to find and difficult to replicate; care must be taken before firm conclusions can be drawn. New technologies may be more promising. For example, as the cost of sequencing the entire genome decreases, more researchers will be able to take advantage of it. By increasing the coverage of the genome, sequencing expands the number of variants that can be tested, especially rare variants.

Neuroscience. The search for the neurobiological underpinnings of openness to experience is more complex than the search for its genetic roots. Part of this complexity stems from the number of ways to conceptualize neurological correlates; the correlates of openness have been examined in the context of the volume of brain structures, resting-state blood flow, and functional connectivity, among others (see also the chapter by Allen and DeYoung).

One of the defining features of openness is cognitive flexibility, or the ability to store and manipulate information with ease. Such flexibility requires good working memory, attention, and set shifting ability, all of which have well-established neural correlates. Some have used these correlates together with a conceptual understanding of openness to make theory-driven hypotheses about how openness should be associated with brain structure and function. DeYoung and colleagues (2010), for example, hypothesized that openness would be positively related to structural

variation in the prefrontal cortex. Others have noted the inconsistencies in the literature on personality and brain structure and have thus taken a more exploratory approach (Bjørnebekk et al., 2013; Liu et al., 2013). In each of these studies, using slightly different techniques, no correlation between openness and structure emerged (Bjørnebekk et al., 2013; DeYoung et al., 2010; Liu et al., 2013). Kapogiannis and colleagues (Kapogiannis, Sutin, Davatzikos, Costa, & Resnick, 2013) also took an exploratory approach and found that openness was associated with gray matter volume of several brain structures, including areas in the prefrontal cortex implicated in cognitive control. Given the inconsistencies in the literature, however, caution should be taken when evaluating these results.

The literature on openness and both the resting-state correlates and functional connectivity is likewise mixed. Open individuals tend to have greater resting-state activity in regions associated with cognitive flexibility, monitoring processes, and reward and emotional processing including the prefrontal cortex, the orbitofrontal cortex, and the cingulate cortex (Sutin, Beason-Held, Resnick, & Costa, 2009). Novelty seeking, a trait somewhat related to openness, also correlates positively with some of these regions when measurements are taken at rest (e.g., Nakao et al., 2013; Sugiura et al., 2000; Youn et al., 2002). Not all, however, find these relations (e.g., Kunisato et al., 2011). Adelstein and colleagues (2011) hypothesized that openness would be associated with greater connectivity in regions implicated in cognitive flexibility, and, indeed, they found that open individuals had greater functional connectivity in the dorsolateral prefrontal cortex. Xu and Potenza (2012) also found that openness was associated with better white matter integrity in this area. Others, however, have either found associations in different regions (e.g., Jung, Grazioplene, Caprihan, Chavez, & Haier, 2010) or none at all (e.g., Bjørnebekk et al., 2013).

The search for the neural underpinnings of openness has been somewhat hampered by methodological limitations. First, the sample sizes tend to be modest. Compared to genetic studies that typically include tens of thousands of participants, neuroimaging studies use a few hundred participants at best. The modest sample sizes are not surprising, given the time and expense of neuroimaging. At the same time, openness is complex, and the neurobiological correlates are likely to be small; large samples are thus needed to reliably detect significant associations. Second, different measures of openness tend to be used across different studies. Even well-

validated scales may not have consistent correlates because different scales emphasize different aspects of openness. A facet-level approach to the neural underpinnings may reveal more consistent associations. Finally, neuroimaging studies tend to use samples that vary widely in age. Although not a limitation, this difference may make it difficult to compare findings across studies, given the significant changes in brain structure and function that come with aging.

Biomarkers. In addition to the genetic and neurological correlates, there are numerous biomarkers of biological relevance to openness. Although some biomarkers have already been found to be unrelated to openness, such as brain-derived neurotropic factor (BDNF; [Terracciano et al., 2010](#)) and telomere length ([Sadahiro et al., 2015](#)), there are other promising biomarkers that have yet to be tested in relation to openness. Elevated homocysteine is a risk factor for dementia ([Seshadri et al., 2002](#)), and gut microbiota have been linked to psychological functioning, as well as physical health ([Cryan & Dinan, 2012](#)); both are plausible links to openness. A better understanding of the physiological underpinnings may provide valuable insight into the nature of openness.

DEVELOPMENTAL TRAJECTORY

There are lay theories about how openness changes across the lifespan, theories that are shared by people all over the world. When participants from over 20 cultures were asked to rate the level of openness of the average adolescent, the average adult, and the average older person, the perceived trajectory was a clear decline across the lifespan: Adolescents were perceived to be the most imaginative, intellectually curious, and liberal, whereas older adults were perceived to be the most practical, the most closed-minded, and the most conservative, with middle-aged adults falling in between ([Chan et al., 2012](#)). Although these perceptions map to actual age differences in openness, such stereotypes of openness also exaggerate age differences. For example, adolescents are perceived to be much higher on fantasy, actions, and values than they actually are, whereas older adults are perceived to be lower on these traits than they actually score ([Chan et al., 2012](#)).

The exact trajectory of openness across the lifespan, however, is debatable, starting with the emergence of openness in childhood. Traditional models of temperament do not include a childhood antecedent

of openness, and early research suggested that openness might not emerge as a recognizable trait until adulthood (Eder, 1990). Recent advancements, including improvements in measurement, have challenged this assertion (see also the chapter by De Pauw). Openness is present and measurable even in early childhood. Interestingly though, openness may be more closely related to conscientiousness than extraversion in childhood (Soto & John, 2014), a pattern that replicates across cultures (Tackett et al., 2012). In early childhood (~ages 3–5), openness is also defined in part by motor activity and energy level, as well as by the more expected characteristics of imagination and creativity. The shared association with activity level suggests that openness is rooted in physical as well as cognitive exploration (Soto & John, 2014). In middle childhood, openness is clearly associated with both conscientiousness and extraversion, with intellect-related items more strongly related to conscientiousness, and imagination-related items more strongly related to extraversion (Herzhoff & Tackett, 2012).

Adolescence is a particularly important and complicated developmental period. There is a consensus that adolescents should score high in openness (Chan et al., 2012). Indeed, the very definition of adolescence is equivalent to openness: It is a time for children to explore and try new things. As such, openness should increase across adolescence, but the evidence is equivocal. The meta-analysis of Roberts et al. (2006) pointed to a slight, but not significant, increase in openness across adolescence (ages 10–18 years). Using cross-sectional, longitudinal, and cross-cultural data, McCrae and colleagues (2002) did document an increase in openness between the ages of 12 and 18 years. Using a comprehensive measure of openness that included experiential items in addition to intellectual interests, adolescents increased in “their appreciation of aesthetics, tolerance of alternative value systems, and sensitivity to moods/emotions” (p. 1465). This increase in openness may reflect the growth in cognitive capacity that is one of the defining characteristics of adolescence (McCrae et al., 2002). Other studies, however, document a decline. In a short-term longitudinal study using parent reports of personality, a domain labeled imagination, which included facets of curiosity and creativity, decreased between childhood and early adolescence (De Fruyt et al., 2006). And from the largest cross-sectional study to date, the age difference in openness was not in the expected direction: 10-year-old participants scored higher in openness than 20-year-old participants (Soto, John, Gosling, & Potter, 2011).

The transition between adolescence and young adulthood is more clearly marked by an increase in openness. American college students, for example, increase in openness across their time in college (Robins, Fraley, Roberts, & Trzesniewski, 2001), as do Italian (Vecchione, Alessandri, Barbaranelli, & Caprara, 2012) and German (Lüdtke, Roberts, Trautwein, & Nagy, 2011) students. Given that education may increase openness, the increase in this trait among students might be more a function of going to school than a function of development. To address this question, Lüdtke and colleagues (2011) compared the trajectories of emerging adults who did vocational training with those who entered a university. Although the university students scored higher in openness than the students in vocational training, the trajectory of the groups was identical. This increase in openness in young adulthood may thus be more of an intrinsic developmental process than a consequence of higher education.

Across adulthood, the trajectory of openness parallels lay perceptions of change, but the exact shape of the decline is less clear. Terracciano and colleagues (Terracciano, McCrae, Brant, & Costa, 2005) used hierarchical linear modeling to model up to 11 assessments of openness per participant. At the domain level, openness clearly declined between the ages of 30 and 90 years. The trajectory of some of the facets, however, diverged from this overall pattern. In particular, general tendencies toward an interest in art and beauty (Aesthetics), an active imagination (Fantasy), and interests in intellectual pursuits (Ideas) remained consistent across adulthood, whereas the general tendencies toward being open-minded (Values), interested in trying new things (Actions), and depth of emotion (Feelings) declined considerably from young adulthood to old age. This pattern suggests that openness measures that have more items related to values, actions, and feelings should show a greater decline than measures weighted toward aesthetics, fantasy, and ideas.

A slightly different trajectory emerges from large-scale national samples that now have personality measured twice, approximately 4 years apart. National samples from the United States (Stephan, Sutin, & Terracciano, 2015), Germany (Lucas & Donnellan, 2011), and Australia (Wortman, Lucas, & Donnellan, 2012) all show that openness declines over the 4-year follow-up period. The cross-sequential nature of these studies also allows for modeling the trend across adulthood. In this case, openness is relatively

flat up until about age 60 years, with accelerated decline from age 60 years into old age ([Lucas & Donnellan, 2011](#); [Wortman et al., 2012](#)).

Longitudinal studies thus indicate that, in general, people become more conservative with age. Studies of cross-sectional age differences, however, challenge these findings. With a sample of over 1 million participants drawn from internet users, [Soto and colleagues \(2011\)](#) found that 60-year-old participants scored higher on openness than 20-year-old participants. A second internet sample found curvilinear age differences, such that middle-aged participants scored higher on openness, with adolescent and older participants scoring lower; this pattern was similar across three different measures of openness ([Lehmann, Denissen, Allemand, & Penke, 2013](#)). This different pattern across cross-sectional internet studies versus longitudinal studies may be due in large part to selection bias. That is, when deciding whether to participate in an internet study, individuals who are more intellectually curious and introspective may be particularly excited to fill out a questionnaire to learn about their personality. This effect may be even stronger at older ages. Selection bias is also likely to have an effect in other types of studies. That is, open individuals are more likely to volunteer to participate in research. From this perspective, longitudinal studies are particularly critical to track development; participants must be followed longitudinally to see actual age-related decline. There are limits to longitudinal studies as well, as open individuals are more likely to remain in a study than more closed individuals ([Jerant, Chapman, Duberstein, & Franks, 2009](#)). These trends need to be kept in mind in both designing studies and interpreting results. A more concerted effort to provide incentives for closed individuals to participate and remain in research studies would help to reduce these biases.

Finally, developmental time is typically measured as time since birth (i.e., chronological age), but there are alternative measures. Subjective age refers to how old (or young) someone feels relative to his or her chronological age. Open individuals tend to feel younger than their chronological age, an association that grows stronger with chronological age ([Stephan, Demulier, & Terracciano, 2012](#)). Stephan and colleagues argue that “from middle-to-old age, open individuals’ tendency to search for a variety of new ideas, values, and experiences could lead them to have interest and activities more indicative of younger people than of people their own age, leading them to feel younger than their actual age” (p. 878).

A younger subjective age may also have implications for the developmental trajectory of openness: Instead of showing the typical age-related decline, people who feel younger than their age increase in their tendency to be open to new experiences ([Stephan et al., 2014](#)).

PHYSICAL, MENTAL, AND COGNITIVE HEALTH

Physical health. Research on the personality predictors of longevity has focused primarily on neuroticism and conscientiousness. Openness, in fact, is more often than not unrelated to mortality risk. A study of over 76,000 adults with a mean follow-up period of almost 6 years, for example, found that open adults did not die any sooner or later than more closed individuals ([Jokela et al., 2013](#)). The association between openness and longevity, however, may be more nuanced than simply domain-level associations. In one study, individuals who had a high preference for novelty (i.e., openness to actions) had a reduced risk of all-cause mortality and individuals who appreciated art and beauty (i.e., openness to aesthetics) had a reduced risk of cardiac death, whereas domain-level openness was unrelated to either all-cause or cardiac mortality ([Jonassaint et al., 2007](#)). Likewise, in another sample, creativity, but not intellect, was associated with a reduced mortality risk, whereas there was no association at the domain level ([Turiano, Spiro, & Mroczek, 2012](#)).

This same pattern holds for intermediate markers of health: Facet-level associations tend to be more consistent than domain-level correlates. For example, there is no clear association between domain-level openness and systemic inflammation, measured with either interleukin-6 or C-reactive protein. Although some studies find that domain-level openness is associated with lower inflammation ([Armon, Melamed, Shirom, Berliner, & Shapira, 2013](#); [Chapman et al., 2011](#)), others have not ([Sutin et al., 2010](#); [Turiano, Mroczek, Moynihan, & Chapman, 2013](#)). In addition, when associations are found, they typically hold for some populations but not others (e.g., [Jonassaint et al., 2010](#)) or have complex relations (e.g., [Mõttus, Luciano, et al., 2013](#)). The aesthetics facet, however, has been associated consistently with lower inflammation (e.g., lower interleukin-6 and C-reactive protein (e.g., [Chapman et al., 2011](#); [Sutin et al., 2010](#)), even when openness at the domain level is unrelated to inflammation. Individuals who are moved by works of art tend to have more favorable inflammatory profiles.

Openness may be unrelated to risk of disease ([Sutin, Zonderman, Ferrucci, & Terracciano, 2013](#)), but when individuals do get sick, those with experientially rich lives may have slower disease progression. Among HIV⁺ adults, those with higher openness, particularly those who are open to aesthetics and ideas, have slower rates of increase in viral load and slower rates of decrease in CD4 cells over 4 years ([Ironson, O'Cleirigh, Weiss, Schneiderman, & Costa, 2008](#)). Among the elderly, domain-level openness has been linked to a reduced risk of walking limitations over a 6-year follow-up period ([Tolea et al., 2012](#)). And in a community sample, over a 10-year follow-up, open individuals were less likely to develop incident coronary heart disease than more conservative individuals ([H. B. Lee et al., 2014](#)).

There are at least two pathways through which openness may contribute to slower disease progression. First, openness may help buffer against the negative effects of stressful situations. For example, Williams and colleagues ([Williams, Rau, Cribbet, & Gunn, 2009](#)) found that during a laboratory stressor, more open individuals showed greater stress regulation at the physiological level (e.g., less blood pressure reactivity) as well as the emotional level (e.g., greater increases in positive affect) level. Second, open individuals may be more open to try experimental treatment options or alternative therapies ([Honda & Jacobson, 2005](#)).

In contrast to traits such as neuroticism and conscientiousness, behavioral factors do not seem to contribute to the association between openness and health. That is, openness tends to be unrelated to many health-risk behaviors, such as smoking ([Terracciano & Costa, 2004](#)). Open individuals are also not more or less likely to exercise than closed individuals, a pattern found in both younger ([Rhodes & Smith, 2006](#)) and older ([Stephan, Boiché, Canada, & Terracciano, 2014](#)) adults. Open and closed individuals, however, may have different motivations for engaging in physical activity. Open individuals tend to engage in physical activity to manage stress and because they enjoy it, whereas open and closed individuals are equally likely to engage in physical activity for health, appearance, maintaining a healthy weight, or social reasons ([Courneya & Hellsten, 1998](#)).

Openness does emerge as a consistent predictor of at least two health-related behaviors: marijuana use and diet. From early studies ([Eisenman, Grossman, & Goldstein, 1980](#)) to more recent ones ([Fridberg, Vollmer, O'Donnell, & Skosnik, 2011](#)), current and frequent marijuana users

consistently score higher in openness. This association may be due, in part, to the shared association between openness and intelligence. For example, more intelligent 5-year-old children are more likely to have ever tried marijuana by age 16 years and are more likely to report use within the past 12 months at age 30 years ([White & Batty, 2012](#)). [Daly \(2013\)](#) argued that openness may be the key to the association between intelligence and cannabis use. Specifically, he found that openness explained the marijuana-intelligence link, and he concluded that open individuals may “seek out illicit substances and to select into cognitively stimulating environments that improve neuropsychological functioning” (p. E979). Although openness is unrelated to harder drug use in some samples (e.g., [Terracciano, Löckenhoff, Crum, Bienvenu, & Costa, 2008](#)), some studies find that openness is protective against current opiate/cocaine use ([Kornør & Nordvik, 2007](#); [Sutin, Evans, & Zonderman, 2013](#)). With any study of drug use, however, it is unclear whether scores on openness are truly predictive of current use or whether the drug has an effect on the individual’s level of openness.

Of the five traits, openness has the most consistent associations with healthier eating patterns. In a large study of Estonians who ranged in age from 18 to 89 years, open individuals were more likely to report eating a “health aware” diet, a diet characterized by a high consumption of cereal and dairy products, fish, vegetables, and fruits. In addition, participants who scored lower in openness were more likely to consume a “traditional” diet, a diet characterized by greater consumption of potatoes, meat, meat products, and bread ([Mõttus et al., 2012](#)). In a large sample of older Scottish adults, open individuals were more likely to consume a Mediterranean (defined as the consumption of vegetables, fish, poultry, pasta, oil, and beans) and health aware (defined as the consumption of fruit and less consumption of meat, eggs, and alcohol) diet, whereas more conservative individuals were more likely to consume a convenience diet (defined as tinned vegetables, beans, meat or chicken pies, pastries and sausage, mashed potatoes) and sweets ([Mõttus, McNeill, et al., 2013](#)). And in a large sample of older Finnish adults, openness was associated with consuming more fruits and vegetables and fewer sweets and soft drinks, but was unrelated to the consumption of cereals, dairy, fats, meat, or fish ([Tiainen et al., 2013](#)).

This evidence thus suggests that open individuals eat healthier diets than more closed individuals. This healthy eating pattern, however, does not translate into healthier body weight. In American (Chapman, Fiscella, Duberstein, Coletta, & Kawachi, 2009; Sutin, Ferrucci, Zonderman, & Terracciano, 2011), British (Cheng & Furnham, 2013; Mõttus, McNeill, et al., 2013), Italian (Terracciano et al., 2009), and Israeli (Armon, Melamed, Shirom, Shapira, & Berliner, 2013) samples, openness is unrelated to body mass index (BMI) and risk of obesity (i.e., $BMI \geq 30$). A meta-analysis of nearly 80,000 participants found that openness was associated with a lower risk of obesity, but the effect disappeared after controlling for education (Jokela et al., 2013). This pattern suggests that any protective effect of openness on BMI likely functions through higher education. Still, some have found that openness is associated with lower waist circumference (van Reedt Dortland, Giltay, van Veen, Zitman, & Penninx, 2012), and there is also evidence that the association between openness and anthropomorphic measures may be complex. For example, in a study of midlife adults, open men had lower BMI than more traditional men, an association that decreased across middle adulthood, whereas openness was unrelated to BMI for women across this time period (Brummett et al., 2006). In the context of the association with a healthier diet, it may be that open individuals consume better foods, but still consume a similar number of calories as more closed individuals.

Mental health. As described above, there is great interest in integrating normal and pathological personality functioning for all five traits, and there has been much discussion about the conceptual and empirical overlap between openness and psychotism (as defined by the *DSM-5*). In addition to personality disorders, openness may play a role in other aspects of mental health. Rather than being a strong component of mental disorders (such as neuroticism), openness may help to differentiate among similar but distinct disorders. In clinical samples, openness is the defining trait difference in distinguishing between bipolar disorder (BD) and major depressive disorder (MDD). That is, the personality profiles of BD and MDD are identical except for openness: Individuals with BD and MDD score higher in neuroticism and lower in extraversion, agreeableness, and conscientiousness, but BD is characterized by high openness, whereas openness is unrelated to MDD (Barnett et al., 2011). As such, high openness seems to be a risk factor for mania or hypomania versus other

disorders with an affective component. Although openness predicts the type of depressive disorder, it is generally unrelated to manic symptomatology ([Quilty, Pelletier, DeYoung, & Bagby, 2013](#)) and does not seem to share genetic roots with BD ([Middeldorp et al., 2011](#)).

Just as openness appears to differentiate BD from MDD, it also may differentiate positive from negative schizotypy. Symptoms of positive schizotypy generally refer to beliefs in things that are implausible and perceptual and bodily distortions that are schizophrenic-like, whereas symptoms of negative schizotypy generally refer to deficits in sensory and aesthetic pleasure. Cluster analyses of schizotypal symptoms show that positive schizotypy is characterized by higher openness, whereas low openness is characteristic of negative schizotypy (e.g., [Kwapil, Barrantes-Vidal, & Silvia, 2008](#)). In fact, there is about a one standard deviation difference in openness between the positive and negative schizotypy clusters ([Barrantes-Vidal, Lewandowski, & Kwapil, 2010](#)). This difference may be one reason that openness is not consistently associated with schizotypy, unless the positive and negative aspects of it are distinguished.

In addition to psychiatric disorders, personality traits contribute to more general evaluations of subjective well-being, such as life satisfaction and happiness. The role of openness in these evaluations is more limited than that of the other traits. Open individuals experience a broader range and depth of emotions but that does not translate into feeling happier or sadder, on average ([Lamers, Westerhof, Kovács, & Bohlmeijer, 2012](#)). Although openness tends to be unrelated to measures of happiness and life satisfaction, open individuals tend to have greater psychological well-being. That is, individuals who are intellectually curious and have experientially rich lives report more autonomy, a greater sense of mastery, and more personal growth ([Cox, Wilt, Olson, & McAdams, 2010](#); [Lamers et al., 2012](#)). Openness is also the trait that has the strongest association with societal engagement. Open individuals report making more positive contributions to society and the world ([Cox et al., 2010](#)). This association may be due, in part, to the greater generativity among open individuals.

Cognitive health. Open individuals are perceived to be verbally fluent, humorous, and expressive ([Sneed, McCrae, & Funder, 1998](#)). This shared perception may be due to their fluency with language, a fluency that is apparent across the lifespan. Open adolescents, for example, score higher on the verbal section of aptitude tests ([Noffle & Robins, 2007](#)), open young

adults perform well on vocabulary and comprehension tasks (Bates & Shieles, 2003), open older adults score higher on verbal measures of cognition, such as analogies and synonyms (Sharp, Reynolds, Pedersen, & Gatz, 2010), and across the lifespan, open individuals perform better on verbal fluency tasks (Sutin, Terracciano, et al., 2011). Open individuals may perform better on verbal tasks both because of their reading abilities (Ritchie, Luciano, Hansell, Wright, & Bates, 2013) and because they tend to have better executive functioning (Ayotte, Potter, Williams, Steffens, & Bosworth, 2009), which contributes to the cognitive flexibility needed to perform well on verbal fluency tasks. In addition, open people tend to seek out new experiences, which may naturally lead to more opportunities to learn new things.

With the increasing prevalence of dementia worldwide, identifying factors that help maintain cognitive function in older adulthood is critical. It is often asserted that openness should be protective against Alzheimer's disease and other forms of dementia. After all, open individuals tend to engage in the behaviors that form the core of the cognitive reserve/resilience hypothesis. Yet openness rarely emerges as a significant predictor of Alzheimer's disease. In fact, it took a meta-analysis of over 5,000 participants for the protective effect of openness to emerge (Terracciano et al., 2014). Even then, neuroticism and conscientiousness were stronger predictors of Alzheimer's disease than openness.

Openness is likewise unrelated to cognitive decline prior to dementia onset. It appears that going in to old age, open individuals have higher cognitive functioning but decline at the same rate as less open individuals. In a sample of older adults, for example, open participants performed well on tasks that measured reading, memory, and nonverbal reasoning; these effects persisted even after controlling for childhood intelligence. Over the follow-up period, however, openness was unrelated to change in these cognitive dimensions (Hogan, Staff, Bunting, Deary, & Whalley, 2012). Similarly, in another sample of older adults, open individuals performed better on measures of five different aspects of cognition (verbal, spatial, memory, speed, and general intelligence), but these individuals declined at the same rate as more closed individuals (Sharp et al., 2010).

Such findings are surprising, given the strong associations between openness and intelligence and cognitive functioning in young adulthood. Part of the explanation may lie in the shared association among cognition,

openness, and education. Education is among the most protective behavioral factors against dementia and cognitive decline ([Barnes & Yaffe, 2011](#)), and open individuals are more likely to seek out opportunities for higher education. Studies of personality and cognition in older adulthood typically control for the effect of education, which may absorb the effect of openness along with it. There are, of course, plenty of open people who do not have the opportunity to continue in school and vice versa. For people with less education, openness may be more protective of cognitive function, whereas this protective effect may diminish with more education ([Franchow, Suchy, Thorgusen, & Williams, 2013](#)).

It is also surprising given that open individuals engage in cognitively stimulating behaviors that are thought to help preserve cognition. In two large samples, for example, openness was strongly associated with “developmental” activities, including reading, writing letters, stories, or journal entries, using technology, and attending educational lectures or courses ([Stephan et al., 2014](#)). At the same time, however, closed individuals are more likely to participate in religious activities (e.g., [Jopp & Hertzog, 2010](#)), and this social engagement may also be protective against cognitive decline in old age ([Fratiglioni, Paillard-Borg, & Winblad, 2004](#)). As such, the tendencies and behavioral patterns associated with both ends of the openness continuum may be protective, albeit for different reasons.

Employment

For most adults, employment is of great economic and psychological importance. In addition to the economic necessity, working can be a significant source of stress and/or personal fulfillment. Given the economic and psychological significance of employment to both the individual and society, there is tremendous interest in the role of personality traits in the employment experience (see also the chapter by [Siebert and DeGeest](#)). The classic 10-year longitudinal study from [Kohn and Schooler \(1982\)](#) was among the first to show that personality plays a role in work experiences. Specifically, men who scored higher on ideational flexibility (i.e., openness) were employed in more substantively complex jobs with less supervision, fewer working hours, and a greater likelihood of a self-directed position at the 10-year follow-up. The association between openness and work experiences was not unidirectional. Men employed in jobs that required more complex work that had more time pressures increased in ideational

flexibility over 10 years, whereas men who were supervised closely, worked in manual labor, or routinization work decreased. [Clausen and Gilens \(1990\)](#) subsequently found a similar pattern among women. These early studies set the stage for more systematic investigations of the role of personality, particularly openness, in employment.

From looking for a job to retirement, openness is a key personality contributor to this process. Open individuals, for example, seek out and prefer jobs that are intrinsically motivating, such as jobs that have autonomy, variety, and an opportunity for growth ([Bipp, 2010](#)). These preferences fit well with their general tendencies for intellectual curiosity and preference for novelty. In contrast to these intrinsic motivations, openness is unrelated to extrinsic motivations to work: Open and closed individuals are both equally likely to value job security, working hours, and relationships at work ([Bipp, 2010](#)).

Once in a job, the characteristics of the working environment vary greatly across occupations. That is, some jobs are highly demanding, some jobs allow for a great degree of autonomy and decision-making capabilities, and other jobs are more restrictive. A longitudinal study that spanned approximately 10 years partially replicated [Kohn and Schooler's \(1982\)](#) classic findings with well-validated measures of both personality and job characteristics ([Sutin & Costa, 2010](#)). Open individuals tended to be employed in positions with a great deal of decision-making latitude, and this latitude increased over the 10 years between assessments. Openness was unrelated to having either psychologically or physically demanding jobs. Surprisingly, these characteristics of the working environment were unrelated to changes in openness. Most individuals spend a great deal of their waking hours working, and thus it is surprising that the day-to-day working environment would have little effect on personality.

All jobs involve some evaluation of performance. In the classic meta-analysis by [Barrick and Mount \(1991\)](#), openness was unrelated to job performance. The meta-analytic correlation was essentially zero, which indicated that open people did not perform much better or much worse than closed people. A number of more recent studies have noted that looking only at domain-level openness misses the complexity of the relation between openness and job performance. And, indeed, facet-level analyses indicate a more nuanced story. [Ziegler et al. \(2014\)](#) had supervisors rate their apprentices during their first year of training on a number of work-

related characteristics (e.g., acquired skills and knowledge, teamwork). Across a range of professions, domain-level openness was unrelated to training success, but openness to ideas and openness to fantasy both shared significant correlations with supervisor ratings—in opposite directions. In situations that require a great deal of flexibility and learning, individuals who are intellectually curious may perform well, presumably because they use their intellectual engagement to learn how to do the job effectively. In contrast, individuals high in fantasy are rated worse, perhaps because their tendency to daydream distracts them from learning how to do the job.

There are a number of ways to define a successful career, including the objective prestige of the job, the amount of money earned, and the individual's own subjective evaluation. Open individuals tend to be employed in objectively higher prestige jobs (defined as a combination of the education required for the job and the average income of the profession, derived from the census, not the individual's actual education or income) but are not more likely to earn more money than individuals lower in openness ([Sutin, Costa, Miech, & Eaton, 2009](#)). The association between openness and the more subjective evaluation of success is complex. Although some have found that openness is unrelated to job satisfaction ([Sutin et al., 2009](#)), others have noted that this association varies by the type of job and that collapsing across professions may obscure the relation between openness and satisfaction ([Lounsbury et al., 2003](#)). For example, open individuals are more satisfied with jobs in consulting, whereas closed individuals are more satisfied in manufacturing. Open individuals also tend to report overall satisfaction with their career choice, even if they are not necessarily satisfied with their current job ([Lounsbury et al., 2003](#)); they also tend to draw more meaning from their work ([Bipp, 2010](#)) than more conservative individuals.

In many jobs, it is essential to be able to work effectively in a team. Teams can be more creative than individuals working alone. It turns out that the personality composition of the team is important for the team's creative output. Similar to individual-level openness, teams high in openness tend to develop more creative solutions to problems. But it is not just the average level of openness that matters; the variability in openness within the team matters too. That is, teams made up of individuals both high and low in openness perform better than teams made up of individuals either all high or all low in openness ([Schilpzand, Herold, & Shalley, 2011](#)). Groups may

need some open team members to generate unusual and different ideas, and other team members to ground those ideas in reality. Openness, and the variability of openness within a group, is unrelated to other group metrics, such as conflict or satisfaction with the team ([Tekleab & Quigley, 2014](#)).

Finally, some people will need to switch jobs over the course of their working lives and most people will retire. Openness is associated with these employment transitions. For example, following unemployment, individuals who are more open are reemployed more quickly ([Kanfer, Wanberg, & Kantrowitz, 2001](#)). As retirement nears, open individuals endorse more aspirational reasons for retirement ([Robinson, Demetre, & Corney, 2010](#)). For example, they report that they have become more interested in their lifestyle than in how much money they make and that they want more time to pursue new opportunities, such as self-employment. Interestingly, openness is unrelated to either positive or negative experiences at work that contribute to the decision to retire, and it is unrelated to life satisfaction in retirement ([Robinson et al., 2010](#)). That is, both open and closed individuals are equally likely to be satisfied with their retirement.

Person Presentation and Perception

Open individuals are creative, curious, and crave variety; individuals lower on openness tend to prefer the conventional and more conservative. These characteristics of open and closed individuals are expressed across a wide variety of circumstances and mediums. From physical living spaces to massively multiplayer online role-play games, individuals express their personality in numerous ways. Observers often pick up on these behavioral manifestations of openness and can accurately judge openness based on these cues. At the same time, lay perceivers have their own ideas about what is indicative of openness, and these ideas are not always diagnostic.

In their physical spaces, such as offices and bedrooms, consistent with their intellectual interests, open individuals tend to own and display a wider variety of books and magazines ([Gosling, Ko, Mannarelli, & Morris, 2002](#)). Open individuals also decorate these spaces in ways that are considered unique and unusual. It is not just their physical space that is described as unusual. As judged from photographs, open individuals themselves tend to look more distinctive and more messy, and they also tend to look away from the camera. More conservative individuals, in contrast, look healthier, more ordinary, and neater ([Naumann, Vazire, Rentfrow, & Gosling, 2009](#)).

Observers do not always pick up on these cues. Whereas a distinctive appearance is diagnostic of openness and is perceived as such by observers, cues such as smiling and looking energetic are taken as signs of openness, when they are actually unrelated (Naumann et al., 2009). Likewise, people judge cheerful and colorful offices as occupied by someone high in openness, when in fact these cues are unrelated to openness (Gosling et al., 2002). Laypersons confuse interpersonal openness with openness to experience (Sneed et al., 1998) and thus may misattribute these cues to openness.

For some cues there is strong consensus, but little accuracy. In one study of World of Warcraft (WoW) usernames, people with and without experience with the game rated the personality of the usernames. There was consensus among both users and nonusers on all five of the traits, including openness. Despite the consensus among observers, there was no correlation with actual scores on openness—raters agreed with each other on what cues should be indicative of openness, but there was little accuracy with actual cues (Graham & Gosling, 2012). Open players tended to have fantasy- and sci-fi-related names, whereas more closed individuals used names that were funny, emotional, or self-deprecating. Observers thought that closed individuals would use more gendered-related names and more aggressive names, but these cues were unrelated to the individual's openness.

The rise of social media has led to new ways of examining how personality leaves its residue in everyday life. In particular, the words that people use when writing blogs, status updates, and tweets should reflect elements of their characteristic ways of thinking, feeling, and behaving. Given that openness is associated with verbal fluency, open individuals may be more expressive in their writing. In an analysis of blog posts, openness correlated significantly with 393 words—over three times as many words as the trait with the next highest number of significant correlations (agreeableness at 110 words). Many of the words correlated with openness reflected the very nature of this trait. That is, open individuals value artistic pursuits and use words such as poet, art, films, and literature in their blogs (Yarkoni, 2010).

Open language analysis is one new and innovative way to characterize the language of personality without being confined to predetermined word sets. This approach makes use of “Big Data” to visualize the words and phrases most commonly associated with a trait of interest. One benefit of

this approach is that it is purely data driven and thus has the power to uncover associations with a wide variety of written expressions. For example, in an analysis of Facebook updates from almost 70,000 participants, high openness was associated with words that reflect artistic and intellectual interests such as music, writing, universe, and book, and, more than any other trait, low openness was associated with misspellings and the use of shorthand, such as “wat,” “ur,” and “2day.” This difference reflects the difference in intellectual and cultural sophistication between individuals high and low in openness; it could also be due to differences in education. The language choices of open individuals also reflect their intellectual and sensory pursuits, with words related to causation (makes, origin, rationale, used, why), insight (accept, become, believe, know, recall), and sensory processes (delicious, feel, flavor, sour, press). More closed individuals, in contrast, make more references to their family ([Kern et al., 2013](#)).

This approach has likewise been used to test how accurately personality can be judged from online language use. In an analysis of approximately 75,000 Facebook users, of the five traits, openness was the trait most accurately predicted from language use ([Schwartz et al., 2013](#)). Consistent with other analyses of language, words related to aesthetic interests and misspelled words/contractions were the words that best discriminated openness. A similar analysis of what people “Like” on Facebook also revealed that openness is the trait best predicted by what users endorse. For example, knowing that someone likes The Colbert Report is indicative of openness, whereas fewer open people liked Mitt Romney ([Kosinski, Stillwell, & Graepel, 2013](#)). Individuals high (or low) on openness tend to inhabit similar social spaces and interests and this is reflected in what they like. As such, inferences about someone’s personality, particularly their openness, can be accurately derived from their activity on social media. That is, status updates, “likes,” and tweets reveal psychologically meaningful information about the individual who posted it.

Finally, in any interpersonal context, individuals strive to present themselves in a certain way, which may or may not reflect who they actually are. These biases may be particularly likely to be present on social media, as people have a lot of control over how they present themselves. And yet personality still comes through accurately. In fact, how people present themselves on social networking sites is more strongly associated

with their actual personality than their ideal personality; this effect is strongest for openness ([Back et al., 2010](#)).

Relationships, Marriage, and Family

In any relationship, the dynamics of the interaction are shaped, in part, by the personalities of the individuals involved. Although true for any dyadic interaction, most evidence comes from research on romantic relationships and married couples. At each stage, from whom to date to whether to get married to parenting, openness shapes choices, interactions, and consequences.

When asked what they are looking for in a partner, single individuals say they want someone who resembles them on openness; by comparison, agreeableness and extraversion are a distant second and third, respectively ([Figueroedo, Sefcek, & Jones, 2006](#)). When actually evaluating potential mates, there are sex differences in the types of traits that people value. Asendorpf and colleagues ([Asendorpf, Penke, & Back, 2011](#)) used a speed-dating paradigm to examine what characteristics contributed to who the speed-daters would choose for actual dates. Of the five personality traits, women tended to choose men who scored the highest on openness, presumably because openness is a marker of future resource potential. Men, in contrast, did not evaluate women based on any FFM trait. Men's own openness, however, may shape what they look for in a mate. For example, when evaluating potential romantic partners, open men care more about perceived intelligence than the facial attractiveness of a potential mate. Women's own openness, however, is unrelated to how she evaluates a potential mate ([A. J. Lee, Dubbs, von Hippel, Brooks, & Zietsch, 2014](#)).

Psychodynamic approaches to mate selection traditionally indicate that individuals are motivated (consciously or not) to select mates who are similar to their parents. McCrae and colleagues ([McCrae, Willemsen, & Boomsma, 2012](#)) tested this hypothesis for personality traits. Specifically, they examined whether individuals selected partners with personality traits similar to that of their parents. The strongest selection effect was for openness: Women tended to choose husbands who resembled both their mother's and father's level of openness. A similar, but nonsignificant, pattern emerged for men. There was no evidence of any selection effects for the other four traits.

Whether people select mates with similar traits and characteristics is of considerable interest to behavioral geneticists, who typically assume no assortative mating in calculating heritability estimates. That is, behavioral geneticists assume that an open man would be just as likely to marry a closed woman as an open woman. For most of the FFM personality traits, this assumption seems to be true; assortative mating correlations tend to be lower for personality traits than for other personal characteristics ([Watson et al., 2004](#)). The one exception is openness.

[McCrae et al. \(2008\)](#) analyzed trait similarity using both self-reports and spouse ratings of personality in married couples across three cultures. The correlations between spouses for each of the five traits were generally modest, with openness showing the strongest spousal similarity (mean r for openness across the three cultures = .22). Facet-level analyses again revealed a more nuanced story. Openness to values showed the most similarity across the different cultures: Liberals seek out other liberals, whereas conservatives seek out other conservatives. Part of this pairing is likely due to convenience; these two types of people inhabit very different social worlds. Different ideologies may also be a source of argument and conflict within the relationship that would lead to early dissolution. Although lower in magnitude, individuals also married partners similar to themselves in openness to aesthetics. While getting to know each other during the early stages of dating, couples may engage in shared interests, such as going to art museums or the symphony. The relationship may not last long if one partner adores the arts and the other one is bored stiff. In contrast to values and aesthetics, there was no evidence for similarity for fantasy or feelings. Across the three cultures, individuals with an active imagination and depth of feeling were just as likely to be paired with someone with similar or opposite tendencies. Perhaps the internal nature of these experiences matters less when selecting a mate than the other tendencies associated with openness.

Couples may resemble each other in openness (or any other trait) because partners select each other based on the trait (i.e., selection) or because partners became more (or less) similar in openness over the course of their relationship (i.e., convergence). The trait similarity on openness among married couples comes more from initial choice than convergence over time ([Watson, Beer, & McDade-Montez, 2014](#)): People with the same values and intellectual pursuits seek each other out rather than mold each other into

their likenesses over time. With many large-scale longitudinal studies now including personality assessments, it is possible to take a more sophisticated approach to couple similarity. For example, [Rammstedt, Spinath, Richter, and Schupp \(2013\)](#) not only examined whether couples' personality traits became more congruent over time but also examined how trait congruence changed before couples dissolve. For couples that remained in the relationship over the 4-year follow-up, the correlations were similar across both measurement occasions: Partners' scores on openness were moderately correlated and did not increase or decrease over time. A number of couples did separate and/or divorce across the follow-up period. At the first assessment, couples who were to separate already showed lower convergence than couple who were to stay together, and, at the follow-up, their openness scores were actually negatively correlated. Openness was the only trait that showed a significant change in similarity across the follow-up period.

Although marriage is a normative and expected event, and there is often considerable pressure to get married, some choose to remain single. Those who remain single tend to score higher on openness and related constructs ([Johnson, McGue, Krueger, & Bouchard, 2004](#); [Jokela, Alvergne, Pollet, & Lummaa, 2011](#)). It may be that open individuals have other types of relationships and activities that are just as fulfilling as marriage, and, without a strong internal need to conform to the expectations of society, pursue these interests instead of potential mates. When open individuals do get married, they tend to marry at an older age compared to more closed individuals, a pattern that holds for both men and women ([Jokela et al., 2011](#)). Open individuals are also less likely to have children, and if they do, they do so at an older age. This effect, however, might be confounded by education.

The association between personality and marriage is not immune to societal pressure, and the personality correlates of marriage and divorce, especially for openness, may be partly driven by the social landscape. Replicating the study of [Jokela et al. \(2011\)](#), [Lundberg \(2012\)](#) found that open individuals were much less likely to be married by age 35 years. This association, however, held only for more recent cohorts. In the older cohorts, openness was strongly related to divorce, whereas openness was virtually unrelated to divorce in the younger cohorts. With changing social norms, there is less pressure for people to marry young. Without this

societal expectation, open people may wait until they find a partner who is truly a good match or they may forego marriage altogether.

In addition to the length of the relationship, how happy individuals are within the relationship is another measure of the success of the partnership. Even though people tend to seek out and couple with individuals who have similar levels of openness, openness is the trait that is the least associated with relationship satisfaction. That is, open and closed individuals are equally likely to report being satisfied or dissatisfied with their romantic partner (Malouff, Thorsteinsson, Schutte, Bhullar, & Rooke, 2010). In addition, the degree of similarity in openness between members of the couple is likewise unrelated to relationship satisfaction (Dyrenforth, Kashy, Donnellan, & Lucas, 2010; Furler, Gomez, & Grob, 2013). It may, however, be associated with more specific aspects of relationship functioning, such as sexual satisfaction. Specifically, open wives tend to have more sexually satisfying marriages, as rated by both the wife and the husband (Donnellan, Conger, & Bryant, 2004). Donnellan and colleagues speculated that openness is related to sexual satisfaction because the motivation to seek out new and varied experiences may also extend to sexual experiences. Wives who are more open to trying new things may translate into greater sexual satisfaction for both partners.

Finally, openness not only shapes marriage and childbearing patterns but also how individuals parent their children. That is, the different philosophies that characterize low and high openness—obedience and deference to authority versus open-mindedness and tolerance—also characterize the parenting styles of those low and high in openness. For example, closed parents expect obedience and limit their children's autonomy, whereas open parents are more likely to encourage their children to voice their opinions (Metsäpelto & Pulkkinen, 2003). Open mothers tend to have more knowledge about parenting, feel more competent and invested in their parenting role, and tend to provide more stimulating environments for their children (Bornstein, Hahn, & Haynes, 2011). The consequence of these different parenting styles may be evident in their children's behavior: Open parents are less likely to report child misbehavior as a major daily stressor (Lee-Baggle, Preece, & DeLongis, 2005). Rather than having well-behaved children, however, open parents may just be more tolerant of child misbehavior.

Geographic Openness

We typically think about personality as a characteristic of individuals, but it can also be a characteristic of places. That is, depending on the psychological make-up of its inhabitants, different regions may have different aggregate psychological profiles. Large-scale cross-cultural studies suggest that mean levels of personality traits differ systematically across nations. McCrae and colleagues ([McCrae, 2002](#); [McCrae, Terracciano, 2005b](#)) used both self-reported personality (36 cultures) and observer ratings (51 cultures) to derive mean aggregate personality scores for each culture. Convergent culture-level correlations across the two datasets were significant for four of the five factors and for all but four of the facets. In particular, there was a correlation of .50 for total openness with the facets ranging from .44 for openness to actions to .75 for openness to values. Thus, different samples that used different methods generally converged in describing the citizens of some cultures as more open than others. Individual differences within culture, however, were generally much greater than the differences between cultures.

Which cultures are most open? Of the 28 cultures with both self-reports and observer ratings, French-speaking Switzerland, Serbia, Austria, Germany, and German-speaking Switzerland had the highest openness, with T-scores ranging from 53 to 59; Croatia, Spain, Hong Kong, Malaysia, and India scored the lowest, with T-scores ranging from 46 to 49. Although it is not clear why openness scores are so much higher in Serbia than Croatia, the other findings make some sense: Modern, progressive, well-educated countries are higher in openness than are more traditional cultures. The United States was about average on aggregate openness.

Although aggregate openness for the United States is about average, there is considerable variability in openness across different regions within the United States. Indeed, there is a shared perception that the West Coast is more open than the Deep South ([Rogers & Wood, 2010](#)). These regional stereotypes do seem to accurately reflect regional variability in personality across the country. Studies over the past 40 years have shown remarkable consistency in regional variations, especially for openness: The Northeast and Western parts of the country are higher in openness than the Deep South (reviewed in [Rentfrow, 2010](#)).

Rentfrow and colleagues ([Rentfrow et al., 2013](#)) used five samples to distinguish psychological regions across the United States. Cluster analyses

of these samples revealed three distinct regions, which they labeled “Friendly and Conventional,” “Relaxed and Creative,” and “Temperamental and Uninhibited.” The first two clusters were particularly defined by their standing on openness: The Friendly and Conventional cluster was characterized by low openness, whereas high openness was one of the defining traits of the Relaxed and Creative cluster. Not surprisingly, the first cluster mapped to the north central Great Plains and the South and the second cluster mapped on to states in the West and along the Eastern Seaboard.

Aggregate openness scores can be treated similarly to individual-level openness and be correlated with outcomes of interests. In general, the correlates of aggregate openness tend to parallel those of individual-level openness. Cultures with more open-minded individuals, for example, tend to be less conservative and more likely to have democratic regimes, even after controlling for gross domestic product ([Terracciano & Chan, 2013](#)). Within the United States, aggregate openness is a strong predictor of voting patterns: Open states tend to vote Democrat, whereas closed states tend to vote Republican. Political and social attitudes tend to follow this pattern as well, with open states more likely to endorse liberal values, such as legalization of marijuana and same-sex marriage and place less value on organized religion ([Rentfrow, Gosling, & Potter, 2008](#)). Care should be taken, however, when interpreting correlations across different levels of analysis, as aggregate-level correlates may not generalize to the individual level and vice versa ([McCrae & Terracciano, 2008](#); [Rentfrow, 2010](#)). Nonetheless, aggregate openness reveals meaningful psychological characteristics and correlates of geographic regions.

Conclusions

This chapter was meant to provide a brief overview of the varied ways in which openness matters. And, indeed, the broad range of correlates highlights the reach of this trait: The consequences of openness range from the biological to the societal. Once thought to be relevant primarily for creativity and intelligence, openness contributes to functioning across a surprisingly wide array of important life domains.

The research on openness has come of age. Early research on openness was devoted to the reliability and validity of this trait and to establishing its

rightful place within the FFM. After openness was recognized as a meaningful trait, research on openness then moved to documenting how critical this trait is to a wide variety of domains. The next generation of openness research will need to advance our understanding of its biological basis, better elucidate its relation to psychopathology, and uncover the processes and mechanisms that link openness to important life outcomes. Openness no longer needs to struggle to survive; that it is thriving is a testament to the enduring power and significance of this trait.

Agreeableness and the Five Factor Model

William G. Graziano and Renée M. Tobin

Abstract

Agreeableness is a summary label for individual differences in the motivation to maintain positive relations with others. Agreeableness is one of the major dimensions in the Big Five structural model of personality. It is also a major domain in the Five Factor Model of personality. This chapter provides an overview of the considerable body of research concerning the conceptualization, assessment, and etiology of Agreeableness with a focus on its six facets. It concludes with a discussion of alternative theoretical explanations for Agreeableness. In particular, an opponent process model that involves two competing motive systems is applied to the processes underlying Agreeableness.

Key Words: Agreeableness, facets, motives, emotion, personality, opponent process

Agreeableness is one of the major dimensions in the Big Five structural model of personality. It is also a major domain in the Five Factor Model of personality. In his book, *The Big Five Personality Factors*, Boele De Raad (2000) described Agreeableness as the Big Five personality dimension “with the shortest history” (p. 91), perhaps due to the shifting construct labels used for it. Labels may have shifted but many writers (e.g., De Raad, 2000; Matthews & Deary, 1998; Wiggins, 1991) noted that relative to the other dimensions of the Big Five, Agreeableness is associated distinctively with differences in social behavior and interpersonal relations. Substantively, in their comprehensive overview, Graziano and Eisenberg (1997) proposed that the Big Five dimension of Agreeableness could be defined in motivational terms. Specifically, they suggested that Agreeableness was a summary label for individual differences in the motivation to maintain positive relations with others. Less prominence was given to differences in thought and social cognition. Subsequent reviews supported the utility of this perspective (Graziano & Tobin, 2009, 2013), but added more material on social cognition.

From the Five Factor Model camp, [McCrae and Costa \(2003\)](#) also described Agreeableness in terms of motives and emotions (differences in selfless concern for others), but in addition, in terms of thoughts and attitudes (trusting and generous sentiments). [McCrae and Costa \(2003\)](#) further described Agreeableness in terms of characteristics of persons who score low or high on the domain. Persons low in Agreeableness are critical, skeptical, try to push limits, express hostility directly, and show condescending behavior to others. Persons high in Agreeableness are sympathetic, considerate, warm, compassionate, generous, and arouse liking from others. From the perspective of both the Big Five and the Five Factor Model approaches, Agreeableness explains individual differences in certain forms of social behavior through links to psychological processes of cognition and affect. It follows that a comprehensive understanding of this domain will ultimately require connections beyond differential psychology toward the fields of psychology dealing explicitly with social cognition and the psychology of interpersonal relations.

The two approaches (i.e., Big Five, Five Factor Model) to personality structure and function are not isomorphic (e.g., [De Raad, 2000](#); [John & Robins, 1993](#); [McCrae & Costa, 2003](#)). The Five Factor Model is a specialized, theory-based version of the empirical Big Five. At the operational level, however, measures of Agreeableness derived from the five factor approach converge consistently with corresponding measures of Agreeableness derived from the Five Factor Model, except for some nuances involving the internal structure of measures and external correlates (e.g., [Costa & McCrae, 1995](#); [Gow, Whiteman, Pattie, & Deary, 2005](#); [Rojas & Widiger, 2014](#); [Samuel, Mullins-Sweatt, & Widiger, 2013](#)). Of particular note is the Five Factor Model facet substructure operating beneath the superordinate supertrait domain of Agreeableness. A facet indicates a local, subordinate organization of characteristics, and facets “reflect specific sides or aspects of the broader domain” ([McCrae & Costa, 2003](#), p. 47; see also [Axelrod, Widiger, Trull, & Corbitt, 1997](#)).

The original measures of the Five Factor Model [NEO and NEO Personality Inventory (NEO PI)] did not assess separate facets of Agreeableness, or its theoretical cousin, Conscientiousness. The revised NEO PI-R ([Costa & McCrae, 1992](#); [Costa, McCrae, & Dye, 1991](#)) introduced six new facets for Agreeableness: in alphabetical order they are labeled altruism, compliance, modesty, straightforwardness, tender-

mindedness, and trust. Costa and McCrae (1995) also noted that the NEO PI-R was different from the Big Five in being constructed top-down (theory-based item construction) as opposed to the bottom-up empirical approach of the Big Five, which helps to explain why the five mega-trait dimensions are referred to as “domains,” not factors in this model. The conventional assumption is that these facets all load only on Agreeableness, the appropriate superordinate domain inside five factor space, and form a positive manifold (Costa & McCrae, 1995; Samuel et al., 2013).

Piedmont and Weinstein (1993) were among the first to present evidence to support these assumptions. One small fly in the ointment involved “warmth” as a facet of Extraversion. It also had a significant (double) loading on the Agreeableness factor. Costa and McCrae (1995) reported a similar secondary loading of the NEO PI-R warmth facet of Extraversion on two different Big Five domain-level measures of Agreeableness (see Costa & McCrae, 1995, Table 3, p. 35). In the interest of giving the domain of Extraversion an affective and interpersonal aspect, Costa and McCrae (1995) preferred a factor-analytic rotation that assigned warmth to Extraversion rather than to Agreeableness (see Costa & McCrae, 1995, p. 37). Based on other empirical research on emotions this decision likely contributes to an underestimate of the role of Agreeableness in emotional experience and expression (e.g., Tobin, Graziano, Vanman, & Tassinary, 2000; Tobin & Graziano, 2011).

Another assumption, perhaps less conventional, is that the facets are co-equals. That is, they all have comparable breadth, that no one of them is more basic than another, and that they operate at the same or similar levels of abstraction above the observable data, but beneath the superordinate domain of Agreeableness (but see DeYoung, Quilty, & Peterson, 2007 for another view). As noted previously, Costa and McCrae (1995) did not elaborate precisely on what theoretical top-down basis they chose these substantive content areas, or why they settled on six, as opposed to two, eight, or ten facets. They stated that “there is nothing magical about the number six” (Costa & McCrae, 1995, p. 26). The choices appear to have been driven largely by empirical considerations and by the prospects for finding stable structure with six variables (Costa & McCrae, 1995, p. 27) rather than by conceptual/rational considerations.

Despite claims for a top-down approach, Costa et al. (1991) devote less time to the explication of the substantive content of Agreeableness than do

supposedly atheoretical Big Five theorists such as Jerry Wiggins or Robert Hogan. [Wiggins \(1991\)](#) framed the substantive content of Agreeableness in terms of social exchanges, or underlying social motives such as agency and communion. [Hogan \(1982\)](#) framed his conceptualization of the Agreeableness domain in terms of the demands of social living, focusing on likeability and social reputation. In contrast, [Costa et al. \(1991\)](#) devote less than half a page to the substantive theoretical content for Agreeableness facets, and much of this was measurement oriented. More details were offered later ([Costa & McCrae, 1995](#)). The considerations listed were (1) that more than six facet scales would “lead to intellectual overload” (p. 27), (2) it is generally difficult to replicate factors with fewer than five or six salient variables per factor, and (3) the discovered factor pattern was similar in men versus women, younger versus older participants, and white versus nonwhite respondents.

[McCrae and Costa \(2003\)](#) reported that within each Five Factor Model supertrait domain, no one yet had a coherent theoretical rationale for identifying the number or nature of these facet subdomains. Intuitively, however, it makes sense to recognize local organization, subtleties, and nuances within the larger supertrait domain. Beneath this intuition are a host of complex conceptual issues (e.g., [Costa & McCrae, 1995](#)), some of which will be raised later. Are domains and facets in the Five Factor Model both hypothetical constructs, or are facets merely intervening variables (e.g., [Grimm & Widaman, 2012](#), p. 622)? Do facets have both predictive and explanatory roles, or are they merely “local predictors”? Other subdomain structures were proposed based on factor analytic methods by [Soto and John \(2012\)](#); 3: trustfulness, compassion, and humility) and by [DeYoung et al. \(2007\)](#); 2: compassion and “politeness”).

Despite these differences, it could be argued that the empirical literature on the Five Factor Model approach to Agreeableness prior to 1992 is functionally the same as that of the Big Five approach to personality. After that date, the facets became widely available, allowing for the possibility of refinements, or even differences to emerge between the two approaches to Agreeableness. In previous work, we reviewed comprehensively the literature on Agreeableness making no sharp distinction between the two approaches ([Graziano & Tobin, 2009, 2013](#)), so we will not attempt to replow soil already tilled. Instead, here we will concentrate on developing a coherent explanatory account of the supertrait of Agreeableness, including

its facets, within the framework of the Five Factor Model. Special attention is devoted to studies published after 1992 that examine Agreeableness facets empirically with a focus on “construct explication” ([Shadish, Cook, & Campbell, 2002](#)). We consider issues of application (e.g., career counseling, workplace) and clinical utility only as they pertain to construct elaboration.

In terms of advanced organizers, first we briefly discuss the emergence of the empirical concept ([Feigl, 1970](#); [Salmon, 1984](#)) of Agreeableness as a single, coherent construct, and its subsequent elaboration within the Five Factor Model. To what distinctive thoughts, feelings, and behaviors does Agreeableness refer? What are the empirical correlates of Agreeableness that are especially informative about its status within the Five Factor Model? Can the single domain of Agreeableness (or its set of corresponding facets) be extracted from the five factor system without distorting its properties? Conceptual issues arise in extracting one construct from a system such as the Five Factor Model, and a brief rationale is presented for doing so.

Second, we discuss critically the strategies used to specify the construct underlying the domain of Agreeableness. Up to the introduction of facet structure, the dominant strategy is based on “bottom-up” psychometric and empirical principles of construct elaboration. This dominant strategy created a large collection of empirical findings, but these have been difficult to organize into coherent patterns.

Third, we consider major theoretical explanations for Agreeableness, concentrating on those that point toward an underlying process or set of affective and cognitive processes. These are empathy, the temperamental variable of effortful control, and processes underlying social accommodation. Finally, within the framework of Five Factor Theory ([McCrae & Costa, 2003](#)), we propose processes that could provide the basic tendency underlying the entire Agreeableness domain, including the facets.

Agreeableness: Emergence of an Empirical Concept

Many years before scientific psychology appeared, Aristotle commented on the role of the moral virtue of Agreeableness in his *Nicomachean Ethics*. He believed it was a characteristic that could be cultivated and used in the service of group living and civic participation. Other writers commented on

Agreeableness in emotional life (e.g., [Ricord, 1840](#)). In modern scientific psychology research, Agreeableness has an unusual history relative to other recognized dimensions of personality. Unlike the two supertraits of Neuroticism and Extraversion, Agreeableness did not initially receive attention because of deductive top-down theorizing about its link to biology or especially to conspicuous processes such as anxiety. It was not tied to distinctive psychological processes of brain activity in the way that Neuroticism or Extraversion was. Instead, systematic Agreeableness research was stimulated by observable regularities arising in descriptions of others, and later in self-descriptions ([Digman & Takemoto-Chock, 1981](#); [John & Robins, 1993](#)).

In recent years, additional raw material has appeared to feed the understanding of Agreeableness, both empirically and conceptually. A PsycINFO search of the keyword “Agreeableness” identified 2,872 peer-reviewed journal articles written in English from 1860 to February 7, 2015. More than 97% of these articles were written after 1992. Within that set, more than 220 of these articles were published in the year 2014 alone, suggesting a growing interest in the construct. In a related search, we found 135 articles with “Agreeableness” in the title between 1900 and 2014. For purposes of comparison, the corresponding numbers for titles during this same time frame was 1,600 for Neuroticism, 1,398 for Extraversion, 363 for Conscientiousness, and 175 for Openness.

As a domain, Agreeableness has an impeccable empirical genealogy. It could be argued that Agreeableness is a poster-child illustration of what logical empiricists call an “empirical concept” ([Feigl, 1970](#); [Grimm & Widaman, 2012](#), p. 622; [Salmon, 1984](#)). Agreeableness had its origins in modern scientific psychology in an effort to build a bottom-up taxonomy of English language personality-related words ([Graziano & Eisenberg, 1997](#); [John & Robins, 1993](#); [McCrae & John, 1992](#); see also the chapter by [Costa and McCrae](#)). In the United States, [Allport and Odber \(1936\)](#) extracted 17,953 personality-relevant terms from the 1925 edition of *Webster’s New International Dictionary*. Words were sorted into four lists, or “columns.” The first sorting divided “censorial” or evaluative words (Column 3) from “neutral” words (Column 1). Words in Column 1 were the “real” (quotes from [Allport & Odber, 1936](#)) traits of personality. Column 3 was the longest of the lists, and contained words such as “amiable,” “agreeable,” and “appealing.” [Allport and Odber \(1936\)](#) suggested that words in

Column 3 “should be avoided by psychologists unless they are prepared to deal with the subject of social judgment” (p. vii).

The Allport–Odber list (and taxonomy) was a major source of terms for many (but not all) linguistic analyses of personality. When [Cattell \(1957\)](#) used the technique of factor analysis to identify additional order beneath the relatively crude categorization, he limited himself to Column 1 (see also the chapter by [Wright](#)). Given this state of affairs, the prior probability seemed low that factor analysis would uncover a major dimension devoted primarily to “social evaluation.” Despite this strategic elimination, when [Digman and Takemoto-Chock \(1981\)](#) reanalyzed data from six large studies, they labeled the first factor to emerge as “friendly compliance vs. hostile non-compliance.”

At the least, bottom-up statistical patterns—now in many natural languages (e.g., [Kohnstamm, Halverson, Mervielde, & Havill, 1998](#))—provide good reason to think diverse cultures develop words that describe differences in the motivation for having cooperative, harmonious relationships with other people. As Aristotle anticipated, Agreeableness is a property associated with efficient group living across most cultural groups studied so far. What is less clear is how to label the underlying construct. Construct labeling is not a trivial matter because labels provide frames for research on construct elaboration. When a person is described as “altruistic,” is the motivation underlying it inherently prosocial (e.g., [Graziano & Habashi, 2015](#)) or is it compliant acquiescence to social norms, conformity to social demands, or the actions of the less powerful to find a place in the sun, so to speak? [Digman and Takemoto-Chock \(1981\)](#) used the label “compliance” for the supertrait domain, but as we discuss later, this word carries surplus meaning.

Until quite recently in modern psychology, Agreeableness was usually described in behavioral terms, not in terms of underlying affective or cognitive processes. That is, Agreeableness was described as differences in behavior characterizing people who score high versus people who score low on Agreeableness measures. From extreme group (high versus low) behavioral differences, researchers can and do make inferences about underlying processes, but rarely test them directly. For example, Agreeableness is presumed to be related to the cognitive and affective processes of prejudice because persons who score high on Agreeableness are more positive about most social groups, and are less negative about

outgroup members and traditional targets of prejudice, than are persons who score low on Agreeableness (Graziano & Bruce, 2008; Graziano, Bruce, Sheese, & Tobin, 2007; Graziano & Habashi, 2010). A similar logic was used to connect Agreeableness to empathy and its components (Graziano, Habashi, Sheese, & Tobin, 2007). Agreeableness has also been linked to other overt behaviors, such as constructive conflict resolution (Graziano, Jensen-Campbell, & Hair, 1996; Jensen-Campbell, Gleason, Adams, & Malcolm, 2003; Jensen-Campbell & Graziano, 2001) and intragroup cooperation (Graziano, Hair, & Finch, 1997; see Graziano & Tobin, 2009, for a review).

Perhaps because of its empirical origins, some findings for Agreeableness emerged quasiaccidentally. Perhaps a better term is “incidentally.” That is, in studies focused on specific behaviors (e.g., bullying) or on life outcomes (e.g., longitudinal stability of behavior patterns or life outcomes), some findings for Agreeableness and its facets emerged. The focus in these studies was on the behavioral phenomenon, per se, and not on Agreeableness and its facets. In some cases, the patterns made sense, whereas in other cases they are best described as intriguing curiosities begging for more focused follow-up. For example, why are first-born children lower in Agreeableness than their siblings (Michalski & Shackelford, 2002)? Why do college women high in Agreeableness weigh less than their less agreeable peers, yet the former show less antifat prejudice than the latter (Graziano, Bruce, et al., 2007)? Why do children lower in Agreeableness like to play chess more than their higher-agreeable peers (Bilalic, McLeod, & Gobet, 2007)? In one large longitudinal study (Costa, Herbst, McCrae, & Siegler, 2000) two Agreeableness facets (trust and modesty) showed small 6-year declines, whereas three other facets of the same domain of Agreeableness (straightforwardness, altruism, and compliance) increased slightly over the same interval. All changes were small, but why did this pattern occur? Are these merely statistical noise or genuine effects? Each empirical snippet can be partly explained retrospectively, but in the absence of theory, integrative coherence is elusive.

Because of its behavioral and empirical origins, controversies appeared about its sources within human psychology, its correlates, and even a suitable label for this hypothetical construct. Alternative labels used to describe the dimension are “friendly compliance versus hostile

noncompliance,” “tender mindedness,” “likeability,” “communion,” “benevolence,” and even “love versus hate.” What we are describing here are alternative labels that are applied to the entire domain of Agreeableness, not just one facet. The implication is that the label characterizes the bulk of the variation associated with the domain. That is, if the domain is labeled “friendly compliance,” then we might expect the entire domain to be associated with a range of social influence phenomena such as conformity, compliance, internalization, impression management, deference to norms and conventions, and the like. If the domain is labeled “benevolence” or “tender-mindedness,” however, then the expected pattern would be entirely different. The domain should be associated with prosocial behavior, some forms of which might even involve resisting and defying conformity pressure to help victims. We consider this issue later in our discussion of “surface similarity” in construct elaboration.

The verbal label of “friendly compliance” in particular has led to misunderstandings about Agreeableness as a domain. For example, the term “compliance” has a process-based meaning in social psychology that often places it on a continuum of social influence with internalization and social identification (e.g., Petty & Wegener, 1999). That variety of compliance is considerably different in scope and meaning from the one used more casually in personality to imply tendencies to follow rules and norms (Parks, 2011, “Conformity,” pp. 530–531). “Friendly compliance” might imply a general conforming personality, but the empirical evidence is thin, at best, for such a connection. In fact, there is evidence to the contrary (Graziano & Tobin, 2002; Xia & Habashi, 2015). For example, Xia and Habashi (2015) found that persons high in Agreeableness were less persuaded by weak arguments, but more persuaded by strong arguments, than were persons low in Agreeableness. Overall, persons low in Agreeableness were less responsive to the nature of the communications, suggesting that Agreeableness (at least at the domain level) is more a matter of attention and responsiveness to other people than to a generalized conforming disposition.

Repeated attempts to find a theory-based empirical link between Agreeableness and compliance-related behavior has been met with stubborn resistance in the form of null outcomes (see Kassner, 2011; but see Carlo, Okun, Knight, & de Guzman, 2005, p. 1302; Erdheim, Wang, & Zichar, 2006; Habashi & Wegener, 2008). Of course, there is a bias against

publishing research reporting null outcomes, but some work ran that null-bias gauntlet successfully (e.g., Graziano, Jensen-Campbell, Shebilske, & Lundgren, 1993; Graziano & Tobin, 2002). A possible outlier/exception is one experimental study from France exploring obedience using the Milgram paradigm (Begue et al., 2015). It did not focus on Agreeableness as a domain, or on Agreeableness facets, *per se*. These authors found three significant correlations with obedience, operationally defined as the level of shock participants delivered to the “learner.” They were political orientation ($r = .32$), domain-level Conscientiousness ($r = .34$), and, bringing up the rear, domain-level Agreeableness ($r = .26$) (for a different perspective on higher-order personality factors and conformity, see DeYoung, Peterson, & Higgins, 2002).

A similar construct-labeling problem arises with Agreeableness at the facet level. For example, consider the facet label “altruism.” In the social psychology literature on prosocial behavior, the term “altruism” has a restricted, process-based meaning tied to the presumed preponderant intent of the actor (see Batson, 1991; Batson, Duncan, Ackerman, Buckley & Birch, 1981; Batson, O’Quin, Fultz, Vanderplas, & Isen, 1983; Schroeder & Graziano, 2015, for a comprehensive overview). Altruism is defined as a subset of the more comprehensive construct of *prosocial* behaviors. Prosocial behaviors seem to be much more common than altruistic behaviors because the former are presumed to be motivated by self-interest, whereas altruistic behaviors are rare (perhaps even nonexistent), presumably because they require ignoring self-interest. Instead, they are motivated primarily by concern for the recipient. To label a behavior or chronic disposition as altruistic implies that the labeler can isolate the motives underlying the action in question. The NEO PI-R altruism facet items, however, ask questions such as “Make people feel welcome,” “Love to help others,” “Have a good word for everyone,” and “Am concerned about others.” Persons who endorse these items may indeed be chronically prosocial, but those items do not permit a clean diagnostic assessment of underlying egoistic or altruistic motives. Furthermore, researchers have constructed taxonomies for forms of prosocial behavior (e.g., emergency helping versus sustained volunteerism). These different forms of prosocial behavior probably have different predictors for eliciting and maintaining those behaviors (e.g., Dovidio, Piliavin, Schroeder & Penner, 2006; Pearce & Amato, 1980).

The implication here is that Agreeableness and its facets probably do not apply uniformly across the full range of the prosocial taxonomy, and may be differentially responsive to different eliciting conditions. Emergency helping is associated with impulsive, often thoughtless actions (Extraversion?), whereas volunteering over months or years is associated with other-oriented aspects of Agreeableness (e.g., Penner, Fritzsche, Craiger, & Freifeld, 1995). Note it is not our intent to promote one subdiscipline's definitions over the others. There are, of course, many ways of conceptualizing altruism and prosocial behaviors other than the narrow ones offered by social psychology (e.g., John, 1984; Sober & Wilson, 1998). Nevertheless, the narrow definitions lend themselves to falsifiable hypotheses and focused process-based explanations. Because Agreeableness is associated with distinctive forms of social and interpersonal behaviors, and because social psychology has a major stake in the area, its theoretical distinctions are especially worthy of attention (for a particularly insightful personality-oriented article on this altruism/prosocial issue, see John, 1984).

Strategies for Construct Specification and Elaboration

Two strategies have been used to elaborate and explicate psychological constructs (Grimm & Widaman, 2012). Both have been used for the Big Five construct of Agreeableness. One is to expand the nomological network, demonstrating empirical links to variables *external* to Agreeableness. In this strategy, researchers explore Agreeableness as a predictor or moderator of variables having some intuitive connection to Agreeableness such as interpersonal conflict, intergroup and intragroup cooperation, helping, prejudice, and various psychopathologies. In some cases, the intuitive connections were corroborated (e.g., helping), but in other cases they were not (e.g., responsiveness to social desirability pressures). A second strategy is to focus on the *internal* structure of the Agreeableness measures to identify subordinate, localized pockets of coherence. This second strategy gave rise to the development of facets, described as specific sides or aspects of the five broader domains. Presumably, as more refined, internally coherent measures are developed, more precise predictions can be made and theoretical explanations become more systematic (e.g., Kausel & Slaughter, 2011). McCrae and Costa

(2003) noted that researchers from many different personality research traditions agree about the five broad domains of the Big Five; they added that “the finer distinctions within domains, however, are more arbitrary” (p. 47).

Just how arbitrary are these facet distinctions? The NEO PI-R has no monopoly on the identification of facets. In an effort to make available public-access measures of individual differences in personality, Goldberg (1999) reported work on the International Personality Item Pool (IPIP). One aspect of this work was the construction of facet items for Agreeableness (see also Goldberg et al., 2006). How well do the NEO PI-R Agreeableness facets match the IPIP facets? Let us look specifically at Agreeableness from the perspective of prosocial behavior, which seems to be a pervasive aspect of domain-level Agreeableness. In the NEO PI-R, at least three of the six Agreeableness facets deal with prosocial behavior in one form or another. We already discussed problems with the facet labeled “altruism.” There is a separate Agreeableness facet for “straightforwardness,” which seems to map onto “sympathy” in the IPIP items (e.g., Goldberg, 1999), and “compliance,” which maps onto “morality” in the IPIP items. Perhaps trust and modesty facets also are predictors of aspects of prosocial behavior at the group level (e.g., Fisher, Bell, Dierdorff, & Belohlav, 2012; John, 1984; Kausel & Slaughter, 2011; Paulhus & John, 1998). In the IPIP, trust is measured with items such as “Believe that others have good intentions,” “Trust what people say,” “Believe that people are basically moral,” and “Believe in human goodness.” Modesty is indexed with items such as “Boast about my virtues.”

Both NEO PI-R and IPIP facets may indeed be measuring different faces of the broader domain of Agreeableness, but do the IPIP facets refer to the same variables or processes as the NEO PI-R facets? More importantly, even if they do converge, how many different facets of the larger Agreeableness domain are we seeing? The conceptual problems here go far beyond simple issues of facet labeling. It is plausible that there are Agreeableness-related individual differences in, say, prosocial predispositions, but the links among facets and psychological processes are not well articulated, perhaps because the processes underlying such differences are still very much in question (see Graziano & Habashi, 2015, “The quest for the prosocial personality”)

To explore convergent and discriminant validity empirically, Costa and McCrae (1995) reported Agreeableness facet correlations with other measures of the Big Five and Five Factor Model, namely Goldberg's (1990) Transparent Trait Rating Form (TTRF) and Wiggins' Revised Interpersonal Adjective Scales—Big Five version (IASR-B5; Trapnell & Wiggins, 1990). The Agreeableness facet that correlated the highest with both of these scales was altruism, with $r_s = .75$ and $.68$ for the Wiggins IASR-B5 scale and the Goldberg TTRF, respectively. Correlations this large are what we expect to see for measures of the same construct (Grimm & Widaman, 2012, p. 632). Costa and McCrae (1995) concluded that the NEO PI-R, TTRF, and IASR-B5 covered the same *range* of traits. The Hogan Personality Inventory (HPI; Hogan, 1986) offers another version of the Five Factor Model. In the HPI the domain of Agreeableness is represented at the domain level as Likeability. The NEO PI-R converges less well with the HPI than with the Wiggins or Goldberg measures. Nevertheless, the NEO PI-R facet that correlates highest with the Hogan Likeability domain is altruism ($r = .37$, followed closely by trust at $.35$).

More recent research by Widiger and colleagues (e.g., Rojas & Widiger, 2014; Samuel et al., 2013) examined convergent and discriminant validity for several combinations of personality measures, including a modified one-page version of the Five Factor Model Rating Form, the Five Factor Form. Rojas and Widiger (2014) reported strong convergence correlations for the Five Factor Form Agreeableness facets and IPIP, especially for trust (.70), altruism (.52), and tender-mindedness (.52). Samuel et al. (2013) used exploratory structural modeling to examine links among the Five Factor Model Rating Form facets of Agreeableness. All six facets of Agreeableness loaded on the Agreeableness factor. The highest loading was for tender-mindedness (.59), followed by trust (.49) and modesty (.44). Last in rank was straightforwardness (.26).

Empirical Basis for the Agreeableness Facets: The Extraction Problem

A distinguished personality psychologist who will remain unnamed once referred to the “bad old days of personality,” referring to previous years in which personality was investigated one trait variable at a time. This approach undermined efforts to find a coherent structure underlying

personality. The Big Five and Five Factor Model promised to show a path out of the wilderness, but these efforts to create coherence and integration can come at a price.

A special set of problems arises in explaining Agreeableness within the Five Factor Model. First, the major domains of personality, not to mention the subordinate facet structure, are parts of an integrated Five Factor Model system. Extracting one domain or facet from the full set for examination works directly against one of the main strengths of the Five Factor Model, namely integration. Extraction could be potentially misleading if the domains or facets form distinctive combinations or configurations “horizontally” (e.g., [De Raad & Hofstee, 1993](#); [Hofstee, Ostendorf, & Boomsma, 1998](#), as cited by [De Raad, 2000](#)). An individual scoring high on Agreeableness could be one of several different nuanced “varieties” (e.g., [Costa, Herbst, McCrae, Samuels, & Ozer, 2002](#); [DeRaad, 2000](#); [Paulhus & Jones, 2015](#)). By collapsing across the other variables, we run the risk of failing to “generalize across” cases ([Shadish et al., 2002](#)) if they also score high on other domains as well.

[De Raad \(2000\)](#) provides an illustration using trait word descriptors (see also the chapter by [de Raad and Mlačić](#)). For example, a person high in Agreeableness could also score high on (1) Extraversion (“sympathetic,” “kind,” “warm”) or (2) Conscientiousness (“helpful,” “cooperative,” “sympathetic”) or (3) emotional stability (“trustful,” “pleasant,” “tolerant”) or (4) Openness (“genial,” “tactful”). These individuals do share some common properties, but at least intuitively, the individual persons seem noticeably different from each other. The nuanced differences might be more pronounced at the low end of the Agreeableness continuum (e.g., Dark Triad configurations; [Jakobwitz & Egan, 2006](#); [Paulhus, 2015](#); [Stead & Fekken, 2014](#)). If this is true for domain-to-domain configurations, then its influence could be even greater at the facet-to-facet level.

Table 6.1. Results of PsycINFO Searches for Agreeableness Facet Keywords Conducted on 2/7/2015

Construct	No Limits	Peer-Reviewed, English Language Journal	Combined with Agreeableness	Only this Facet	Multiple Facets	Total
Agreeableness	3,922	2,866	—	—	—	—
Trust	23,935	15,561	69	8	10	18
Straightforwardness	76	51	23	2	17	19
Altruism	5,499	3,330	44	1	13	14
Compliance	27,518	20,177	31	2	13	15
Modesty	736	443	16	1	10	11
Tender-Mindedness	69	53	15	3	8	11

Such nuances notwithstanding, empirical research on personality would be severely handicapped if each study was required to investigate all five domains and all of their respective facets in every data collection. After all, each domain does refer to a distinctive, general form of thoughts, feelings, and behavior. For the foreseeable future, if the goal is construct elaboration (e.g., Shadish et al., 2002, pp. 66–68), then it makes sense to focus on domain-specific or facet-specific processes, allowing room for a few brave pioneers to study comprehensive, nuanced differences among configurations and varieties.

Here we discuss the Agreeableness facets extracted from their superordinate structure. Earlier, we described the key assumption that Agreeableness facets represent distinctive aspects or faces of persons underneath the larger umbrella of the Agreeableness domain. Since the introduction of facets, some research was conducted to examine systematically the relations among them and overt behaviors. As shown in Table 6.1, there is variability in how many of the facets have been linked empirically to outcomes. Table 6.1 presents the results of PsycINFO searches focused specifically on the Agreeableness facets. In the first column, we present the total number of articles identified in keyword searches for each of the constructs when no limits were set on the search. This information provides a baseline for level of interest in the variables as “stand alone” topics. The second column presents the number of studies for each construct when the searches were limited to peer-reviewed journal articles published in the English language. The third column presents the results of a search in which the facet keyword was combined with

Agreeableness. This restriction produced a dramatic drop in numbers. As discussed previously, a likely explanation for these reductions may be largely accounted for by the different verbal labels for the Agreeableness domain and facet labels in the psychological literature.

We then focused on each of the articles that included the combination of the facet label and Agreeableness. Results of this investigation appear in the remaining columns. The fourth column provides the number of articles that reported results for only that facet, but not for any of the other five simultaneously. The fifth column reports the number of articles that reported results for more than one facet, including the target facet. Thus, the Multiple Facets column reflects redundant tallying of the studies. For example, the 10 articles reported for trust overlap with four articles with significant findings for the compliance facet, including one that also reported a significant effect for straightforwardness, one that also reported significant effects for altruism and tender-mindedness, and one that reported significant effects for all but one of the facets (i.e., significant effects for trust, compliance, altruism, straightforwardness, and tender-mindedness, but not modesty). All of the studies reporting significant results for more than one facet were counted in the “Multiple Facets” total for each of the facets. Finally, the last column provides the total number of articles reporting findings for that facet, either reported alone or with other significant facet results. Overall, these searches produced only modest evidence of linkages between the facets and reportable outcomes.

In examining the results, it appears that the bulk of the articles did not make a priori, facet-specific predictions or try to test them. The most common case involved studies that report administering the NEO PI-R and examining inductively how each of the facets is related to the outcomes of interest, a situation that increases the chances of Type I errors. Furthermore, the majority of studies providing significant results for the Agreeableness facets also report significant relations with multiple facets, including facets outside of the Agreeableness domain. Examination of the articles also revealed that topics in industrial/organizational and clinical psychology most commonly generated the studies using correlational methods only. The studies frequently focused on links to characteristics of employees and psychopathology. Here we highlight the findings for each facet in alphabetical order.

Altruism

As noted previously, the psychological literature on altruism and prosocial behavior is substantial (e.g., [Schroeder & Graziano, 2015](#)). In our literature search, however, we found only one empirical study that explicitly made a priori predictions about the altruism facet of the Five Factor Model. [Van Iddekinge, McFarland, and Raymark \(2007\)](#) found that the altruism facet predicted defensive impression management behaviors during a structured interview task. The sample consisted of 132 university students who were randomly assigned to one of two interview conditions (impression motivation versus control). Most striking was that all other studies of altruism reported findings for other facets simultaneously (discussed subsequently) or they examined links between domain-level Agreeableness and altruism, not the facet of altruism and its links to other variables.

Compliance

There is a substantial Five Factor Model-oriented, empirical literature on compliance. This research is generally not focused, however, on the facet of the same name. Only a few studies report findings exclusively for the Agreeableness compliance facet. When they do, it is not because the researchers designed the study to examine compliance specifically. For example, in a large longitudinal examination of the data from participants in the East Baltimore Epidemiologic Catchment Area study, [Lockenhoff, Terracciano, Patriciu, Eaton, and Costa \(2009\)](#) found that the compliance facet was decreased by the experience of traumatic events. It is important to note, however, that Lockenhoff and colleagues examined all 30 of the NEO PI-R facets in the study, not just the compliance facet. The focus here was on the omnibus influence of traumatic experience, not on construct elaboration for Agreeableness. A second longitudinal study examined compliance in inner city boys, but not as measured by the NEO PI-R. Using factor analysis of California Q-set data ([Caspi et al., 1992](#)), [Kern et al. \(2013\)](#) found that compliance was related to important academic, employment, relationship, and legal outcomes. Another study by [MacLaren, Ellery, and Knoll \(2015\)](#) examined the compliance “aspect” ([DeYoung et al., 2007](#)), finding that it predicted problem gambling in a community sample of electronic gambling machine users. Again, the [De Young et al.](#)

(2007) compliance aspect of personality is not the same as the compliance facet from the NEO PI-R; it is made up of the trust, altruism, and tender-mindedness facets. For De Young et al. (2007) the politeness aspect of personality is made up of the compliance facet along with straightforwardness and modesty.

Modesty

Much like the research on the Agreeableness altruism and compliance facets, the literature solely examining the modesty facet is scant. Furnham, Moutafi, and Chamorro-Premuzic (2005) found that Agreeableness, and the modesty facet in particular, was related to self-estimated intelligence. That is, in a two-study set of undergraduate student participants ($N = 230$), they found that modesty was related to underestimating intelligence relative to intelligence testing scores on the Wonderlic Personnel Test (Wonderlic, 1992). This finding is interesting, but it is not contrary to uninformed intuition, nor did it have strong a priori theoretical backing.

Straightforwardness

The straightforwardness facet lacks a strong empirical base. Before publishing the study linking compliance to problem gambling, MacLaren, Best, Dixon, and Harrigan (2011) reported significant inverse relations between the straightforwardness facet and a questionnaire measure of problem gambling in undergraduate students. It is possible that the difference in samples (i.e., frequent electronic gamblers versus university students) accounts for the emergence of one significant facet in one study and the emergence of another in the other study. Additional explanations seem more likely. In both cases, all of the facets were entered into the analyses and the significant facet from each was reported without discernible connection to theory. This approach to the examination of facets increases the chances for spurious associations. For example, Piedmont and Weinstein (1994) included all of the available facets in analyses of the supervisor ratings of employee performance. They provided little rationale for examining the specific facet, but they found that *low* straightforwardness predicted positive supervisor ratings.

Tender-Mindedness

Few studies of the tender-mindedness facet were uncovered in our searches. [Koelsch, Enge, and Jentschke \(2012\)](#) predicted a significant relation between tender-mindedness and cardiac signatures (i.e., electrocardiogram amplitudes), but they found no evidence of a significant relation. Relative to most of the research on the other facets, however, those examining tender-mindedness seem more purposeful and focused. As noted previously, [Graziano, Bruce, et al. \(2007\)](#) found a relation between domain-level Agreeableness and prejudices. They had not examined Agreeableness facets. In two different studies, the team of Akrami and Ekehammar ([Akrami & Ekehammar, 2006](#); [Ekehammar & Akrami, 2007](#)) explored the relations between facet-level personality and prejudice. [Akrami and Ekehammar \(2006\)](#) found that among the significant facets of Agreeableness that predicted right-wing authoritarianism, tender-mindedness was the strongest. Going outside the Five Factor Model, they also found the strongest (inverse) relation between social dominance orientation and right-wing authoritarianism. They had not made any specific predictions about these relations. A year later, this team published another article in *Journal of Personality* showing that the domain of Agreeableness as well as the tender-mindedness facet was a significant predictor of sexism (inversely; [Ekehammar & Akrami, 2007](#)).

Trust

Based on sheer frequency of publications, trust seems to be a popular stand-alone topic. Among the Agreeableness facets, trust has been examined to a greater degree than any of the other facets. Several of these studies examine the trust facet in the workplace. [Kausel and Slaughter \(2011\)](#) examined the fit between job applicant personality and recruitment methods in predicting organizational attractiveness, hypothesizing that scores on the trust facet would moderate the relation between organizational trustworthiness and workplace attractiveness. They found that trustworthiness made a significant difference, but only for participants low in trust. [Timmerman \(2004\)](#) found that trust was the only significant predictor of supervisor ratings of job performance for 203 call center employees. It is interesting to note that 10 years prior to this report, [Piedmont and Weinstein \(1994\)](#) reported a significant relation between an Agreeableness facet and supervisor ratings of job performance, but it was a

significant link to low straightforwardness, not trust, as was found in this study.

Significant trust facet results have also been reported for dysfunctional behavior and psychopathology. [Christopher, Zabel, and Miller \(2013\)](#) found that trust was inversely related to hostile and benevolent sexism. Again, we see researchers presenting significant relations between an Agreeableness facet, but it is not the same as the one reported by others who found tender-mindedness to be the best predictor of sexism ([Ekehammar & Akrami, 2007](#)). In their first study, Ekehammar and Akrami report significant correlations between generalized prejudice and all of the facets except compliance. In more targeted regression analyses, they found that only tender-mindedness and a facet of Extraversion added significantly to the prediction of generalized prejudice (Study 1) and sexism (Studies 2 and 3). Most importantly, the researchers made a priori hypotheses that tender-mindedness would be linked to prejudice.

Beyond sexism, trust has also been examined in a clinical context, revealing inverse relations to other problem behaviors. For example, [Hopwood et al. \(2007\)](#) found that the trust facet meaningfully distinguished between problem alcohol drinkers and other patients in the Collaborative Longitudinal Personality Disorders Study ([Gunderson et al., 2000](#)). As another example, [Bienvenu et al. \(2004\)](#) found that only the trust facet was related to social phobia as assessed using a semistructured interview instrument with a sample of 398 participants from the Hopkins Epidemiology of Personality Disorders Study ([Samuels et al., 2002](#)). Unlike many of the other significant findings for facets, this relation is in the absence of a significant relation at the domain level. That is, [Bienvenu and colleagues \(2004\)](#) found that individuals with social phobia tended to be average in Agreeableness and found only a significant relation with the trust facet. On that basis, [Glinski and Page \(2010\)](#) examined the trust facet from a somewhat different clinical angle building on the research specifically linking trust to social phobia. They posited that individuals who are high in social anxiety have an increased fear of evaluation from others and are more likely to be low in Agreeableness, primarily because of the decrease on the trust facet. Furthermore, they ventured that improving anxious symptoms would be reflected in improvements in self-ratings of personality. To test this hypothesis, they examined the influence of group therapy for social anxiety on changes (preintervention to postintervention)

in facet and factor scores for 25 adults completing an average of nine group therapy sessions. They found that postintervention trust scores were higher than they were before the intervention, suggesting malleability of this facet of Agreeableness. Although these results are positive from a clinical perspective, it remains to be seen whether the results reported from this study are replicated with a larger sample in the future.

Multiple Facets

In terms of multiple facet results, a growing literature, including meta-analytic reviews, links the Agreeableness facets inversely to psychopathy and antisocial/aggressive behavior (e.g., Axelrod et al., 1997; DeCuyper, De Pauw, De Fruyt, De Bolle, & De Clercq, 2009; Jones, Miller, & Lynam, 2011; see also the chapter by Widiger, Gore, Crego, Oltmanns, and Rojas) as early as adolescence (Salekin, Debus, & Barker, 2010; see also the chapter by De Fruyt, De Clercq, and De Bolle). Across these articles, each of the six facets of Agreeableness has been linked to psychopathy and/or antisocial/aggressive behavior in at least one study. Among the studies presenting more than one significant relation with an Agreeableness facet, the most frequently reported was the straightforwardness facet (DeCuyper et al., 2009; Jones et al., 2011).

Importantly, these articles also found significant relations for the Agreeableness domain as well as its facets when analyses at the domain level were reported. For example, Stead and Fekken (2014) found that Agreeableness and its facets were related to the Dark Triad. Specifically, they found that Agreeableness was inversely related to all three aspects of the Dark Triad. Factor analyses revealed that Agreeableness and its facets were central to Machiavellianism, but only modesty and straightforwardness loaded on Narcissism and Psychopathy. That Agreeableness was also a significant predictor in these studies draws into question the amount of benefit gained from facet analysis, particularly in the absence of a priori hypotheses. Furthermore, the spread of significant relations across all six facets of Agreeableness suggests that the variance in psychopathy is distributed across multiple aspects of Agreeableness.

These associations are also reflected in the significant inverse relations between the Agreeableness domain and its facets and destructive behaviors, such as acts of violence, delinquency, and risky sexual behavior. For example, Voller and Long (2010) found that rape perpetrators had lower

levels of Agreeableness, tender-mindedness, and altruism relative to sexual assault perpetrators and nonperpetrators. Similarly, [Madsen, Parsons, and Grubin \(2006\)](#) found that convicted child molesters with personality disorders were lower in Agreeableness, trust, straightforwardness, and compliance in a modest sample of 40 men. [Heaven \(1996\)](#) found significant inverse relations between Agreeableness and interpersonal violence and vandalism/theft among 216 adolescents attending an Australian Catholic school. In their second study, they found that the trust facet in particular predicted these acts in a sample of 90 undergraduate students. Exploring the relations between Agreeableness facets and vengefulness, [Bellah, Bellah, and Johnson \(2003\)](#) found that low straightforwardness accounted for the most variance (27%), followed by modesty (8%) and tender-mindedness (6%). Finally, [Miller et al. \(2004\)](#) linked risky sexual behavior in a sample of 481 participants (mean age 21 years) to low Agreeableness at the domain level and to low trust and straightforwardness at the facet level.

In addition to antisocial and aggressive behavior, other impairments in social-emotional functioning have also been linked to multiple Agreeableness facets. In their investigation of emotional functioning, [Luminet, Bagby, Wagner, Taylor, and Parker \(1999\)](#) found no evidence that the Agreeableness domain was related to alexithymia, but they found significant relations at the facet level for altruism, modesty, and tender-mindedness. In terms of internalizing psychopathology, [Bienvenu et al. \(2004\)](#) found that low trust was related to the experience of social phobia and low trust and low compliance were related to experiences of agoraphobia and panic disorder. Consistent with our earlier comments, the authors identify one of the major concerns with examining the Five Factor Model facets: They state that “Replication of our facet-level findings is needed, as the likelihood of Type I errors (rejecting the null hypothesis when it is, in fact, true) is high, given the large number of comparisons we made.”

[Costa and McCrae \(1995\)](#) note that the detailed information provided by a facet analysis can either support or call into question the construct validity of other scales. They reported Agreeableness facet correlations with empirically based occupational scales from the Hogan Personality Inventory and California Psychological Inventory ([Gough, 1987](#)). These measures include variables for Service Orientation, Stress Tolerance, Reliability, Clerical Potential, Sales Potential, and Managerial Potential.

The strongest correlations between the Agreeableness facets for Service Orientation were for compliance (.52), altruism (.39), and straightforwardness (.35). For Reliability, the largest correlations were for compliance (.53), straightforwardness (.52), and modesty (.29). The Agreeableness facets have a special relation to Sales Potential: most of them are negative: modesty (−.48), straightforwardness (−.36), and compliance (−.32). Only one Agreeableness facet, modesty, correlated with Management (−.31). The Agreeableness facets with the largest correlations to Work Orientation, a measure of the so-called Protestant Work Ethic, were compliance (.34) and altruism (.24). In another study of the workplace, [Thomason, Weeks, Bernardin, and Kane \(2011\)](#) found that high levels on the altruism and tender-mindedness facets of Agreeableness were most appealing to peers when evaluating managerial potential, whereas high Conscientiousness and achievement striving appealed to supervisors (see also the chapter by [Siebert and DeGeest](#)). These results highlight the importance of interdependence when evaluating colleagues.

Beyond clinical settings and the workplace, multiple Agreeableness facets have been connected to a wide range of behaviors, including compulsive buying ([Otero-Lopez & Pol, 2013](#)), caregiver relationships ([Riffin, Lockenhoff, Pillemer, Friedman, & Costa, 2013](#)), birth order ([Jefferson, Herbst, & McCrae, 1998](#)), executive functioning ([Williams, Suchy, & Kraybill, 2010](#)), therapeutic orientation ([Scandell, Wlazelek, & Scandell, 1997](#)), and reactance ([Seemann, Buboltz, Thomas, Soper, & Wilkinson, 2005](#)), and even the characteristics of rock musicians ([Gillespie & Myors, 2000](#)). Overall, these studies do not provide compelling a priori predictions, but they offer stimulating possibilities for future research.

HEXACO

[Ashton et al. \(2004\)](#) have suggested that six, not just five, factors have repeatedly emerged from both English and non-English lexical studies of personality structure. As a consequence, Ashton and colleagues proposed a new six-dimensional model of personality structure forming the acronym “HEXACO”: Honesty–Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. Articles published on HEXACO deal with both theory and measurement, but conceptually and empirically the work has its origins in a bottom-up format. Specifically, the Agreeableness and emotionality factors of HEXACO do

not correspond isomorphically to the Agreeableness and Neuroticism factors of the Big Five/Five Factor Model (B5/FFM). The Agreeableness factor of six-factor solutions observed in various languages is characterized by content such as forgiveness, tolerance, and even-temper versus irritability, anger, and harshness. It is their contention that B5/FFM Agreeableness is not characterized by content related to even-temper versus anger, which instead chiefly defines B5/FFM emotional stability (i.e., low Neuroticism). Moreover, unlike the B5/FFM Neuroticism versus emotional stability factor, the emotionality factor observed in the six-factor solutions of various languages is not defined by anger-related content. The latter dimension, which they believe to be summarized more accurately and less pejoratively by the name of emotionality, is instead characterized by content such as anxiety, sentimentality, and vulnerability versus independence, toughness, and fearlessness. Conversely, they purport that content related to sentimentality is not a central feature of B5/FFM Neuroticism (i.e., low emotional stability) but rather is aligned mainly with B5/FFM Agreeableness.

[Lee and Ashton \(2006\)](#) suggest that content of the HEXACO Agreeableness and emotionality factors corresponds roughly to rotational variants of the B5/FFM Agreeableness and emotional stability factors. Consistent with this interpretation, HEXACO-PI Agreeableness correlated .72 with IPIP pleasantness, a scale designed to measure the high Agreeableness/high emotional stability axis of the Big Five space, and HEXACO-PI emotionality correlated .74 with IPIP imperturbability, a scale designed to measure the high emotional stability/low Agreeableness axis of the Big Five space. Despite apparent differences in orientation and focus, work on HEXACO could potentially contribute to construct elaboration for the Five Factor Model domain of Agreeableness and its facets. Here we briefly describe three recent programs of HEXACO-based research relevant to construct elaboration of Agreeableness.

Using a self-report questionnaire format, [Stürmer et al. \(2013\)](#) found that traits associated with “endeavor” (Extraversion, Openness, Conscientiousness) were better predictors of xenophilia than traits associated with altruism and cooperation-related traits (i.e., Honesty–Humility, Emotionality, and Agreeableness). The HEXACO outcomes suggested that high levels of Agreeableness are associated with increased concerns for becoming exploited by others ([Ashton & Lee, 2007](#), see

especially p. 156). These researchers conclude that high levels in traits predisposing individuals to be gentle and cooperative in dealing with others on an interpersonal level are often insufficient to explain how people will behave in encounters with members of culturally different or unfamiliar outgroups.

Looking at other forms of cooperation in a laboratory setting, [Hilbig, Zettler, Leist, and Heydasch \(2013\)](#) found that Honesty–Humility (but not Agreeableness) predicted active cooperation (nonexploitation in the dictator game), whereas Agreeableness (but not Honesty–Humility) was linked to reactive cooperation (nonretaliation in the ultimatum game). Finally, examining another aspect of interpersonal relations, namely adolescent bullying, [Book, Anthony, Volk, and Hosker \(2012\)](#) found that bullying was negatively associated with personality traits such as fairness and modesty (honesty–humility), but was unrelated to traits such as forgiveness and tolerance (Agreeableness), based on adolescent self-report ($N = 310$). Work of this sort contributes to construct elaboration of two major domains of personality, but also contributes to a greater understanding of the structure of complex interpersonal situations.

On the one hand, several aspects of the HEXACO-based work are noteworthy. First, there are only a few studies, but several of those that are published are based on *a priori* hypotheses. Second, the studies are diagnostic, either in terms of discriminant validation (e.g., honesty–humility versus Agreeableness) or in construct elaboration (e.g., Agreeableness and wariness about stranger exploitation). On the other hand, the links to the Big Five and Five Factor Model (measures and theory) are not direct. The honesty–humility domain seems to parse Agreeableness-related behaviors in ways that make direct comparisons with other approaches difficult.

Taking Stock of Empirical Research on Five Factor Model Agreeableness Facets

Where does this leave us? We restate the claim we made previously, but here it is based on frequency counts of published empirical articles open to public scrutiny. There is far more published empirical research on the domain of Agreeableness than on individual Agreeableness facets. Facets promised to give us greater precision, not to mention enhanced predictive and explanatory power, than we would get from an omnibus measure of the

superordinate domain of Agreeableness. To date, there is little evidence to support that promise. Inferences from small literatures are risky. Often, the facet information is collected as part of an investigation of some phenomena (e.g., traumatic experience, gambling), without any a priori theoretical rationale for the inclusion of the Agreeableness facet. Often, these studies provide little or no increment in predicting external criteria over the comprehensive Agreeableness domain measure. As a collective, the empirical studies of Agreeableness facets contribute less than they could to construct elaboration of the superordinate Agreeableness domain. It might be argued, however, that construct elaboration was not the top priority for researchers in this area. Furthermore, there is heterogeneity in the research literature. Some facets have been investigated more extensively (e.g., trust) than others (e.g., modesty, tender-mindedness). Perhaps the most prudent conclusion is that the promise of Five Factor Model-oriented Agreeableness facets needs to be more tightly focused on construct elaboration rather than on diverse correlates of Agreeableness (and other domain) facets. In this sense, the potential value of Agreeableness facets still remains to be met.

It could be rebutted that we are quibbling about semantics and verbal labels for facets. In some of the best studies, the correlations involving facets converge reasonably with other measures, align with intuition, and make sense (e.g., [Rojas & Widiger, 2014](#)). In other cases, however, the facets have correlates that seem tangential to the label. For example, [Costa and McCrae \(1995\)](#) reported that the largest correlation with the Agreeableness compliance facet in the *California Q Set* is “behaves in a sympathetic manner.” It is difficult to understand how this is a manifestation of compliance, but not altruism. In contrast, [Costa and McCrae \(1995\)](#) reported, as an empirical finding, that the altruism facet does not correlate with “behaves in a sympathetic manner.” At the same time, the largest single correlation with the Agreeableness altruism facet in the *California Q Set* is “basically distrustful” at $r = -.34$. We might think that this behavior best fits under the Agreeableness trust facet. It does ($r = -.54$), but this *Q Set* item has significant correlations with three different Agreeableness facets. Is this pattern because all three facets fall under the same Agreeableness domain or because there are serious problems with construct validity? A skeptic might wonder about discriminant validity, or even whether the labels match the content faithfully. At the least, the NEO

PI-R Agreeableness facet labels can create problems due to misinterpretation.

[Shadish et al. \(2002\)](#) describe how such scientific misinterpretations can happen. They note that practicing scientists routinely make causal generalizations in their research, and they almost never use formal probability theory as the basis for generalization. Instead, they use five closely related principles; these are (1) surface similarity, (2) ruling out irrelevancies, (3) making discriminations, (4) interpolation and extrapolation, and (5) causal explanation. The principle of surface similarity seems to be most relevant here. [Shadish et al. \(2002\)](#) define surface similarity as the act of “assessing the apparent similarities between study operations and the prototypical characteristics of the target of generalization” (p. 357).

Part of the meaning of surface similarity is captured by the now-almost-obsolete concept of face validity. Obsolete or not, it is widely used by practicing researchers to make decisions about which predictors should be explored with which outcomes. If the prototypical properties of an Agreeableness facet seem similar, intuitively or linguistically, to the prototypical thought, feeling, or behavior in question, then that facet becomes a predictor. That is, they choose plausible-sounding labels that appear to be reasonable, with the scientist accepting the label on faith. The prototypical features associated with the verbal label “altruism” probably share more intuitive surface features with helping, volunteering, and donating to charity than being trusting/distrustful. Nevertheless, intuition-based heuristics that lead to surface similarity matching can be false prophets. The prototypical features associated with the verbal label “compliance” probably share more intuitive surface features with compliance, conformity, and obedience than with a “sympathetic manner.” [Begue et al. \(2015\)](#) thought so. As an empirical fact, the largest single correlation with the compliance facet and the *California Q Set* was “behaves in a sympathetic manner” ([Costa & McCrae, 1995](#), Table 2, p. 32; see also [Shadish et al., 2002](#), pp. 357–361, for details on surface similarity as a pervasive influence on research decisions).

The more general point is that labeling and measurement methods have contributed to skepticism about Agreeableness in particular as a domain and scientific construct. Lacking the kind of theoretical foundation associated with domains such as Extraversion and Neuroticism, Agreeableness is

vulnerable; mere empirical links for Agreeableness seem ephemeral. Researchers often frame questions in terms of labels and surface similarity. As Costa and McCrae (1995) noted, perhaps Agreeableness absorbs so much rating variability because it is assessed with such broad traits (e.g., “kind”) that necessarily covary with many more lower-level trait words than do narrower traits for other domains. In rebuttal, broadly assessed or not, Agreeableness as a domain predicts behaviors external to the Agreeableness measure.

Agreeableness has been measured through observation by knowledgeable informants such as spouses (Costa & McCrae, 1988), employment supervisors (Hogan, Hogan, & Roberts, 1996), and teachers/childcare supervisors (e.g., Digman & Takemoto-Chock, 1981; Tobin & Graziano, 2011). Still, self-report measures continue to be the most commonly used method (Costa & McCrae, 1988; Goldberg, 1992; Goldberg et al., 2006; John & Srivastava, 1999). Finch, Panter, and Caskie (1999), Graziano and Tobin (2009), Hofstee (1994), and Paulhus and John (1998) provide more thorough discussions of Agreeableness-related issues in assessment.

Because self-report is the most common way of measuring Agreeableness, it is reasonable to ask questions about self-favoring biases emerging from self-report. Given that words indicative of high Agreeableness (e.g., friendly, likes to cooperate with others) are considered more favorable than those indicating low Agreeableness (e.g., cool, aloof, unkind), items assessing Agreeableness have raised social desirability concerns. After all, one of the main facets of Agreeableness is compliance, and through surface similarity, should we not expect a link between Agreeableness and the compliance-related activity of social desirability responding? Observations of these measures have generated suspicions that the entire domain of Agreeableness may simply reflect responsiveness to the direction of the prevailing social wind (e.g., Begue et al., 2105; DeYoung et al., 2002).

If this proposition is true, then an individual’s standing on Agreeableness could be altered by manipulating the social desirability of Agreeableness experimentally. Both correlational and experimental data, however, do not support this alternative explanation for Agreeableness findings. Finch et al. (1999) conducted both joint and interbattery factor analyses of the Big Five, as measured with NEO PI (Costa & McCrae, 1988) and Murray’s needs, as measured with the Personality Research Form (Jackson, 1984). Both

methods produced a large factor for Agreeableness (and for each of the other Big Five dimensions), but both analyses failed to find evidence that social desirability-related needs such as abasement, defendance, succorance, or desirability loaded on the Agreeableness factor.

Taking a more focused experimental approach, [Graziano and Tobin \(2002\)](#) examined the relations among Big Five dimensions and social desirability in three studies. In one study, they pretested participants for domain-level Agreeableness and then randomly assigned them to one of three different social desirability conditions, namely *Good to Be Agreeable*, *Bad to Be Agreeable*, or *No Information Control*. [Graziano and Tobin \(2002\)](#) found that self-ratings of Agreeableness for participants who were randomly assigned to the bad to be agreeable condition remained the same or actually increased their self-reports of Agreeableness. Furthermore, they found that other domains of the Big Five (i.e., Neuroticism and Conscientiousness) had stronger correlations with measures of social desirability than did Agreeableness. It might be argued that these studies used domain-level Agreeableness, not the compliance facet, as its predictor. The domain-level assessment may have been too molar to capture the process; the compliance facet may have given a more precise prediction. In rebuttal, the domain-level assessment is not too molar to predict helping, cooperation, or conflict tactics. If facets are assumed to operate at comparable levels of breadth beneath their respective domains, then the “too molar criticism” is less plausible. Taken together, these and other findings suggest that Agreeableness effects are probably not primarily (or even preponderantly) artifacts of social desirability. Instead, they are assessing an authentic personality domain linked to important differences in interpersonal relations and social behavior.

Theoretical Explanations for Agreeableness

The process of searching for correlates and measurement artifacts could be endless in the absence of guiding theory. Theories vary in size, scope, and compatibility with other theories. First, we will briefly revisit the problem of extracting any one domain or facet from a larger system of personality for purposes of theoretical explanation. Second, we discuss attempts to link Agreeableness and its facets to various basic processes such as empathy, temperament, and differences in motivation to accommodate to

the social environment. Third, we will discuss a specific endogenous mechanism as a prime candidate for the basic tendency underlying Agreeableness, as outlined in Five Factor Theory.

Earlier, we provided a rationale for extracting domains and facets from the Five Factor Model for focused explanation. We noted that extracting one domain or facet from the full set for examination works directly against one of the main strengths of the Five Factor Model, namely integration. Extraction could be potentially misleading if the domains or facets form distinctive combinations or configurations “horizontally” (e.g., De Raad & Hofstee, 1993; Hofstee et al., 1998, as cited by De Raad, 2000). An individual scoring high on Agreeableness could be one of several different nuanced “varieties” (e.g., Costa et al., 2002; DeRaad, 2000; Paulhus & Jones, 2015). By collapsing across the other variables, we run the risk of failing to “generalize across” cases (Shadish et al., 2002) if they also score high on other domains as well.

Extraction comes with tradeoffs. On the benefits side of the ledger, extraction allows researchers to focus on specific behaviors and processes. On the disadvantage side, extraction could be misleading in the absence of the larger system. For example, Ode, Robinson, and Wilkowski (2008) showed that at higher levels of Agreeableness, the link between anger and Neuroticism was considerably reduced. Similarly, Ode and Robinson (2008) found that Agreeableness moderated the relation between Neuroticism and depressive symptoms. As another example, Jensen-Campbell and Graziano (2005) found that higher Conscientiousness partially compensated for low Agreeableness in predicting cheating during a resistance to temptation task with adolescents. In each of these cases the substantive concern was affect regulation. The configuration of personality patterns (versus the examination of one personality dimension at a time) is a front-line issue in personality theory and measurement, generally following the tradition of the Abridged Big Five Circumplex (AB5C), but it suggests avenues for refinement of associations among personality domains and their shared relation with behavior (De Raad, 2000, p. 83; De Raad, Hendriks, & Hofstee, 1994). This issue is especially relevant to the discussion of our opponent process approach to Agreeableness (Graziano & Habashi, 2010; Graziano & Tobin, 2009, 2013).

With these complexities noted, there is still the challenge of explicating each domain and its facets. What do the diverse thoughts, feelings, and

behaviors associated with the Agreeableness domain have in common? By asking this question, we can perhaps identify a variable or set of variables that could qualify as the endogenous basic tendency underlying Agreeableness as described (abstractly) in Five Factor Theory. Here we consider three candidates: (1) dispositional empathy, (2) the temperamental process of effortful control, and (3) processes associated with social accommodations. Finally, we will consider a learning-oriented opponent-process mechanism compatible with Five Factor Theory.

Agreeableness and Empathy

Agreeableness as a domain may not be highly related to the other four major structural domains of personality, but it is probably related to other dispositions (e.g., [Finch et al., 1999](#)). What processes might be candidates for the basic tendency underlying Agreeableness? Intuitively, we might expect empathy to be a basic tendency, or at least a component of the basic tendency, of Agreeableness. Davis ([1996, 2015](#)) conceptualized dispositional empathy as a psychological system that is linked to thoughts and feelings of connectedness to other people. For Davis, empathy has a cognitive component (perspective taking), a self-focused emotional component (personal distress), and a third other-oriented emotional component (empathic concern; a fourth component, “empathic fantasy,” is rarely studied). Given the nature of the Agreeableness facets (e.g., altruism, tender-mindedness, and perhaps also trust and compliance), empathy becomes a plausible candidate. Empirically, studies show that Agreeableness is related to dispositional empathy. Empirical research supports the claim that Agreeableness is related both to empathy and to overt helping (e.g., [Graziano, Habashi et al., 2007](#)). Persons high in Agreeableness report greater ease in seeing the world through others’ eyes (perspective taking) and feeling the suffering of others (empathic concern), but not necessarily in experiencing self-focused negative emotions (personal distress) when observing victims in sorrow. Past research showed that these cognitive and emotional processes are related to overt helping, so we might expect persons high in Agreeableness to experience the kind of empathic processes that motivate prosocial behavior (e.g., giving aid to others, even to strangers) more than their peers. They do ([Graziano & Habashi, 2015](#)).

Nevertheless, [Graziano and Habashi \(2015\)](#) expressed reservations about Agreeableness or empathy being the single basic process underlying altruism, or even the less restrictive prosocial behavior. Despite their tendency to take the perspective of a victim, and to experience other-oriented empathic concern, persons high in Agreeableness will decline helping victims if they have a clear opportunity to escape from the helping situation. If they cannot escape, they will help. Persons high in Agreeableness may indeed be more helpful and empathic in naturalistic settings than their peers, but the motivation underlying the helping is probably egoistic: It is personally aversive to them to experience the suffering of others. To eliminate their own unpleasant state, they help. Such helping makes them more prosocial, but probably not more altruistic, than their peers.

Adding further to the reservation is the conceptualization of empathy as a composite of two different processes. The self-focused process of personal distress generally undermines prosocial behavior and helping, whereas the other-focused process of empathic concern promotes it. Given this pattern, we might expect the two dispositions to be negatively correlated, but they are correlated *positively* in most published studies that report separate components (e.g., [Graziano, Bruce, et al., 2007](#)). [Graziano and Habashi \(2015\)](#) proposed that personal distress and empathic concern must be configured in a different pattern in persons high and low in Agreeableness. At the least, this conceptualization suggests that some additional variable moderates the link between empathy and Agreeableness as the process underlying prosocial behavior.

Agreeableness and Temperament

If there is a third-variable moderator in the empathy–Agreeableness system, then what kind of variable is needed? One particularly promising line of theory offers some clues to the nature of the basic tendency. It is provided by theory and research on temperament and development. Agreeableness may be tied distinctively to temperament-based systems of self-regulation, especially as they apply to regulating frustrating emotions in social relations ([Cumberland-Li, Eisenberg, & Reiser, 2004](#); [Eisenberg & Spinrad, 2004](#); [Graziano & Tobin, 2013](#); [Jensen-Campbell & Graziano, 2005](#); [Jensen-Campbell & Malcolm, 2007](#); [Laursen, Pulkkinen, & Adams, 2002](#); [Tobin & Graziano, 2011](#)). Consistent with these findings, Smits and

[Boeck \(2006\)](#) found that Agreeableness had a positive relation with the Behavioral Inhibition System (BIS) and a negative one with the drive scale of the Behavioral Approach System (BAS).

[Ahadi and Rothbart \(1994\)](#) were the first to propose that an early appearing temperamental variable, effortful control, provides a developmental substrate for subsequent personality structure in children, adolescents, and adults. They proposed that effortful control is part of a common developmental system underlying two of the major dimensions in the Big Five, namely Agreeableness and Conscientiousness. Rothbart and her colleagues (e.g., [Evans & Rothbart, 2007](#); [Rothbart & Bates, 2006](#); [Rothbart & Posner, 1985](#)) proposed that effortful control modulates other temperament systems as the frontal cortex matures. Effortful control is related to early-appearing differences in the ability to sustain and shift attention and the ability to initiate and inhibit action voluntarily (e.g., [Kochanska & Knaack, 2003](#); [Kochanska, Murray, & Coy, 1997](#); [MacDonald, 2008](#)). Effortful control seems to be related to the ability to suppress a dominant behavior to perform a subdominant response or even an opposing dominant response, as is commonly the case for Agreeableness. Applying this to our helping example, upon witnessing a victim in distress, people experience the unpleasant self-focused emotion of personal distress. The dominant behavior associated with this aversive state is to escape without helping. However, people high in dispositional effortful control have the resources to suppress that dominant response, allowing subdominant prosocial responses to come on line.

[Graziano and Habashi \(2015\)](#) as well expressed some reservations about this explanation. First, the temperament of effortful control is assumed to lay the foundation for Agreeableness and Conscientiousness. That conceptualization implies an intimate, perhaps even part–whole link between effortful control and Agreeableness. It is possible that one part of a system could act as a moderator on another part, but where does effortful control end and Agreeableness begin? Within the framework of Five Factor Theory, perhaps effortful control skills provide the basic tendency that precedes the later developing characteristic adaptation of Agreeableness.

Based on patterns of correlations using the Adult Temperament Questionnaire ([Thomas, Mittelman, Chess, Korn, & Cohen, 1982](#)), a few writers suggested that effortful control (especially attentional control) may not be the developmental precursor of Agreeableness, and therefore it is not

a good candidate for the basic tendency for Agreeableness. That is because temperamental effortful control is more closely tied to Conscientiousness than to Agreeableness. That may or may not be true because much of the evidence supporting this claim is open to alternative interpretations, or at least is not differentially diagnostic. For example, the original content of the Adult Temperament Questionnaire did not include items dealing explicitly with the social and interpersonal expression of effortful control. It is possible that effortful control appears to be more closely correlated with Conscientiousness than Agreeableness in this case because the measure itself does not assess social and interpersonal expressions of effortful control (but see also [Evans & Rothbart, 2007](#)). Even then, some social and interpersonal tasks (e.g., resistance to temptation) will require processes that place more stress on Agreeableness than on Conscientiousness, whereas other tasks (e.g., reactions to disappointing gifts) could reverse that pattern (see, for example, [Jensen-Campbell & Graziano, 2005](#); [Tobin & Graziano, 2011](#)). These issues are worthy of further empirical investigation.

Consistent with this theoretical connection, [Jensen-Campbell et al. \(2002\)](#) found that both Agreeableness and Conscientiousness were associated with the Stroop Test and the Wisconsin Card Sorting Task, both of which are considered traditional measures of self-regulation. Furthermore, [Haas, Omura, Constable, and Canli \(2007\)](#) found that Agreeableness is related to activation of the right lateral prefrontal cortex following exposure to negative emotional stimuli. These results suggest that individuals high in Agreeableness automatically engage in processes of emotion regulation when exposed to negative stimuli. In a converging multimethod three-study set, [Tobin et al. \(2000\)](#) presented evidence consistent with this connection: They found that individuals high in Agreeableness reported experiencing stronger emotional reactions when they were presented experimentally with negatively valenced stimuli. However, based on both objective observations and on self-report, they also exerted greater efforts to regulate these emotions than their peers. Similarly, [Tobin and Graziano \(2011\)](#) found that Agreeableness predicted regulation of negative affect in school-aged children using the disappointing gift paradigm ([Cole, 1986](#); [Saarni, 1984](#)). Thus, the Agreeableness dimension has been associated with both negative affect expression and regulation in more than one age range (i.e., school-aged children and university students).

Agreeableness and Social Accommodation

Perhaps the problem with empathy and effortful control explanations is that they are too closely connected to narrow specific behaviors. Perhaps what is needed is a more abstract variable that covers more diverse forms of Agreeableness-related behaviors. [Graziano and Tobin \(2013\)](#) attempted to expand the explanatory structure surround Agreeableness by moving past behavioral regularities toward underlying processes. They proposed that Agreeableness was closely linked to interpersonal accommodation, a process central to social psychology. Here is a bridge between personality and mainstream social psychology. [Gordon Allport \(1968\)](#) defined social psychology in terms of the adjustments in thoughts, feelings, and behavior that individuals make as a result of the actual, imagined, or implied presence of other people. In keeping with this perspective, we proposed that Agreeableness refers to the motivation to accommodate to other people with the goal of maintaining smooth interpersonal relationships ([Graziano & Eisenberg, 1997](#); [Graziano & Habashi, 2010, 2015](#)). More formally, Agreeableness is defined as a superordinate summary term for a set of interrelated dispositions and characteristics manifested as differences in being likable, pleasant, and harmonious in relations with others. Agreeableness can be indexed through individual differences, but it is a larger construct likely reflecting a set of underlying psychological processes. Presumably, the Five Factor Model facet structure captures the key processes in that set. Research shows that persons who are described by others as “trusting” are also described as “kind” and “warm.” Taken together, this combination of characteristics points toward a domain of behaviors involving flexibility and tolerance in dealing with others. We now know that these tendencies are relatively stable over time ([Costa et al., 2000](#); [De Fruyt et al., 2006](#); [Hair & Graziano, 2003](#); [Laursen et al., 2002](#); [Shiner, Masten, & Roberts, 2003](#)).

One problem with this interpretation is that it is largely descriptive, and does not identify the precise mechanism that generates the stability of differences in accommodation tendencies over time. Furthermore, this approach implies that persons high in Agreeableness will be more accommodating than their peers to most people most of the time. There is evidence that persons high in Agreeableness are selective and discriminating in their accommodation (e.g., [Graziano, Bruce, et al., 2007](#);

(Graziano, Habashi, et al., 2007; White et al., 2012), suggesting there is still much to be learned about these processes.

Agreeableness and Five Factor Theory

The most comprehensive theory covering Agreeableness is the Five Factor Theory of Personality (McCrae & Costa, 2003; see also the chapter by Costa and McCrae). First, we will briefly summarize key aspects of the theory as they apply to the special case of Agreeableness and its facets. Next, we will discuss the theory's compatibility with lower level theories and with empirical outcomes. McCrae and Costa (2003) note that the first and most central fact to be explained in personality is the stability of personality traits over long periods of time (e.g., Costa et al., 2000). Yet some other aspects of personality such as habits and self-images do seem to change. For personality to be both stable and also changeable, personality must consist of at least two different components. In the Five Factor Theory, personality consists of three central components: *Basic Tendency*, *Characteristic Adaptation*, and *Self-Concept* (in Five Factor Theory, self-concepts are a form of characteristic adaptation, and will not be discussed further). The key distinction is between a Basic Tendency and a Characteristic Adaptation because Basic Tendencies are assumed to be stable over long periods, whereas Characteristic Adaptations are open to change. Basic Tendencies are the abstract capacities and tendencies of the individual, whereas Characteristic Adaptations are the concrete, acquired structures that emerge as the individual interacts with the environment.

In its original form, Five Factor Theory made the strong assumption that the environment did not influence Basic Tendencies; they were endogenous, biological structures. Five Factor Theory focused on personality traits, but other kinds of predisposing tendencies are Basic Tendencies as well. Included in this list are cognitive abilities, artistic talents, sexual orientation, and the entire neurocognitive ensemble underlying psychological activities such as perceiving and thinking. All learned skills are Characteristic Adaptations, including habits, interests, attitudes and beliefs, and language. Some Characteristic Adaptation skills and tendencies such as language or self-concepts are stable over time, but generally Characteristic Adaptations are less stable over time than Basic Tendencies. These changes over time could involve learning or the unfolding of endogenous aspects of persons (e.g., maturation) (see also Costa et al., 2000).

In Five Factor Theory, presumably the process underlying the supertrait domain of Agreeableness is a Basic Tendency. As such, the process is assumed to be endogenous, and has its origins as an inherited biological system. Behavior genetic twin studies suggest that Agreeableness shows broad heritability comparable to (but possibly slightly lower than) the other Big Five domains, depending on assumptions about nonadditive genetic effects and shared/nonshared environments (e.g., [Loehlin, 1992](#); but see as well [Matthews & Deary, 1998](#), pp. 116–117). Exactly what is being inherited?

From these simple assumptions, many important questions follow. First, precisely what is the process that underlies the Basic Tendency of Agreeableness? To qualify as a Basic Tendency, it must be an abstract tendency that would give rise to Characteristic Adaptations. The large collection of behavioral differences associated with Agreeableness *cannot* be the Basic Tendency itself. They are instead acquired residues of interactions of Characteristic Adaptations and the environment. If this is true, then personality development is a process in which Basic Tendencies predispose individuals to acquire certain kinds of skills and habits, depending on the availability of environmental conditions relevant to the Basic Tendency. In the absence of those environmental conditions, the typical Characteristic Adaptation will not develop, nor be present in form typically found with persons of that Basic Tendency. In this view, the Basic Tendency underlying Agreeableness provides a mechanism for a dynamic “reaction range” ([Dobzhansky, 1955](#); [Griffiths & Tabery, 2007](#)) determining responsiveness to environmental variations. The Basic Tendency would be a species-wide mechanism ([Eastwick, 2009](#)) with some small variation in operating parameters among individuals, whereas the Characteristic Adaptations associated with it would show considerably more variability due to differential social learning experiences in the environment. If this is true, then we have an explanation for why persons high in Agreeableness can appear as different phenotypic varieties, as described previously. Thus, a key question is: What are the fundamental, endogenous processes underlying the Basic Tendencies that make up Agreeableness?

The next important conceptual question for Five Factor Theory is precisely how to differentiate Basic Tendencies from Characteristic Adaptations. At present, we must rely on intuitions. Perhaps we can perform a process similar to “backward engineering.” In a study that may

address the Characteristic Adaptations associated with Agreeableness, [Laursen et al. \(2002\)](#) tracked 194 individuals longitudinally for 25 years collecting peer and teacher reports of self-control, compliance, and aggression, with compliance at age 8 and again at age 33 years. They found distinct patterns in childhood and adulthood that varied by level of Agreeableness. Specifically, fewer problems on noncompliance and inattention were reported for children high in Agreeableness relative to those low in Agreeableness. Boys high in Agreeableness also had fewer behavior problems and better grades relative to boys low in Agreeableness. [Laursen et al. \(2002\)](#) noted continuity in Agreeableness status, with more positive outcomes associated with high Agreeableness. Specifically, adults high in Agreeableness reported fewer arrests and problems with alcohol, less depression, and greater career stability relative to their peers. Based on these results, [Laursen et al. \(2002\)](#) concluded that Agreeableness is linked to processes of self-regulation that appear stable from childhood through adulthood (see also [De Fruyt et al., 2006](#)).

Agreeableness as a Complex of Motivational and Cognitive Processes

[Graziano and Eisenberg \(1997\)](#) first identified Agreeableness as a summary term for individual differences in motives to maintain positive interpersonal relations. More than a decade later, [Graziano and Tobin \(2009\)](#) reported reliable behavioral differences tied to Agreeableness, implicating these motivational processes, but they noted the need for additional research to reveal its underlying processes and mechanisms. In the language of Five Factor Theory, we seemed to know more about Characteristic Adaptations associated with Agreeableness than its most central Basic Tendency. [Graziano and Tobin \(2009\)](#) made progress in identifying these psychological processes by noting parallels in the way Agreeableness related to the two outwardly opposite social behaviors of prejudice and helping. The main concern was not to dissect two different social behaviors—admitting these two classes of behavior qualify as important—but to identify a process or mechanism underlying them and to explain its connection to Agreeableness and social accommodation.

In keeping with everyday intuition, there is evidence from behavior genetics that prosocial and antisocial systems may be different (e.g., [Krueger, Hicks, & McGue, 2001](#)), but [Graziano and Tobin \(2009\)](#) noted that the commonalities between behaviors of prejudice and helping are not

merely coincidences: Underlying both are accommodative processes with approach and avoidance elements. It is plausible that a common regulatory system linking approach, avoidance, and Agreeableness, may underlie both forms of behavior, and likely others. In general, Agreeableness and social accommodation might be tied closely to self-regulation, and to balancing approach and avoidance tendencies in particular. Here we offer this claim: That system may provide the Basic Tendency underlying the panoply of Agreeableness-related events.

CHARACTERISTIC ADAPTATIONS

How would such a system work? In overview, the system we describe is based on an opponent process model of learning ([Solomon, 1980](#); [Solomon & Corbit, 1974](#); see also [Eisenberger, Lieberman & Satpute, 2005](#) for a related two component approach). The dual-process system has an endogenous mechanism (corresponding to Five Factor Theory's Basic Tendency) that responds to the environment and accumulates "residues of experience" in patterned ways. The operative mechanism within the system is endogenous, and in keeping with [McCrae and Costa \(2003\)](#), the basic mechanism itself is not influenced by the environment. Operationally, the system consists of two components that operate in time and includes an initial emotional reaction to events or people (State A) followed by a subsequent homeostatic "correction" (State B). It is the nature of the system for State A to activate an opponent State B. State A and State B are yoked endogenously through hard wiring. In terms of outcomes, State B automatically reduces the effects of State A. With repeated exposure, the opponent State B will be activated by State A with shorter and shorter latencies. That is, when activated, State A is expressed at lower levels, whereas State B is expressed at higher levels. The mechanism is endogenous because it is an evolved homeostatic device that maintains the integrity of the organism when it is faced with challenges.

Detailed aspects of the application of this model to Agreeableness are provided elsewhere (i.e., Graziano & Tobin, [2009](#), [2013](#)). Here, we present an overview of the opponent approach, as shown in [Figure 6.1](#). In keeping with Five Factor Theory, the mechanism itself is endogenous. It is the single, simple Basic Tendency underlying the entire domain of Agreeableness. The first process activated is labeled State A. Its activation is automatic. In keeping with Solomon's model, it is an unconditioned

response to the onset of an environmental stimulus. It is active while the evocative stimulus is present and ends when the stimulus is removed. State B is the second process activated as an opponent. It is not activated as quickly, but it remains well after State A terminates. States A and B are opponents, but State A is the first to come on line in response to an environmental event. Thus, State A operates in almost pure form (without an opponent) initially. As discussed in [Graziano and Tobin \(2013\)](#), this model can be applied to helping behavior: If State A is Personal Distress and State B is Empathic Concern, then the initial response to a victim would be unopposed Personal Distress. If escape is possible in this interval, the victim will not receive help. Using the same logic, first reactions to unusual cases (e.g., victims of misfortune) as well as to members of outgroups would be personal distress and avoidance. As time passes, these processes have the opportunity to unfold: State B (Empathic Concern) can be activated, opposing the processes of State A.

IMPLICATIONS FOR AGREEABLENESS

The opponent process approach provides a conceptualization of the nature of Agreeableness and its links to social accommodation, but it leaves some questions unanswered. First, what appropriate time window captures the expression of social accommodation? It is plausible that if the window we examine is too narrow, we would miss the dynamics underlying these processes. When these systems operate simultaneously, as in the opponent process, one system (State B) may diminish the influence of another (State A) once State B is activated. When studying a helping incident, it is common to assume that a single process is operating, but it is more likely that these components are at work simultaneously.

A second question is, what is the role of individual differences such as Agreeableness, empathic concern, and personal distress? One approach to individual differences, whether at the domain or facet level, is to regard them as proxies or markers of differences in cognitive or emotional processes. Then the question shifts to identifying processes. Temperament researchers (e.g., [Rueda, Posner, & Rothbart, 2005](#)) remind us that each individual is born with an emotional core that interacts with the social learning environment over the life course, leaving residues such as internal working models, social learning histories, and individual differences in personality. Individuals learn about others (including outgroup members) as

they develop, but what exactly are they learning ([Biesanz, West, & Millevoi, 2007](#))? Evidence suggests that most individuals are selective in attention, encoding, retrieval, and general information processing.

As we noted previously, the Basic Tendencies of personality would condition that selectivity. Personality development is a process in which Basic Tendencies predispose individuals to acquire certain kinds of skills and habits, depending on the availability of environmental conditions relevant to the Basic Tendency. In the absence of those environmental conditions, the typical Characteristic Adaptation will not develop, nor be present in a form typically found with persons of that Basic Tendency. The Basic Tendency underlying Agreeableness provides a mechanism for a dynamic “reaction range” ([Dobzhansky, 1955](#); [Griffiths & Tabery, 2007](#)) determining responsiveness to environmental variations. In this view, persons high in Agreeableness are predisposed to learn about others, to be flexible and accommodating in dealing with others, and to be biased toward learning prosocial (but not necessarily altruistic) thoughts, feelings, and behavior. In normative environments, person high in Agreeableness will typically acquire Characteristic Adaptations of the sort described by [Laursen et al. \(2002\)](#). These Characteristic Adaptations will be stable over time. From the perspective of Five Factor Theory, the Characteristic Adaptations were induced by the endogenous Basic Tendencies outlined in the opponent process model.

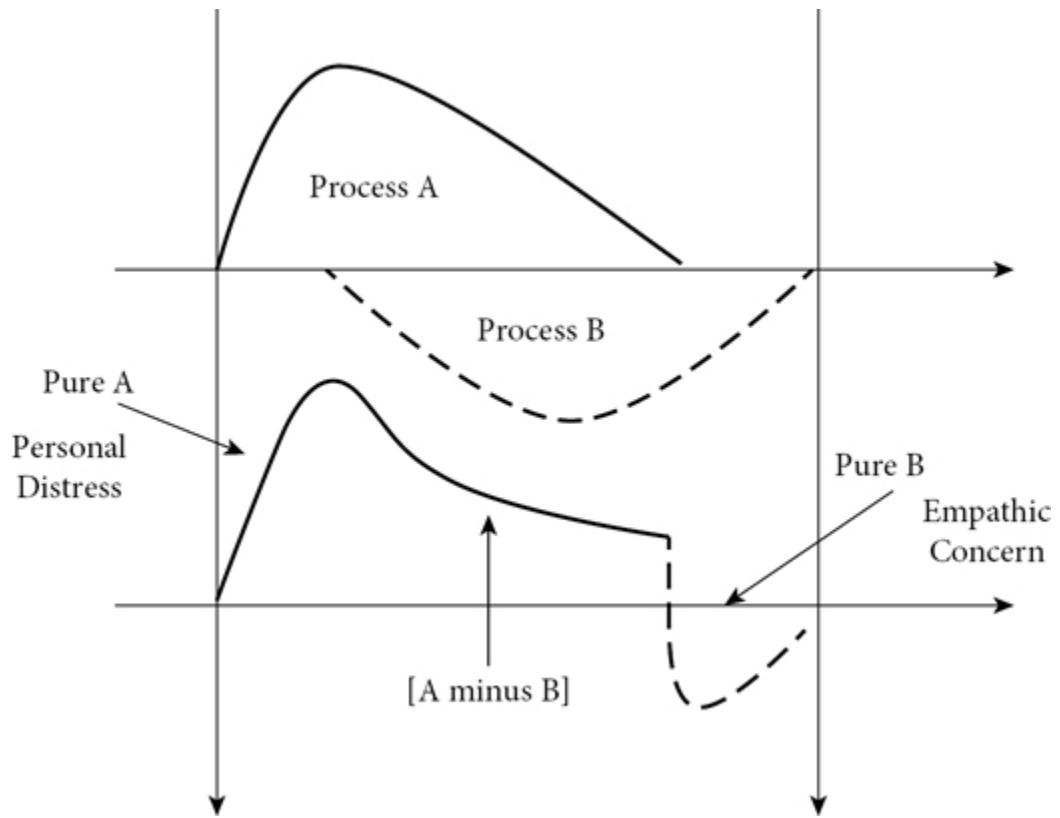


Figure 6.1. Opponent process model of motivation (adapted from [Solomon & Corbit, 1974](#)).

Theorists ([Brown & Brown, 2006](#); [Dijker & Koomen, 2007](#); [Eastwick, 2009](#); [Jonas et al., 2014](#); [Porges & Carter, 2012](#)) posited that evolution left humans with two powerful motive systems in Fight/Flight and Care. [Dijker and Koomen \(2007\)](#) describe Fight/Flight as unconscious responses that are deeply rooted in our evolutionary history to protect the organism. This system allows the individual to escape from danger or fight if necessary. In contrast, the Care system is tied to kin selection and attending to the needs of others. It has the capacity to override the Fight/Flight system. These motives systems are considered universal, but there are probably individual differences in the relative strength of these motives. In terms of overt behaviors, observers might identify these socially important behavioral differences as domain-level Neuroticism and Agreeableness, respectively ([Graziano & Habashi, 2010](#)).

Common approaches to studying these processes are to build structural models or collect data showing intercorrelations among variables such as Care, Agreeableness, its six facets, and some other disposition such as empathy or self-esteem. These methods would likely miss important aspects

of the dynamic processes, their major dispositional inputs, and the range of influence of the individual difference under consideration. Nevertheless, from the perspective of Five Factor Theory, repeated exposure to certain kinds of environmental events could change the Characteristic Adaptation, but not the basic operation of the inherited dispositions and motives. For example, recent experimental research showed that ostracism and social rejection can induce lower Agreeableness, at least temporarily ([Hales, Kassner, Williams, & Graziano, under review](#)). Presumably, those experiences would reset the level of the Characteristic Adaptation, but not alter the opponent process, the endogenous Basic Tendency mechanism underlying Agreeableness. At this time, it is not clear if Agreeableness facets are more responsive to environmental experiences than the superordinate domain, or are differentially responsive among themselves to environmental events. It is possible that facets differ in how much their operation is determined by the endogenous Basic Tendency, or even whether they are themselves Characteristic Adaptations derived from the endogenous Basic Tendency.

Connecting the affective components of empathy and the personality domain of Agreeableness to interpersonal behaviors and to more general self-regulatory processes ([Graziano & Tobin, 2009](#)) within the framework of Five Factor Theory is novel. Not surprisingly, several questions remain unanswered. Is Agreeableness as a domain tied to the Care system only or to Fight/Flight as well? Does the facet structure of the Five Factor Model give us some leverage in understanding the different processes at work within the domain? Is the Agreeableness domain and/or its facets tied to both personal distress and empathic concern, to both prejudice and the suppression of prejudice, or to just one of these elements in each pair? We believe that the opponent process approach to Agreeableness allows us to conceptualize these processes in ways that will help guide future research.

[Graziano and Habashi \(2010\)](#) offered a few tentative ideas. For example, delayed helping appears to be worthy of special attention (see [Penner et al., 1995](#)), given that rates of helping are affected by the time interval between the request for help and the opportunity to provide it. If the opponent process system operates as described here, then differences may be observed between helping provided after a short delay relative to helping following an immediate request. Delaying the request may allow the initial Fight/Flight reaction to come under the control of the opponent Care

system, in effect disinhibiting helping with time. Undoubtedly, we would also see characteristic emotions, such as relief at finally having an opportunity to provide assistance. Based on the previous rationale, we would also expect persons high in Agreeableness to offer more help, sooner and with less influence of delay, than persons low in Agreeableness. Future research guided by this model is likely to help us understand the dynamic processes underlying the Agreeableness domain and related interpersonal processes.

It could be argued that it is misleading to describe Agreeableness primarily as a domain-level individual difference. The measurement at the domain level is too molar to be valuable for either prediction or explanation. Evidence cited in this chapter as well as previous review chapters (e.g., [Graziano & Tobin, 2013](#)) argues against that statement. Another critique involves ways that the domain-level approach biased the basic definition of the domain. Inevitably, say critics, persons low in Agreeableness are defined by default, as simply lacking qualities that are possessed by persons high in Agreeableness. There is more to the concept of “cold” beyond being merely the absence of “heat.” If persons high in Agreeableness show empathic concern, show a willingness to accommodate to the goals of others, and are motivated to minimize conflict with others, then do persons low in Agreeableness simply lack these qualities? By implication, some of the distinctiveness of persons low in Agreeableness might be lost. We offer several comments in response.

First, all of the Big Five structural domains of personality, including Agreeableness, are better represented conceptually as a set of continuous variables than as categories (e.g., [Finch et al., 1999](#)). The major domains of personality allow for the description of larger patterns and trends in thoughts, feelings, and behaviors. The domain may be less well suited than the facets to predicting specific unique, one-time behaviors such as preferring chess or holding a specific Theory of Mind. Perhaps this is the place in which Agreeableness facets could prove especially valuable in the future. Second, the opponent process model described here suggests that Agreeableness is a proxy for understanding a larger dynamic process of social accommodation. That there are noticeable individual differences suggests that facet-level analyses may prove valuable for construct elaboration. Presumably, the social accommodation process itself operates in different situations for different individuals (e.g., [Kelley, Holmes, Kerr,](#)

[Reis, Rusbult & van Lange, 2003](#); [Pursell, Laursen, Rubin, Booth-LaForce, & Rose-Krasnor, 2008](#)). We infer that variability in Agreeableness means that both distal evolutionary processes and more proximal social dynamics can find uses for individuals at most levels along a continuum of social accommodation (e.g., [Savani, Morris, Naidu, Kumar, & Berlia, 2011](#)). Third, there is much to be gained by comparing individuals who are located at different places along a single continuum. These comparisons can implicate processes underlying the dimension as a whole. As such, our opponent process model is a product of these comparisons. Subsequent research may corroborate or refute such inferences, but we are optimistic that these are worthwhile pursuits.

None of these comments is directed against the measurement of facets subordinate to the domain of Agreeableness. The promise of facets is greater precision in prediction and explanation. So far, however, this enhanced precision promise has not been met by the empirical literature. There are several pervasive problems. Many researchers have not based their facet-based research on *a priori* predictions. Instead, most NEO-based facet research is atheoretical and inductive. In addition, Five Factor Theorists should address the issue of comprehensiveness of coverage. Many Agreeableness-related forms of thoughts, feelings, and behaviors are not well described by the current set of Five Factor Model facets. The altruism and compliance facets in particular are problematic. A second issue related to comprehensiveness is exhaustiveness. In particular, the separate NEO PI-R Agreeableness facets are summed to capture comprehensively the full range of thoughts, feelings, and behaviors associated with the Agreeableness domain as a whole. There is a part–whole relation between the facets and the domain score. That tactic implies that the current facets cover all the relevant issues in the domain; adding other forms of behavior beyond those in the six facets (e.g., somatic complaints) or even other facets will not improve the predictive power of Agreeableness. We think that is premature closure.

It is not clear that this second exhaustiveness criticism applies with comparable force to the domain level, because the Agreeableness domain is clearly a hypothetical construct, implicating something unseen beyond the empirical relations ([Grimm & Widaman, 2012](#), p. 623). Facets may be better characterized in more local, empirical terms as shorthand verbal labels for objective phenomena or results. These are “intervening variables”

([MacCorquodale & Meehl, 1948](#)), which are local manifestations limited by the empirical results. Whether this distinction is valid, these are issues that need discussion within the framework of Five Factor Theory and the Five Factor Model.

Joshua J. Jackson and Brent W. Roberts

Abstract

Conscientiousness refers to a broad swath of constructs that reflects the propensity to be self-controlled, responsible to others, hardworking, orderly, and rule abiding. To understand why conscientiousness is one of the best psychological predictors of important outcomes (e.g., longevity; divorce), this chapter provides a broad overview of the trait. First, the Sociogenomic model of personality traits is briefly described as a means to provide a common language to discuss the status of conscientiousness. Next, the hierarchical structure of conscientiousness is described, including a description of common measures used to assess conscientiousness, as well as constructs related to conscientiousness. The development of conscientiousness is then discussed, followed by a review of the predictive ability of conscientiousness. The potential mechanisms driving the development of conscientiousness and the pathways that relate conscientiousness to important outcomes are also examined.

Key Words: Big Five, personality traits, conscientiousness, facets, personality assessment, predictive validity, personality development, self-control, grit

The personality trait of conscientiousness reflects a family of constructs that describes individual differences in the propensity to be self-controlled, responsible to others, hardworking, orderly, and rule abiding (Roberts, Jackson, Fayard, Edmonds, & Meints, 2009). Although typically thought of as part of the Big Five, constructs resembling conscientiousness are included in almost all of the classical personality taxonomies, such as those put forth by Cattell (1957), Eysenck (1947), Gough, (1956), D. Jackson (1976), Block and Block (1980), and Tellegen (1982). The importance of conscientiousness as a psychological construct is indisputable when considering the predictive ability of life's important outcomes, such as health and longevity (Jackson, Connolly, Levine, & Garrison, 2015; Moffitt et al., 2011), occupational success (Dudley, Orvis, Lebiecki, & Cortina, 2006), marital stability (Solomon & Jackson, 2014a), academic

achievement (Noftle & Robins, 2007) and even wealth (Mroczek, Turiano, Chan, Hill, & Roberts, 2015). As a result, conscientiousness is used in diverse fields such as economics (e.g., Almlund, Duckworth, Heckman, & Kautz, 2011), political science (Gerber et al., 2011), and public policy (Tough, 2013).

Despite the historical and practical significance of conscientiousness, much is unknown about the trait. As seen in the definition, conscientiousness is not a singular dimension but instead encompasses a broad range of lower-order individual differences. The Big Five are indeed “Big,” and as a result, there exists confusion over what falls under the broad umbrella of conscientiousness and how to effectively measure it. Confusion over the status of conscientiousness is problematic as quality measurement of the trait is necessary to help us understand the relationship between conscientiousness and important life outcomes. Similar difficulties arise when considering the genetic and developmental etiology of conscientiousness where accurate assessment of conscientiousness is necessary to describe how it develops across the lifespan and to pinpoint its genetic and biological bases. This chapter covers the conceptual standing of conscientiousness as a personality trait, reviewing the measurement and the nomological network in which conscientiousness is embedded, after which the development of conscientiousness and its predictive utility are discussed.

Conscientiousness as a Personality Trait

Conscientiousness is most often thought of as a personality trait, which reflects the relatively enduring, automatic patterns of thoughts, feelings, and behaviors that differentiate people from one another, and are elicited in trait-evoking situations (Roberts, 2009; Roberts & Jackson, 2008). Conscientiousness, like all personality traits, can be conceptualized as existing within a hierarchical structure, in which broad constructs are structured above more specific lower-order facets, with behavioral, cognitive, and affective manifestations of these traits falling at even lower ends of the hierarchy (Jackson et al., 2010; Markon, Krueger, & Watson, 2005; Roberts, Bogg, Walton, Chernyshenko, & Stark, 2004). Recently, the authors of this chapter put forth a model that capitalizes on this hierarchical structure of personality in the hopes of bringing together diverse ways of

thinking about personality traits. Described herein is the Sociogenomic model of personality traits (Roberts, 2009; Roberts & Jackson, 2008), which will help in better understanding the measurement, development, and predictive power of conscientiousness.

The Sociogenomic model describes two different levels of analyses for personality. The first level is a broad personality trait, which reflects the relatively enduring manifestations typical to a person that are embedded within neurophysiological structures as a way to provide consistency across time (Jackson, Hill, & Roberts, 2012). This is the level in which conscientiousness is typically discussed and measured. The second level is the state-level, which reflects the moment-to-moment fluctuations in the manifestations of personality (Fleeson, 2001). These state-level manifestations are made up of thoughts/cognitions, feelings/emotions, and behavior, which are the result of both an environmental stimulus (e.g., one is more likely to talk when at a party) and personality traits (e.g., extraverts are more likely to talk more than introverts). It is at this level that a personality trait becomes “visible,” and exists in a way others and oneself can perceive. Specifically, it is at the state-level at which the assessment and inference of a personality trait occur. Importantly, the manifestation of a personality trait includes thoughts/cognitions and feelings/emotions in addition to behavior, two important states that sometimes are left out of definitions of personality traits (Bandura, 2012; Jackson et al., 2012). A corollary of this part of the model is that a thorough assessment of a personality trait needs to include all three state-level components.

A common misperception of personality traits is that they denote the existence of highly heritable, and thus unchangeable and decontextualized, constructs. The Sociogenomic model easily addresses questions concerning how context influences coherence across situations and time by integrating two popular views of personality that take opposite positions concerning the mutability of personality (Roberts, 2009). Traditional trait models, such as the Five Factor Model (FFM; McCrae & Costa, 2008), emphasize stability across time and context, whereas social cognitive models of personality, such as the Cognitive-Affective Processing system (CAPs; Mischel & Shoda, 2008), emphasize change across situations and time. According to the Sociogenomic model, these two positions are not in conflict, but simply reflect a focus on the two different levels of analysis common to personality models. The FFM focuses on a broad trait level that exists across multiple

contexts and time, whereas CAPs focuses on the state-level manifestations and emphasize the differences between states across time or situations. When a broad level of analysis such as the FFM is emphasized there is a natural tendency to focus on the stability of personality given that the traits are inferred from a multitude of states across different contexts. In contrast, CAPs focuses on the state variations that by definition are more attuned to environmental influences, and thus vary more across contexts and time. Together both the FFM and CAPs describe the same system, they just emphasize different components of the system, much like in the proverb of the blind men (from Indostan) describing different features of the same elephant. When describing the development of conscientiousness it is necessary to take into account the existence of both a relatively stable trait, as well as behaviors/thoughts/feelings that reflect the existence of a trait, but vary due to contextual factors. To repeat a sentiment echoed for decades: behaving unconscientiously does not invalidate the possibility that a person is highly conscientious ([Jackson, Hill, & Roberts, 2011](#)). And, of course, as many parents will note, one act of probity does not make for a conscientious child.

Part of the disagreement between various models and conceptualizations of personality comes from the disagreements over the contextualized and/or decontextualized nature of personality traits. Again, the different level of analysis helps clarify this issue. An important contribution of the Sociogenomic model is that the environment is unlikely to directly influence personality traits ([Roberts & Jackson, 2008](#)). Rather, the environment can modify state-levels directly (e.g., being at work is associated with more conscientious behaviors). Personality traits are inferred from repeated state-level manifestations, each of which necessarily has a context that it manifests within. Thus at the level of broad traits, the trait-elicitting contexts are multifaceted because they necessarily aggregate state-level experiences that range across the broader trait spectrum. For example, self-control necessitates the presence of something tempting ([Tsukayama, Duckworth, & Kim, 2012](#)); without the context it does not make conceptual sense to describe (or infer) someone as being self-controlled. To infer a trait level of self-control requires evidence about self-control states in a number of contexts across time. In this sense, the broad trait is contextualized in that each manifestation of the trait is necessarily embedded within a context. The broad trait domain collapses across the

many different contexts, resulting in what can be thought of as a trait embedded within a generalized context, meaning that the trait is not context-specific but extends to the many different domains wherein it will most likely manifest. In the case of self-control, the dimension is always contextualized as it cannot be inferred in the absence of a tempting offering, such as food, spending, smoking, or sex. As a result, personality traits can be thought of as being able to manifest in a number of different contexts, though not so many as to suggest that context is separate from personality traits.

From the discussion of the Sociogenomic model it is possible to draw three inferences that will guide the discussion of the structure, development, and predictive power of conscientiousness. First, conscientiousness describes both a higher-order, broad construct as well as more fine-grained, state-level thoughts, feelings, and behaviors. As a result, a systematic description of conscientiousness requires the successful integration of these two extremes. Second, the trait of conscientiousness is relatively stable across time but the manifestations may change across situations and time. Identifying the contexts that can shift the state-level experiences may help us understand the mechanisms responsible for the development of conscientiousness, given that the environment cannot directly influence trait levels. Third, measures of conscientiousness are necessarily contextualized, which means that contexts can be used to help understand the mechanisms by which personality traits influence important life outcomes.

The Hierarchical Structure of Conscientiousness

The two-level of division in the Sociogenomic model can be considered a slight oversimplification. For example, there will be intermediary levels of specificity, such as those found at the facet level of conscientiousness. As per the definition, conscientiousness refers to many different and distinct components, which can be ordered hierarchically from broad to narrow. The narrower traits are referred to as facets, with each having a smaller set of state manifestations and contexts. These facets can be broken down even further into the state-level component of behaviors, thoughts, and feelings associated with conscientiousness. Although a number of studies have begun work at identifying the lower-order facet structure of conscientiousness, the best way to understand the lower-order structure is

not to identify a specific level of analyses as is typically done, but rather to work down the level of the hierarchy from the broad trait to state-level manifestations.

Moving from the broad trait of conscientiousness to a basic two-factor structure, conscientiousness consists of a proactive and an inhibitory component (Costa, McCrae, & Dye, 1991; Jackson et al., 2010; Roberts, Chernyshenko, Stark, & Goldberg, 2005). The proactive component refers to being goal oriented and striving to do well in your endeavors, while the inhibitory component refers to being responsible, to delaying gratification, and to controlling impulses. Together, these two overarching components provide a structure under which the rest of the facets can be organized. It should be noted that an alternative perspective finds that the two-facet structure of conscientiousness consists of industriousness and orderliness (DeYoung, Quilty, & Peterson, 2007). Although this two-factor solution may initially seem similar to the proactive and inhibitory components of conscientiousness, empirical examinations of the lower-order structure of conscientiousness shows that industriousness and orderliness fall in the proactive component (Roberts et al., 2005).

As we move down the conscientiousness hierarchy, facets emerge that reflect coherent factors found in many extant facet measures. Three factor solutions typically consist of achievement, self-control, and responsibility (Jackson et al., 2010; Roberts et al., 2005), though few studies have explicitly tested three-factor solutions. Numerous studies find four-factor solutions consisting of orderliness, industriousness, responsibility, and self-control (Jackson et al., 2010; Peabody & De Raad, 2002; Perugini & Gallucci, 1997; Roberts, Lejuez, Krueger, Richards, & Hill, 2014), indicating that a four-facet description is the minimum number of facets needed to accurately describe the breadth of conscientiousness.

Two facets of the four-factor solution, orderliness and industriousness, fall under the proactive domain of conscientiousness. Individuals high in orderliness like to be neat and clean, and situate their belongings in an organized fashion (Jackson et al., 2009). To a lesser extent, orderliness also includes a proclivity toward making and adhering to plans, such as utilizing to-do lists and planners that aide in a more organized and orderly day. The facet of industriousness reflects how hard-working you are, as well as your ability to persevere in the face of challenges and setbacks. Industrious individuals like to finish what they start, going so far as to work long hours

or even to take on extra work in order to do a thorough job (Jackson et al., 2010). Individuals low in industriousness can be considered more economical in the way they apply themselves, and may be more likely to avoid work, procrastinate, and give up when facing a challenge.

The facet of responsibility has both inhibitory and proactive components and describes a tendency to uphold obligations and follow rules. Those high in responsibility are less likely to break promises, miss appointments, or oversleep whereas those low in responsibility may be described as unreliable or flighty and would be more likely to bend or break rules (Jackson et al., 2010). Responsibility tends to be strongly associated with the trait of agreeableness, likely due to the fact that many obligations and responsibilities manifest in interpersonal contexts. In this respect, responsibility can be seen as an “interstitial” trait that lies equidistant between conscientiousness and agreeableness.

Self-control reflects the inhibitory side of conscientiousness and refers to the ability of a person to inhibit impulses, to have forethought, and to avoid being reckless or out of control. Individuals high in self-control are able to put off immediate gratification in order to attain longer-term goals. For example, those high in self-control are less likely to make impulsive purchases, to put off or cancel plans at the last minute, and burst out in anger when feeling frustrated (Jackson et al., 2010).

Additional facets of conscientiousness beyond these four also appear in the literature, depending on the initial item pool and the number of factors extracted (Roberts et al., 2014). Three additional facets of traditionality, formality, and punctuality are of particular note as they replicate across two or more studies and reflect domains mostly distinct from the four-factor solution (MacCann, Duckworth, & Roberts, 2009; Perugini & Gallucci, 1997; Roberts et al., 2004, 2005). Traditionality is the inclination to support and follow the norms of society in order to maintain good social environments. Individuals high in traditionality are more likely to uphold family and cultural traditions, whereas individuals low in traditionality can be described as nonconforming or unconventional (Roberts et al., 2004). Traditionality also extends to having more conventional or conservative beliefs, particularly within the political and spiritual spectrum, and is closely related to low openness to experience (Johnson, 1994). Formality is associated with the tendency to have a sense of propriety, including being polite and proper, and keeping your physical appearance neat and clean.

Those high in formalness may call others by formal titles, say please and thank you, and are less likely to swear (Jackson et al., 2010). Punctuality describes the practice of doing things in a timely manner and could be considered the narrowest facet of conscientiousness in terms of concrete behaviors. Interestingly, punctuality is equally related to each of the other facets of conscientiousness, unlike the other facets of conscientiousness, and thus serves as a useful marker for overall levels of conscientiousness (Jackson et al., 2010). That is to say, being punctual appears important when considering your ability to plan (orderliness), work hard to get somewhere (industriousness), avoid temptations that might lead to being late (self-control), and care enough to meet other people on time (responsibility).

Further down the hierarchy five, six, eight, and even nine components have been proposed (Costa & McCrae, 1992; Jackson et al., 2009; MacCann et al., 2009; Peabody & De Raad, 2002; Roberts et al., 2004, 2005; Saucier & Ostendorf, 1999). Part of the difficulty in interpreting these factor structures is that the names used for each facet differ across measures; one researcher's traditionality is another's conventionality. Moreover, beyond four factors the structure does not replicate well, most likely because the initial item pools vary in breadth of content. Despite these differences there has been more work on the facet structure of conscientiousness than on any other Big Five trait.

Moving to narrower levels of the hierarchy leads to the state-level experiences associated with conscientiousness. Typical measures of conscientiousness collapse items that assess the different state-level manifestations of thoughts, feelings, and behaviors (Pytlak Zillig, Hemenover, & Dienstbier, 2002; Werner & Pervin, 1986). It is possible that two people score the same on a broad measure of conscientiousness but manifest it in different ways depending on the relative contributions of the facets of conscientiousness and their respective thoughts, feelings, and behaviors. Moreover, the pathways and associations between conscientiousness and important life outcomes may vary by manifestation (Roberts, Jackson, Burger, & Trautwein, 2009). As a result, it can be informative to investigate the structure of conscientiousness states separately from the other manifestations. Is there more breadth in the types of conscientious behavior compared to conscientious thoughts? Or does the structure of conscientious behaviors mirror the structure of conscientious

questionnaires? Thus far, only the hierarchical structure of conscientious behaviors has been investigated, with the results largely mirroring the structure found in questionnaires (Jackson et al., 2010). However, some important differences emerge, such that laziness overtakes industriousness as a major factor. This is partially due to industriousness being contextualized within work, whereas behaviors associated with laziness may exist across multiple domains. It is possible that existing conscientiousness measures do not adequately assess a wide-enough set of contexts or that they oversample personality states within the context of a particular job.

As seen with laziness, the contextual aspect of conscientiousness begins to emerge more clearly at this level of analysis. For example, orderliness manifests itself at home and at the workplace through cleanliness behaviors, whereas responsible behaviors typically include other persons. Understanding the contexts associated with conscientious behaviors is theoretically important because it helps identify the experiences that lend themselves to the expression of conscientiousness. Understanding the experiences that matter for conscientiousness can help inform a number of important areas of inquiry: person–environment transaction, if–then contingencies, processes of personality development, and the causal factors between personality and important life outcomes.

Measures of Conscientiousness

Many measures of conscientiousness exist, ranging from broad omnibus inventories that include facets to brief assessments of a few items designed to assess the broad trait (Mike, Harris, Roberts, & Jackson, 2015). Although the choice of which measure depends upon the researcher's needs and time constraints, we should emphasize the gains in specificity and reliability when using broad measures (see also the chapter by L. Simms, Williams, and E. Simms). As seen below, some existing measures of conscientiousness do not assess all facets of conscientiousness or weight them equally; the unfortunate result is that measures of conscientiousness cannot be adequately compared with one another. Adding to the confusion is that many omnibus measures that include facet measures have names that are specific to the scale, making comparisons across measures difficult.

Likely, the most common measure of conscientiousness is the 48-item NEO Personality Inventory-Revised (NEO PI-R) and the shorter 12-item version within the NEO-Five Factor Inventory (NEO-FFI; [Costa & McCrae, 1992](#)). The NEO PI-R measures six facets: Competence (closely related to the facet of industriousness), Order (orderliness), Dutifulness (responsibility), Achievement Striving (industriousness), Self-Discipline (orderliness), and Deliberation (self-control). The NEO-FFI was not designed to assess facets, but broadly captures the facets of orderliness, industriousness, and responsibility ([Chapman, 2007](#); [Saucier, 1998](#)).

The facets of conscientiousness found within the NEO PI-R and NEO-FFI tend to focus on industriousness and orderliness ([Roberts et al., 2005](#)), and thus may not necessarily reflect the best assessment in terms of breadth. A number of other measures describe various facet-level conceptualizations of conscientiousness, each of which offers some advantages. The Abridged Big Five Circumplex (AB5C; [Hofstee, de Raad, & Goldberg, 1992](#)) includes nine facets of conscientiousness but, unfortunately, does not adequately cover all the facets of conscientiousness discussed above ([Roberts et al., 2005](#)). Instead, the facets of the AB5C mainly assess industriousness and orderliness with a single facet measure designed to tap self-control. In contrast, the Chernyshenko Conscientiousness Scales (CCS) consists of six facets with 10 items per facet ([Hill & Roberts, 2011](#)). Five of the six facets assess previously described facets (orderliness, self-control, responsibility, traditionalism, and industriousness), making it one of the only measures that adequately taps the major facets of conscientiousness. The sixth facet, virtue, assesses the tendency to be responsible members of the community by being honorable and rule abiding. It shares some overlap with the responsibility facet but is broader in scope and concerns issues of right and wrong rather than the tendency to follow through with personal obligations. Another quality facet measure is the 20-item measure from the HEXACO-Personality Inventory ([Lee & Ashton, 2008](#)). In this scale, conscientiousness is measured by assessing four facets: Organization (orderliness), Diligence (self-control/industriousness), Perfectionism (orderliness/industriousness), and Prudence (self-control). Finally, the Conscientiousness Adjective Checklist (CAC; [Jackson et al., 2009](#)) measures most of the identified facets of conscientiousness, including Orderliness, Industriousness, Self-Control, Responsibility, Conventionality, and Decisiveness ([Roberts et al., 2004](#)).

Many options also exist for medium to brief measures of conscientiousness, where there is less need for a facet level of analysis. The most common is the nine items that assess conscientiousness using the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991), which appears to mainly assess the self-control and order components of conscientiousness (Soto & John, 2009). Other medium-length options include 10- and 20-item International Personality Item Pool conscientiousness measures (Goldberg et al., 2006), as well as the 8-item minimarker scale (Saucier, 1994) and the 6-item Five Factor Model Rating Form (Mullins-Sweatt, Jamerson, Samuel, Olson, & Widiger, 2006). In terms of short measures, the most popular is the Ten-Item Personality Inventory (TIPI), consisting of just two items (Gosling, Rentfrow, & Swann, 2003). Though longer measures are generally preferable (Credé, Harms, Niehorster, & Gaye-Valentine, 2012), short measures such as the TIPI do provide an adequate assessment of conscientiousness if you are under extreme time constraints.

Conscientiousness by Another Name

Numerous constructs in related fields are associated with the broad trait and facets of conscientiousness. Many of these constructs have rich literatures that could inform the measurement, development, and predictive ability of conscientiousness. However, as is typical with the narrow focus of academia, these literatures mostly remain separate from one another with some researchers suggesting that constructs related to conscientiousness are meaningfully different in terms of malleability or causal status (e.g., Bogg & Roberts, 2013). Many of these variables though should be considered related to or even synonymous with conscientiousness.

Impulsivity (or impulse control) is strongly related to the facet of self-control, and thus should be considered a facet of conscientiousness, though it is not always viewed this way. One reason that impulsivity is not seen as a component of conscientiousness is that many measures of conscientiousness neglect the self-control facet and instead overly weight the orderliness and industriousness facets (Roberts et al., 2005). Another reason for this confusion is the multidimensional nature of impulsivity, such that impulsivity is often linked with the Big Five traits of extraversion and neuroticism in addition to conscientiousness (DeYoung, 2011; Whiteside & Lynam, 2001). The relationship with multiple traits stems from the plurality

of reasons we may behave impulsively. One possibility is through sensation seeking, reflecting the approach component of extraversion (Revelle, 1997; Zuckerman, Eysenck, & Eysenck, 1978). Impulsive behavior may also manifest as neuroticism, in which impulsive actions are likely to occur because of emotional instability (Costa & McCrae, 1992). However, continuing evidence indicates that most measures of impulsivity are primarily related to conscientiousness (Paunonen, 1998; Roberts et al., 2004). Going by the four-factor structure of impulsivity—consisting of sensation seeking, felt-urgency, premeditation, and perseverance—it appears that the latter two most closely align with conscientiousness whereas the first two tap extraversion and neuroticism, respectively (Whiteside & Lynam, 2001).

A closely related construct to impulse control is constraint, which is typically measured by the Multidimensional Personality Questionnaire (Tellegen, 1982). Temperament researchers have defined constraint as individual differences in the tendency toward planfulness and a focus on the future rather than on risk taking and recklessness (Clark & Watson, 2008). Constraint is associated with most facets of conscientiousness (Gaughan, Miller, Pryor, & Lynam, 2009), indicating that constraint can be viewed as a slightly broader version of conscientiousness that may also include aspects of agreeableness (Markon et al., 2005).

The self-control facet of conscientiousness is often used interchangeably with impulsivity and constraint, though it is necessary to be careful as a slightly broader definition of self-control is used within the self and identity field. Here self-control is defined as “the capacity for altering one’s own responses, especially to bring them into line with standards such as ideals, values, morals, and social expectations, and to support the pursuit of long-term goals” (Baumeister, Vohs, & Tice, 2007, p. 351). In addition to items that tap impulsivity, this measure of self-control (Tangney, Baumeister, & Boone, 2004) also includes items that assess facets of industriousness, responsibility, and punctuality. As a result, it can be conceptualized as a broad measure of conscientiousness, though typical studies using this measure distance themselves from the Big Five literature and perceived baggage that comes with a personality trait model.

The more recently developed construct of grit has also gained attention due to the ability to predict school achievement (Duckworth, Peterson, Matthews, & Kelly, 2007; Tough, 2013). Grit is defined as the ability to

sustain interest and effort toward long-term goals and thus is conceptually similar to the facet of perseverance, industriousness and self-control. Given that conscientious individuals tend to strive toward goals and achievements (Roberts, Jackson, Fayard, et al., 2009), it is not surprising that an extremely high correlation between grit and conscientiousness exists, nearing maximum levels possible based on reliability (Duckworth & Quinn, 2009).

Another developmental construct related to conscientiousness is effortful control, which refers to the ability to inhibit a dominant response to perform a subdominant response, to detect errors, and to engage in planning (Kochanska, Murray, & Harlan, 2000; Rothbart & Rueda, 2005). Importantly, effortful control is thought of as an intentional process aimed at regulating goal-directed processes (Eisenberg, Smith, Sadovsky, & Spinrad, 2004). As a result, effortful control should be related to the inhibitive components of the two-factor structure of conscientiousness. Similarly, others have viewed effortful control in the context of two-mode models, with effortful control indexing the reflective control aspect of self-control, in contrast to the more reactive quick mode that drives impulses (Carver, Johnson, & Joormann, 2008). In line with these ideas, various measures of effortful control are associated with measures of self-control and conscientiousness (Evans & Rothbart, 2007; MacDonald, 2008). Although effortful control is often discussed alongside the construct of executive functioning, it should be noted that most tasks that assess executive functioning are not strongly associated with conscientiousness broadly construed (Duckworth & Kern, 2011; Edmonds, Bogg, & Roberts, 2009).

Self-regulation, in contrast, is broader than effortful control and can be thought of as including regulation of both emotion and behaviors. Similar to effortful control, behavioral self-regulation is defined as being able to control your thoughts, feelings, and behaviors in an effort to act in goal-directed ways (e.g., Hoyle, 2010). In contrast to conscientiousness, most research on self-regulation focuses on the state levels of the Sociogenomic model. Accordingly, self-regulation relates closely to the state-level manifestations of the facets of self-control and industriousness. One interesting aspect of the self-regulation literature is the tendency to relate the behaviors to motivation, a label often used to describe conscientiousness. For example, pursuing personal goals and giving up on

unattainable goals are associated with adaptive self-regulation (Wrosch, Scheier, Miller, Schulz, & Carver, 2003).

Delay of gratification is another term that is definitionally similar to components of conscientiousness, notably self-control (e.g., Mischel, Shoda, & Rodriguez, 1992). A number of studies have demonstrated that children differ in their ability to refrain from immediate gratification in order to receive a more desirable outcome in the future (Mischel et al., 1992). A recent study finds that the marshmallow task, the quintessential measure of delay of gratification, correlates strongly with conscientiousness and influences life outcomes primarily through indexing the facet of self-control (Duckworth, Tsukayama, & Kirby, 2013).

Development of Conscientiousness over the Lifespan

Conscientiousness, like all personality traits, is a developmental construct that is relatively consistent across the lifespan, but also undergoes change. Part of the apparent contradiction between consistency and change stems from the multiple ways to define change and stability (Caspi, Roberts, & Shiner, 2005). In terms of rank order consistency, assessed by the correlation between two assessments, the consistency of conscientiousness increases steadily with age until plateauing between the ages of 50 and 70 years (Roberts & DelVecchio, 2000), and then declining in old age (Lucas & Donnellan, 2011). This means that people who are above average on conscientiousness as a child will likely be above average on conscientiousness as an adult.

In contrast to the relative rank orderings between people, mean level, or absolute changes may also occur. Across a number of cross-sectional and longitudinal studies conscientiousness tends to increase from young adulthood up to the age of 60 years (Allemand, Zimprich, & Hendriks, 2008; Roberts, Jackson, Burger, et al., 2009; Soto & John, 2012; Terracciano, McCrae, Brant, & Costa, 2005). This normative pattern of development replicates across a number of different cultures and countries, including Germany, Italy, Portugal, Croatia, and South Korea (McCrae et al., 1999), as well as Vietnam (Walton et al., 2013). Out of all of the Big Five traits, conscientiousness is the trait that evidences the largest absolute increase across the lifespan.

Despite the general pattern to increase in conscientiousness across the lifespan, the rate and direction of change differ from decade to decade. In late childhood and adolescence, conscientiousness declines during puberty and the teenage years before beginning to increase in young adulthood (Soto, John, Gosling, & Potter, 2011). Most of the increases in conscientiousness occur during young adulthood with the increases subsequently tapering off during middle age (Roberts, Walton, & Viechtbauer, 2006). The pattern of change shifts during older adulthood, to declines in conscientiousness, perhaps due to the onset of retirement or a byproduct of decreased health (Lucas & Donnellan, 2011; Wortman, Lucas, & Donnellan, 2012).

Viewing conscientiousness at a facet level reveals a more nuanced developmental story. Self-control and responsibility increase in young adulthood and continue to increase into old age, mirroring the trends found at the broad trait level (Jackson et al., 2009; Soto et al., 2011). Industriousness tends to change the most during young adulthood, with some evidence of increases continuing to occur throughout the lifespan (Jackson et al., 2009; Soto & John, 2012; Terracciano et al., 2005). Two facets prove unique. Conventionality does not change from young adulthood to middle adulthood, but appears to change during older adulthood (Jackson et al., 2009). Orderliness, on the other hand, undergoes almost no changes across the lifespan compared to the other facets (Jackson et al., 2009; Soto et al., 2011; Soto & John, 2012). Overall, increases in conscientiousness earlier in life can be thought of as mainly resulting from increases in impulse control, responsibility, and industriousness, whereas increases in later adulthood are driven by changes in impulse control, reliability, and conventionality.

Despite these mean level patterns, a significant amount of people do not change at all on conscientiousness, or perhaps even decrease (Lüdtke, Roberts, Trautwein, & Nagy, 2011). These individual differences in change indicate that the environment plays a role in personality development (Roberts, Wood, & Caspi, 2008). Again, the Sociogenomic model can help understand how the environment can “get under the skin” and influence personality trait development. Environments typically influence the state-level manifestations of personality—the behaviors, thoughts, and feelings of personality—rather than directly influence trait levels. However, if the environment presses for long-term shifts in states related to personality, it

may lead to changes to personality traits in a bottom-up fashion (Roberts, 2009; Roberts & Jackson, 2008). For example, being invested in your performance at school likely results in expectations to behave and potential punishments if you do not achieve at high levels. These expectations lead to experiences that shape and change your daily state-level manifestations. Over time, success at school—due to following through with expectations such as going to class or doing homework—would lead to shifts in how you view yourself. These views may be internalized and translate into other domains, not just the school context. Furthermore, the skills accrued within one domain would likely translate to other domains (e.g., the ability to manage responsibilities from multiple classes is a skillset applicable to work and personal life). Researchers are just beginning to document the experiences responsible for the development of conscientiousness. Progress is slow because of the difficulties in assessing experiences and teasing apart the influence of selection bias (Jackson & Allemand, 2014). However, a number of studies find theoretically meaningful life experiences associated with changes in conscientiousness.

Some of the most influential experiences relate to achievement, particularly within academic and occupational settings. For example, students tend to increase in conscientiousness during the final year of high school, likely in preparation for the new responsibilities they anticipate taking on in college or in the workforce (Bleidorn, 2012). However, individual experiences are important as not everyone follows this pattern. Those who are not invested in school tend to change less compared to those who are invested in school (Bleidorn, 2012; Jackson, Lüdtke, & Trautwien, 2015). Leaving school and obtaining your first job is also associated with increases in conscientiousness (Specht, Egloff, & Schmukle, 2011), presumably due to new responsibilities associated with your first job. In line with this idea, individuals who invest in and are satisfied with their occupation evidence increases in conscientiousness (Roberts, Caspi, & Moffitt, 2003), whereas people who deinvest in work, such as committing counterproductive work behaviors, demonstrate declines (Hudson, Roberts, & Lodi-Smith, 2012).

Change in conscientiousness also relates to health and health care behaviors. For example, not surprisingly, enacting negative health behaviors is detrimental to your health. Substance abuse is associated with nonnormative decreases in conscientiousness (Roberts & Bogg, 2004). In

contrast, those who demonstrate the normative increases in conscientiousness will have better self-reported health and fewer sick days at work (Magee, Heaven, & Miller, 2013; Takahashi, Edmonds, Jackson, & Roberts, 2013; Turiano et al., 2012). The increases in conscientiousness likely reflect increases in the ability and tendency to take care of oneself. Consistent with this notion, increases in conscientiousness are associated with increases in preventive health behaviors, such as healthy eating, exercising, and safe driving (Takahashi et al., 2013). Similarly, decreases in alcohol usage are related to increases in conscientiousness (Littlefield, Sher, & Wood, 2009, 2010). Changes in health behaviors also are related to changes in health status, suggesting that changes in conscientiousness may be able to lead to changes in physical health (Takahashi et al., 2013).

Romantic relationships also appear important for the development of conscientiousness. Becoming involved in your first romantic relationship is associated with increases in conscientiousness (Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007). The length of a relationship is also associated with increases in conscientiousness, such that women who were married longer showed greater increases in conscientiousness (Roberts & Bogg, 2004). Increases in conscientiousness likely reflect the maintenance of daily behaviors that keep a relationship healthy, given that conscientiousness influences the quality of romantic relationships (Solomon & Jackson, 2014a). Ending a long-term relationship may also shape conscientiousness, though evidence suggests the effects depend on gender. One study found that conscientiousness increases after a divorce (Specht et al., 2011), whereas another study consisting solely of women found that women decreased in conscientiousness after a divorce (Roberts & Bogg, 2004). Though further research is needed to determine the nature of these findings, one possible explanation is that divorced women may have fewer responsibilities because they no longer have to take care of their husbands, resulting in lower levels of conscientious, whereas men's responsibilities may increase after a divorce. Extending beyond romantic relationships, there also appears to be an association between social relationships and the development of conscientiousness (Hill, Payne, et al., 2014), but further work is needed to tease apart the mechanisms responsible.

The Predictive Utility of Conscientiousness

Much of the interest in conscientiousness stems from its ability to predict a wide swath of important life outcomes, sometimes decades in advance. Even more astonishing is that the strength of the association is better than or equal to other potential predictors, such as intelligence and socioeconomic status, which are considered the best psychological predictors (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). The pathways linking conscientiousness to life outcomes are typically thought to result from behaviors associated with conscientiousness (e.g., Bogg & Roberts, 2004), though many other pathways may exist (e.g., Shanahan, Hill, Roberts, Eccles, & Friedman, 2014). In this section, many of the outcomes predicted by conscientiousness are presented and some possible mechanisms are discussed.

Although not without some negative ramifications (Samuel & Widiger, 2011), conscientiousness has a positive impact across a wide array of important life outcomes. For instance, conscientiousness is one of the best predictors of academic success (Bratko, Chamorro-Premuzic, & Saks, 2006; Noftle & Robins, 2007). Conscientious students tend to have better grades (Poropat, 2009; Trautwein, Lüdtke, Roberts, Schnyder, & Niggli, 2009), especially those high on the facet of self-control (Noftle & Robins, 2007; Paunonen & Ashton, 2001; Trautwein et al., 2009). In general, the association with academic success is due to conscientious students devoting more time to studying, completing projects, and turning assignments in on time (Credé & Kuncel, 2008; Duckworth & Carlson, 2013). The behaviors likely result from high levels of motivation to succeed and the belief that you will be successful within school settings (Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011). The repertoire of successful school behaviors and the identity of being a successful student aid conscientious students in persevering when facing difficult or stressful courses (Corker, Oswald, & Donnellan, 2012).

Conscientiousness also relates to success in the transition from school to the work force (see also the chapter by Sutin). Highly conscientious people earn more money (Roberts, Jackson, Duckworth, & Von Culin, 2011), are more satisfied with their jobs (Ng, Eby, Sorensen, & Feldman, 2005), and are more likely to receive promotions (Ng et al., 2005; Solomon & Jackson, 2014b). These benefits occur because effective school behaviors translate to effective workplace behaviors that result in greater occupational success. For example, conscientious individuals do not demonstrate many

counterproductive workplace behaviors such as stealing, drinking on the job, being tardy, or missing work (Mount, Ilies, & Johnson, 2006; Roberts, Harms, Caspi, & Moffitt, 2007). The effective behavior of highly conscientious individuals likely results from having greater career achievement goals and better attitudes toward their workplace environment (Ng et al., 2005). In general, highly conscientious individuals are more committed and invested in their jobs (Sutin & Costa, 2010). Finally, there is evidence that the relationship between conscientiousness and achievement domains like school and work extends into older adulthood. Conscientious individuals are more likely to volunteer when they are retired compared to when they are working (Mike, Jackson, & Oltmanns, 2014). These findings suggest that volunteering changes meaning for conscientious individuals: when conscientious individuals retire they lose an important niche and hence are more likely to fill their time with a meaningful activity, such as volunteering.

Conscientiousness is one of the strongest predictors of physical health (Hampson, 2012). Conscientiousness predicts fewer self-reported health problems (Lodi-Smith et al., 2010; Turiano et al., 2012) as well as more objective markers, such as physician-rated health status (Chapman, Lyness, & Duberstein, 2007) and various biomarkers associated with health status (Hampson, Edmonds, Goldberg, Dubanoski, & Hillier, 2013; Israel et al., 2014; Moffitt et al., 2011), a decrease in onset of major diseases such as a stroke or a heart attack (Sutin, Ferrucci, Zonderman, & Terracciano, 2011; Weston, Hill, & Jackson, 2015), Alzheimer's disease (Terracciano et al., 2013; Wilson, Schneider, Arnold, Bienias, & Bennett, 2007), and even increased longevity (Hill & Roberts, 2011; Jackson, Connolly, et al., 2015; Jokela et al., 2013; Kern & Friedman, 2008; Roberts, Harms, et al., 2007). The relationship between conscientiousness and health exists across the entire lifespan, as childhood and young adult-rated conscientiousness predicts health and mortality decades later (Freidman et al., 1993; Hampson et al., 2013; Jackson, Connolly, et al., 2015).

The primary mechanism is an increase in health-related behaviors, though many other pathways exist (Shanahan et al., 2014). Conscientious individuals engage in more health prevention behaviors, such as exercising and eating healthy (Lodi-Smith et al., 2010), and are also less likely to smoke, use drugs, abuse alcohol, or engage in risky driving or sexual behaviors (Bogg & Roberts, 2004; O'Connor, Conner, Jones, McMillan, &

Ferguson, 2009; Turiano et al., 2012; Weston & Jackson, 2015). If health issues do arise, conscientious individuals are more likely to adhere to their medical regimens (Hill & Roberts, 2011). By following their doctors' advice, and taking prescribed medications as needed, they are better able to overcome health ailments and prevent future poor health. Furthermore, conscientiousness helps people effectively respond to health issues, such as the onset of a major disease, by modifying their previous health behaviors (Weston & Jackson, 2015).

High levels of conscientious can even seep over and influence the health of your family. For example, diabetic children whose mothers are high in conscientiousness tend to have better blood sugar control (Vollrath, Landolt, Gnehm, Laimbacher, & Sennhauser, 2007). Marrying a partner high in conscientiousness also leads to better health, presumably through the ability of your spouse to shape health-related behaviors such as improved eating and exercise habits (Roberts, Smith, Jackson, & Edmonds, 2009).

Conscientiousness also plays a role in the success and maintenance of romantic relationships. Conscientious people are less likely to get divorced (Roberts, Harms, et al., 2007). This is likely a result of the fact that people high in conscientiousness have higher levels of relationship satisfaction and commitment levels (Dyrenforth, Kashy, Donnellan, & Lucas, 2010; Solomon & Jackson, 2014a). High levels of satisfaction and commitment reflect an accumulation of day-to-day experiences that strengthen the relationship along with fewer experiences that jeopardize the relationship (Hill, Nickel, & Roberts, 2014). In terms of strengthening experiences, conscientiousness is associated with relationship maintenance behaviors (Baker & McNulty, 2011), such as engaging in constructive problem solving. Conscientious individuals are also more forgiving, which would help resolve long-term grudges among couples (Hill & Allemand, 2012). In terms of negative behaviors, conscientiousness is associated with lower levels of cheating (Buss & Shackelford, 1997) and physical and mental abuse (Buss, 1991; Hines & Saudino, 2008).

The influence of conscientiousness stretches beyond the broad domains of work, health, and relationships and into less desirable outcomes. Low levels of conscientiousness predict greater engagement in criminal behaviors, greater arrest rates, and longer sentences (Clower & Bothwell, 2001; Jones, Miller, & Lynam, 2011; Wiebe, 2004). Levels of conscientiousness also have financial repercussions. Those low in

conscientiousness have difficulties saving money, and as a result have worse credit scores ([Bernerth, Taylor, Walker, & Whitman, 2012](#); [Webley & Nyhus, 2006](#)) and lower net worth ([Mroczek et al., 2015](#)). People low in conscientiousness are also more prone to gamble, particularly if they are highly impulsive ([Bagby et al., 2007](#)).

Summary

Conscientiousness is a personality trait that taps into the regulatory system in humans and appears, therefore, to be a critical focal point for optimal functioning. Best thought of as a domain rather than a unitary entity, conscientiousness subsumes multiple components or facets, such as self-control, orderliness, industriousness, and responsibility. The faceted structure alludes to the fact that conscientiousness is a hierarchical domain that can be examined and manifested from broad to narrow levels and encompasses state as well as trait levels of analysis. The multifaceted structure must be taken into consideration when choosing assessment methods, as different measures emphasize some facets over others. Consistent with the emerging consensus on personality traits, conscientiousness is a developmental construct and therefore shows both continuity and change throughout the life course. Finally, conscientiousness appears to play a positive role in the major life domains of work, love, and health. Although not without some negative ramifications, conscientiousness is clearly a personality trait that deserves greater attention given the pervasive positive impact it has on people's lives.

SECTION 2

Construct Validity

Brian P. O'Connor

Abstract

This article examines the effectiveness of the Five Factor Model (FFM) in capturing or duplicating the scales and primary dimensions found in other personality inventories. It considers the robustness—or “comprehensiveness”—of the FFM at both the scale and dimensional structure levels, as well as the nature and extent of the evidence for the FFM as an integrative, organizational framework for other personality tests. “Robustness” here refers to the tendency for the FFM dimensions to keep showing up in a wide range of old and new measures that were designed to assess supposedly unique and important other constructs. This article begins with a review of the primary findings that were reported by O'Connor (2002) before discussing the nature of dimensions in personality psychology data. It then evaluates the robustness of the FFM at the dimensional structure level and suggests directions for further research at the scale and dimensional structure levels.

Key Words: Five Factor Model, personality, scales, dimensions, personality inventories, robustness, personality tests, personality psychology, comprehensiveness

This chapter focuses on the degree to which the Five Factor Model (FFM) captures the scales and primary dimensions that exist in other personality inventories. Many hundreds of personality measures have been developed in the history of our discipline. There must surely be a map or a family tree that organizes and simplifies this complex world of tests. Can the FFM fulfill such a role? [McCrae and Costa \(1986\)](#) claimed that FFM “offers a universal and comprehensive framework for the description of individual differences in personality” (p. 1001), and there have been many empirical reports on the overlap between the FFM and various other measures of personality. Many reviewers have also used the FFM to organize, summarize, and integrate personality research literatures (e.g., [Feingold, 1994](#); [Funder, 2001](#); [Ozer & Benet-Martinez, 2006](#); [Ozer & Reise, 1994](#); [Roberts & Del Vecchio, 2000](#); [Segerstrom, 2000](#); [Shiner & Caspi, 2003](#)). This chapter provides an overview of the nature and extent of the evidence for the FFM as an integrative, organizational framework for other personality tests.

The term “robustness” is here used to refer to the tendency of the FFM dimensions to keep showing up in a wide range of old and new measures of personality that were designed to assess supposedly unique and important other

constructs. “Robustness” is clearly related to “comprehensiveness.” These three terms will sometimes be used interchangeably with the understanding that the sole focus is on the FFM in relation to other measures. The question of whether the FFM is also comprehensive with regard to lexical personality data is beyond the scope of the present review (see [Almagor, Tellegen, & Waller, 1995](#); [Goldberg, 1993](#); [John, Naumann, & Soto, 2008](#); [McCrae & Costa, 1995](#); see also the chapter by [de Raad and Mlačić](#)).

It is also important to distinguish between robustness at the scale level and robustness at the dimensional structure level. This distinction has rarely been made in previous work and it is important both empirically and theoretically. The previous neglect of this distinction has apparently led to misunderstandings and ongoing controversies.

This chapter begins with a reprise of the primary findings that were reported in a previous article, “A quantitative review of the comprehensiveness of the FFM in relation to popular personality inventories” ([O’Connor, 2002](#)). This is followed by suggestions for further research at both the scale and dimensional structure levels.

One possible interpretation of the claim that the FFM “offers a universal and comprehensive framework for the description of individual differences in personality” ([McCrae & Costa, 1986](#), p. 1001) is that the FFM should capture most of the variance in other personality scales. This was my own initial understanding as a student and there seemed to be a close analogy with the primary colors in perception. Just as the many different colors of light can be produced from different blends of the three primary colors (red, green-yellow, and blue), different personality traits should perhaps be reducible to different blends of a small number of primary traits, such as the FFM dimensions. If the FFM is universal and comprehensive, then it should be able to recreate the scores on other measures. In other words, it should capture most of the reliable variance in other measures. In perception, the three primary colors are 100% effective in reproducing all the other colors from the spectrum. How effective is the FFM in capturing or duplicating other personality constructs? This question is important for illustrative purposes, but it raises expectations that are not realistic or fair. First to be reviewed will be the relevant evidence.

Data Sets and Analytic Methods

Much of the work on the appearance of the FFM in other measures has been conducted by McCrae and Costa. In a series of investigations, they have reported associations between their own carefully developed measures of the five factors and the scales of popular personality inventories. To estimate the percentages of variance in other scales that are captured by the FFM, all previous reports of

correlations or factor loadings from joint analyses of FFM variables and other personality inventory scales were gathered. When only factor loadings were available from previous reports, the interbattery correlations were obtained by multiplying a loading matrix by its transpose (Bernstein, 1988; Gorsuch, 1983). The reports were peer-reviewed journal articles that were identified from extensive PSYCHLIT searches (using the terms “five” “factor” “model” and “personality” “test,” “measure,” or “inventory”). The inventories and data sources are listed in [Table 8.1](#). For some inventories, more than one report of associations between the inventory scales and FFM variables was available. Every published data set known to the author was included in the analyses.

The percentage of variance in each personality inventory scale accounted for by the FFM was computed using matrix algebra formulas for *R*-squared that can be found in most multivariate statistics texts (see Bernstein, 1988, p. 104). The computations required both the interbattery correlations and the FFM intercorrelations. In cases in which the FFM intercorrelations were not reported by investigators, the FFM intercorrelations from the relevant manual for their FFM measure [typically a version of the NEO Personality Inventory-Revised (NEO PI-R), Costa & McCrae, 1989, 1992b] were used instead. This introduces a degree of imprecision, but the FFM intercorrelations in the manuals should nevertheless be similar to the unreported correlations in the data from the original articles (any imprecision will serve to attenuate the statistics in the present study). In some cases, investigators reported correlations between inventory scales and orthogonal factor scores for the FFM. A correlation matrix of ones and zeros was therefore used to represent the FFM intercorrelations instead of intercorrelations from manuals. After the *R*-squared values for the individual scales were computed, the mean *R*-squared values for the scales in each inventory were computed.

Variance in Other Measures Accounted for by the FFM

The mean percentages of variance accounted for by the FFM variables for the scales in each inventory are provided in the “Mean Rsq.” column in [Table 8.1](#). These values have typically not been reported in previous work and they are noteworthy because most are in the 30% to 50% range. It should be noted that the mean values hide the fact that the *R*-squared values for some scales in an inventory were small and others were large.

It should also be noted that 100% is not the proper target of the reference point. The column of e^2 values in [Table 8.1](#) (which will be discussed in greater detail below) indicates that most of the percentages of error variance in other scales ranged between 15% and 25%. The FFM cannot be expected to account for the error variances in other tests, which means that the percentages of variance

accounted for by the FFM should be revised upward. So, for example, if the FFM accounts for 50% of the total variation in another measure that has a 15% error variance, then the more accurate percentage of variance is $50/(100 - 15) = 59\%$. When the FFM accounts for 50% of the total variation and the error variance is 25%, the more accurate value is 67%. When the FFM accounts for 30% of the total variation and the error variance is 15%, the more accurate value is 35%. And when the FFM accounts for 30% of the total variation and the error variance is 25%, the more accurate value is 40%.

Table 8.1. Statistics for Data in Personality Inventory Manuals and for Associations with the FFM

Inventory	Personality Inventory Scale Intercorrelations						Associations with the FFM				
	Data Source	N	Number of Factors	h^2	s^2	e^2	Data Source	N	Mean Rsq.	Rv	Rt
ACL	Gough & Heilbrun (1983)	591	5	73	03	24	Craig et al. (1998)	147	39	86	91
							Piedmont et al. (1991)	414	62	95	97
BPI	Maraun & Chrisjohn (1995)	404	2	43	28	29	Costa & McCrae (1992a)	109	23	86	86
							Levin & Montag (1991)	457	25	94	94
							Montag & Levin (1994)	527	38	84	87
CPI	Gough (1987)	1000	3	65	02	33	McCrae et al. (1993)	348	33	74	92
DOTS	Angleitner & Ostendorf (1994)	323	2	25	52	23	Angleitner & Ostendorf (1994)	323	23	99	99
EASI	Angleitner & Ostendorf (1994)	323	3	50	08	41	Angleitner & Ostendorf (1994)	323	43	99	99
EPPS	Edwards (1959)	1509	5	52	24	24	Piedmont et al. (1992)	164	21	60	78
EPPS-N	Sherman & Poe (1970)	315	NA	NA	NA	NA	Piedmont et al. (1992)	166	32	77	81
GZTS	Guilford et al. (1976)	2465	3	49	32	19	McCrae (1989)	180	47	96	96
IAS-R	Wiggins et al. (1983)	132	2	66	20	13	McCrae & Costa (1989a)	315	49	83 ^a	99
ISI	Lorr & DeJong (1986)	303	4	47	34	19	Lorr et al. (1992)	236	43	50 ^a	57 ^a
							McCrae & Costa (1994)	115	39	89	91
JPI	Jackson (1976)	115	4	49	29	22	Paunonen & Jackson (1996)	86	35	76	81
MBTI	Myers & McCauley	55,971	1	24	57	20	Furnham (1996)	160	44	74	76

(1985)

								MacDonald et al. (1994)	161	43	89	89
								MacDonald et al. (1994)	48	62	66	66
								McCrae & Costa (1989b)	201	50	85	85
								McCrae & Costa (1989b)	267	52	88	88
MCMI-I	Millon (1983)	978	3	79	06	15	Costa & McCrae (1990)	207	39	89	91	
								Lehne (1994)	99	45	93	93
MCMI-II	Millon (1987)	769	3	70	20	10	Costa & McCrae (1990)	62	31	67	71 ^b	
								Hyer et al. (1994)	80	14	66	69 ^b
MCMI-III	Millon (1994)	398	2	65	12	23	O'Connor & Dyce (1998)	614	47	97	97	
MMPI-Basic	Dahlstrom et al. (1975)	340	3	60	14	26	McCrae (1991)	274	29	87	88	
MMPI-J	Edwards & Edwards (1991)	842	5	NA	NA	NA	McCrae (1991)	141	24	60	83	
MMPI-C	Costa et al. (1985)	1576	3	43	42	15	Costa et al. (1986)	141	41	69	93	
MMPI-PD	Morey et al. (1985)	475	2	62	11	27	Costa & McCrae (1990)	274	41	96	97	
							Trull (1992)	54	46	96	97	
MMPI- PSY-5	Harkness et al. (1995)	2567	2	45	36	20	Trull et al. (1995)	57	29	91 ^b	91 ^b	
MPQ	Church & Burke (1994)	300	5	28	57	14	Church (1994)	575	34	86	94	
PAI	Morey (1991)	1000	3	62	19	19	Costa & McCrae (1992a)	114	29	91	91	
							Montag & Levin (1994)	583	42	77	90	
							Montag & Levin	286	46	92	95	

										(1994)				
										Morey (1991)	95	42	89	92
PRF	Jackson (1984)	1862	5	47	42	11	Costa & McCrae (1988)	296	37	91	94			
SCL-90-R	Levenson et al. (1988)	1324	1	61	23	16	Smith & Snell (1996)	109	19	99	99			
SDS (Dutch)	De Fruyt & Mervielde (1997)	934	3	44	45	12	De Fruyt & Mervielde (1997)	934	21	85 ^b	87 ^b			
SDS	Holland (1985): females	470	3	54	34	12	Schinka et al. (1997)	645	20	75	88			
	Holland (1985): males	297	2	51	37	12	Schinka et al. (1997)	389	16	63 ^{ns}	75 ^{ns}			
SNAP	Clark (1996)	222	3	42	38	19	Clark (1996)	194	33	93	93			
TCI	Cloninger et al. (1993)	300	1	25	53	22	Cloninger & Svarkic (1994)	136	45	95 ^b	95 ^b			
16PF (Italian)	Caprara et al. (1993)	614	58				Barbaranelli & Caprara (1996)	608	24	96	97			

Note. Decimals are omitted; h^2 = mean proportion of common variance; s^2 = mean proportion of specific variance; e^2 = mean proportion of error variance; NA = data not available; Rv = congruence for varimax rotations; Rt = congruence for targeted rotations; all congruences are significant at the .0001 level, except "a" = $p > .01$; "b" = $p > .001$; "ns" = not significant; the full inventory names appear below, at the end of this table.

Mean Rsq. = mean R squared; ACL = Adjective Checklist (Gough & Heilbrun, 1983); BPI = Basic Personality Inventory (Jackson, 1989); CPI = California Psychological Inventory (Gough, 1987); DOTS-R = Dimensions of Temperament Survey (Windle & Lerner, 1986); EASI = EASI Temperament Inventory (Buss & Plomin, 1975); EPPS = Edwards Personal Preference Schedule ("N" = normative version; Edwards, 1959); GZTS = Guilford-Zimmerman Temperament Survey (Guilford, Zimmerman, & Guilford, 1976); IAS-R = Revised Interpersonal Adjective Scales (Wiggins, Trapnell, & Phillips, 1988); ISI = Interpersonal Style Inventory (Lorr, 1986); JPI = Jackson Personality Inventory (Jackson, 1976); MCMI = Millon Clinical Multiaxial Inventory (Millon); MMPI = Minnesota Multiphasic Personality Inventory ("J" = Johnson et al., 1984, scales; "C" = Costa et al., 1985, scales); MMPI-PD = MMPI Personality Disorder Scales (Morey, Waugh, & Blashfield, 1985); MMPI-PSY-5 = MMPI Psychopathology Five (Harkness, McNulty, & Ben-Porath, 1995); MPQ = Multidimensional Personality Questionnaire (Tellegen, 1985); MBTI = Myers-Briggs Type Indicator (Myers & McCauley, 1985); PAI = Personality Assessment Inventory (Morey, 1991); PRF = Personality Research Form (Jackson, 1984); SCL-90-R = Symptom Checklist (Derogatis, 1983); SDS = Self-Directed Search (Holland, 1985); SNAP = Schedule for Nonadaptive and Adaptive Personality Clark (1996); TCI = Temperament and Character Inventory (Cloninger et al., 1994).

Although effect sizes in the 30% to 50% range, or, more accurately, in the 35% to 67% range, would be considered high and rare in most psychological investigations, the values do not seem particularly impressive when compared to

100%. Although any particular color from the color spectrum can be perfectly replicated by combining the three primary colors, scores on a personality inventory subscale cannot be so precisely replicated by the FFM. This apparently justifies doubts about the comprehensiveness of the FFM (e.g., [Butcher & Rouse, 1996](#), p. 100; [Mershon & Gorsuch, 1988](#)). Proponents of the FFM can point to the considerable associations (percentages of variance accounted for, correlations, or factor loadings) between personality inventory scales and measures of the five factors, whereas critics can point to percentages of variance accounted for that are noticeably lower than 100%.

The FFM is undoubtedly robust in the sense of accounting for noteworthy portions of the variance in most other popular measures. But nonnegligible portions of variance remain unaccounted for. Something is missing. Are there major, hidden, non-FFM branches of the family tree that, if measured, would raise the percentages of variance accounted for to the 100% range? The answer to this question requires an understanding of the nature of dimensions (big branches) in personality psychology data, and it requires a review of the evidence for the robustness of the FFM at the level of dimensional structures.

The Nature of Dimensions in Personality Psychology Data

Is the unaccounted for variance in other measures due to systematic trait dimensions that are not tapped by the FFM? The five dimensions resulted from attempts to simplify the complex world of personality descriptors. Attempts to extract a smaller number of dimensions from a large set of variables necessarily involve a loss of information. Critics are therefore justified in believing that five dimensions are not sufficient to capture the richness and subtleties of specific personality variables or inventory scales. However, “completely accounting for” and “precisely differentiating between” specific personality variables are not goals that can be attained by data reduction models such as the FFM ([Costa & McCrae, 1995a](#), p. 218). Consider the following analogy. When the correlations between personality inventory scales [such as the Minnesota Multiphasic Personality Inventory (MMPI) basic scales] are factor analyzed and no other correlations are included in the analyses, three or four factors typically emerge. These factors describe or summarize the dimensions that underlie the scales, but there will nevertheless be a loss of information and detail about specific scales in this exercise. However, it would obviously be wrong to dismiss the obtained scale factors as inadequate (as critics have dismissed the FFM) because of this loss of information. The FFM cannot be expected to provide representations of personality constructs that are substantially superior to those provided by the data reduction (e.g., factor analytic) solutions for those constructs. Perfect

representations could be obtained only by extracting as many dimensions as there are scales (e.g., in principal components analyses), but this would defeat the purpose of data reduction models. The fact that the FFM contains one or two dimensions more than the number that typically exists in personality inventories suggests the potential for enhanced representations. However, the extra dimensions have clearly not resulted in a complete accounting for every bit of personality variance in every scale. The FFM will probably never achieve this goal, and should not be expected to achieve this goal (Costa & McCrae, 1995a, p. 218).

Concepts from the factor analysis literature can be used to make these points more clear. Distinctions are often made between common, specific, and error variance (Bernstein, 1988, p. 187; Gorsuch, 1983, p. 109). Common variance is the portion of variance in a variable that is shared with other variables. Specific variance is the portion of variance in a variable that is reliably measured but that is unique to the variable. Error variance is also unique to a variable, but is not reliably measured. The FFM as a comprehensive data reduction model should capture the common variance in personality scales that accumulates to form dimensions. However, the FFM will not also capture all the remaining specific and error variances in personality scales and these portions of variance may be substantial. Unfortunately, the total variation in personality inventories has not been broken down and reported in these ways in previous work. Readers of the literature must therefore not only discern, on their own, what portions of variance are accounted for by the FFM, they must also somehow guess what portions of common variance exist in personality inventories, given that they are aware of the distinctions between common, specific, and error variance in the first place.

Costa and McCrae's position on this issue was made clear:

The claim that the FFM is comprehensive does not mean that it exhaustively measures individual differences in personality, any more than a comprehensive examination asks every single question a student should be able to answer on a topic. What the model hypothesizes is that almost every personality trait is substantially related to one or more of the five factors, and that any remaining traits ... form a miscellaneous category rather than covarying to define a sixth or subsequent factor. (Costa & McCrae, 1995a, p. 218)

Trait variance that is not associated with the FFM is clearly believed to take the form of specific variance. However, this clarification appeared in only a footnote in one of McCrae and Costa's papers. Although they have occasionally, briefly added the "common variance" qualification (e.g., Costa & McCrae, 1990, p. 363; McCrae & Costa, 1995, p. 62, 1997, p. 509), many of their descriptions of the FFM as "universal" and "truly comprehensive" have not been accompanied by this qualification (e.g., Costa & McCrae, 1992a, p. 5; McCrae, 1989, p. 243; 1991, p.

399; McCrae & Costa, 1986, p. 1001, 1990, p. vi, 1991, p. 367). Critics have therefore apparently assumed that “comprehensive” means that their favorite personality constructs should be completely captured by the FFM, and the debate has been ongoing. However, progress in the debate over the number and nature of personality dimensions is not likely to be made when there is a preoccupation with capturing specific scales. Progress is more likely to be made by seeking answers to a more basic question that addresses the data reduction nature of the FFM. Does the FFM capture the dimensions that exist in the scales of other personality inventories, or do personality dimensions other than those tapped by the FFM (“a different universe of psychological constructs,” Butcher & Rouse, 1996, p. 100) exist in those inventories? Surprisingly, there have been no quantitative evaluations of this issue in previous work.

At this point, it is useful to recognize what is required for a “dimension” to exist and emerge in data analyses. Dimensions emerge when they summarize substantial portions of variance in the data. Most personality inventories have between 10 and 20 scales and the variation associated with any single scale is not likely to be substantial in this context, unless it is shared with other scales. Bits of scale-specific variance may help precisely describe individual scales, but they will remain crumbs and will not be identified as dimensions unless the same variation also appears on other scales and accumulates into a dimension (i.e., surpasses cut-off criteria that are used to identify dimensions). What seems to be required to make progress in the current debate are ways of determining whether the variation in personality inventories that is not accounted for by the FFM forms “dimensions” of this kind.

The problem has been that identifying dimensions that are not associated with the FFM is not a simple or obvious exercise. When the correlations between personality inventory scales are factor analyzed, the solutions that emerge are often ambiguous and are open to differing interpretations. This is because the various instruments tap some of the five factors more than others. The solutions are blended or aligned differently than FFM solutions and there is too much subjectivity involved in determining whether factors are from the FFM or not. Alternatively, proponents of the FFM have reported correlations between the five factors and personality inventory scales, or they have reported results from joint factor analyses. Proponents are impressed by the magnitudes of the associations, and by how scales are spread across the five factor space. They also claim that no other factors seem to exist in the data. However, critics may remain unimpressed by the same numbers. It thus seems that reports of associations between the five factors and other personality tests, for all to see and judge with their own eyes, have not been as convincing or conclusive as Costa, McCrae, and others probably expected. Quantitative indices of the degree to which the FFM captures the

dimensions in popular inventories are required, yet none has so far been reported in the literature.

Robustness at the Dimensional Structure Level

O'Connor (2002) reported findings from relatively stringent quantitative tests that were designed to help take a small step forward in this debate. The factor structures that exist in previously published associations between the FFM and other inventories were identified and then statistically compared to the factor structures that exist in the inventory scale intercorrelations reported by the test developers (or other independent sources). The tests were thus simple, familiar comparisons of two sets of factor loadings. However, the tests were unique and perfectly suited for the robustness (comprehensiveness) debate because one set of the factor loadings was based solely on the associations between the FFM and other inventory scales. Specifically, interbattery factor analyses (Tucker, 1958) were conducted on previously published data to determine whether the factor structures in popular personality inventories could be replicated using only the known associations between the inventory scales and FFM variables. The statistical method (see Finch, Panter, & Caskie, 1999, for an overview) is easily understood by reference to an example. Figure 8.1 portrays a 10-by-10 matrix of correlations between FFM variables and the 5 MMPI PSY-5 scales.

N	E	O	A	C	Pos	Agg	Con	Neg	Psy
N									
E	FFM						Interbattery		
O	Intercorrelations						Correlations		
A									
C									
					Pos	Agg	Con	Neg	Psy
Pos									
Agg	Interbattery						MMPI PSY-5		
Con	Correlations						Intercorrelations		
Neg									
Psy									

Figure 8.1. Partitioned supermatrix of correlations between FFM scales and MMPI PSY-5 scales.

There are four obvious sections of the “supermatrix” in [Figure 8.1](#): the 5×5 submatrix of FFM intercorrelations, the 5×5 submatrix of MMPI scale intercorrelations, the 5×5 submatrix of correlations between the FFM variables and the MMPI variables, also known as the “interbattery correlations,” and the 5×5 transpose of the interbattery correlations.

Factor analytic techniques are typically applied to complete correlation matrices, that is, to square matrices that contain all of the correlations between variables. For example, regular factor analyses could be conducted on the above supermatrix (which would be a joint factor analysis of the FFM and MMPI variables), or on the 5×5 matrix of FFM intercorrelations, or on the 5×5 matrix of MMPI scale intercorrelations. In contrast, interbattery factor analysis can be conducted on less than complete correlation matrices, such as the above 5×5 matrix of interbattery correlations. The focus on such partial or “submatrices” also involves an adjustment in the interpretations of the results. Regular factor analytic procedures reveal *the dimensions that underlie the variables in complete correlation matrices*, whereas interbattery factor analyses reveal only *the dimensions that underlie the associations between the two sets of variables*. The variance that is shared or is common to two sets of variables (in this case, the variation that is contained in interbattery correlations) may or may not provide an adequate representation of the variation in the original two sets of variables. The factor structure that exists in the interbattery correlations will represent the structure that exists in one set of the original variables (e.g., the inventory scale intercorrelations) only if the variables in the other set (the FFM intercorrelations) are sufficiently comprehensive to capture its structure. If the variables in one set are not comprehensive, then the structure in the interbattery correlations will not greatly resemble the structure in other set of variables.

The exclusive focus in interbattery factor analysis on the variation that is shared among two sets of variables thus provides a uniquely useful tool for assessing the comprehensiveness of the FFM, as it appears in other inventories. The factor structures that are identified in interbattery correlations are direct, unencumbered, and pure representations of the ability of the FFM to capture the dimensions in other inventories. Once identified, these structures can be validated by comparisons with independently obtained factor structures for the inventory scales.

The usefulness of the technique is perhaps best illustrated through contrasts with the procedures that have typically been used in the literature. Researchers have most commonly reported only the interbattery correlations. Some of the coefficients in these matrices may seem large, but the overall picture is ambiguous with regard to the comprehensiveness debate. This is because readers are unable to determine whether the reported interbattery correlations capture the dimensions

that exist in the other personality inventories. Furthermore, the coefficients for some inventory scales in interbattery correlation matrices are often modest, which prompts readers to suspect that other dimensions exist in the data. Interbattery factor analysis can provide direct, unambiguous information on whether the data in interbattery correlations are comprehensive with regard to the factor structures that exist in other inventories.

Researchers have also sometimes reported the results of joint factor analyses of FFM and other inventory scales. This analytic technique has been much less common than the reporting of interbattery correlations, but it is also problematic. In joint factor analysis, information about battery membership is disregarded and factors that are specific to each battery are confounded with between-battery factors ([Cudeck, 1982](#), p. 48; see also [Panter, Tanaka, & Hoyle, 1994](#), p. 119). “The interbattery model, by virtue of its ability to separate battery-specific (method) factors from interbattery (trait) factors, frees the researcher from making interpretations based on what is essentially method variability” ([Finch et al., 1999](#), p. 435). In summary, joint factor analyses are slightly more informative than simple interbattery correlations, but they leave readers wondering about method variance contamination. The reported loading matrix results are also ambiguous because descriptive information about associations between two sets of scales is provided without precise statistical indices of the degree to which the variables in one set capture the structure in the other set.

In the [O'Connor \(2002\)](#) review, interbattery factor analyses were conducted on previously published interbattery correlations involving FFM variables and the scales of other inventories. The results were then compared to the results of factor analyses of inventory scale intercorrelations obtained from independent sources (typically from the inventory manuals published by the test developers). The tests were therefore stringent attempts to provide answers to a simple question: To what extent do factor structures based solely on associations with FFM variables resemble the factor structures in the original personality inventory scale intercorrelations? High degrees of resemblance will suggest that the FFM “captures” the structural dimensions in other inventories, whereas low degrees of resemblance would indicate that the FFM does not sufficiently capture the dimensions in other inventories. In other words, if the structures based solely on the variance that is shared with the FFM are highly similar to the factor structures that exist in the real inventory scale intercorrelations, then untapped dimensions probably do not exist in the data and the FFM can be said to capture the dimensions in other scales. These predictions were tested using data from the published literature for 28 personality inventories.

In summary, controversy has been generated by strong, often unqualified statements regarding the comprehensiveness of the FFM, which have led critics to

focus on the degree to which the FFM completely captures specific personality scales. Greater attention must be given to the distinctions among common, specific, and error variances, and data on these important sources of variation in personality inventories have not been reported or discussed in FFM debates. Readers have also been forced to conduct eyeball assessments of the variation in personality scales that is accounted for by the FFM, because the actual numbers have typically not been reported in previous work. These percentages of variance are clearly less than 100%, yet the seriousness of the apparent deficit cannot be gauged without knowledge of the (unreported) portions of common variance that exist in personality inventories. There have also been no quantitative, statistical tests of the comprehensiveness of the FFM. Reanalyses of published data were therefore conducted to provide (1) the proportions of common, specific, and error variance that exist in the inventory scales; (2) the percentages of variance in inventory scales that is accounted for by the FFM; and (3) quantitative assessments of the degree to which the FFM captures the dimensions that exist in other inventories.

Data Sets and Analytic Methods

The proportions of common, specific, and error variance in personality inventory scale intercorrelations were estimated from the matrices reported by the original test developers. These matrices were typically reported in the test manuals, but sometimes they appeared in other sources (see [Table 8.1](#) for references). Estimations of the specific and error variance components required reliability estimates for the scales, and the internal consistency values reported by the test developers were used for these purposes. In some cases, data were available for both males and females, or for clinical and nonclinical samples. The analyses were conducted on whatever data set was larger and demographically most similar to the samples from which the interbattery correlations were obtained. The interbattery correlations analyzed in this review were from previous reports of correlations or factor loadings from joint analyses of FFM variables and other personality inventory scales, as described above (see [Table 8.1](#)).

Number of factors. Parallel analyses ([Longman, Cota, Holden, & Fekken, 1989](#)) were conducted to determine the number of factors in the personality inventory scale intercorrelations published by the tests developers (typically in the test manuals). A total of 1,000 random data analyses were conducted for each correlation matrix, and the 95th percentile eigenvalues were used to determine the number of factors.

Common, specific, and error variance. The proportions of common variance in the personality inventory scale intercorrelations published by the test developers

were derived from common factor analyses (CFAs). Principal axis factor analyses were conducted on the correlation matrices using the squared multiple correlations as the initial communality estimates on the main diagonal ([Bernstein, 1988](#), p. 187; [Gorsuch, 1983](#), p. 107). The means of the final communalities were then computed, thus providing estimates of the average proportions of common variance in the inventory scales. The mean proportions of error variance were computed by subtracting the scale reliabilities from one, and finding the average of the remainders. The mean proportions of specific variance in the scales were computed by subtracting the communality estimates from the reliabilities and finding the average of the remainders ([Gorsuch, 1983](#), p. 109).

Interbattery factor analyses and varimax rotation. The interbattery factor analysis technique described by [Tucker \(1958\)](#) was used in the present analyses. The computations for Tucker's method are performed on just the interbattery correlations. Tucker's procedure yields a matrix of loadings for each set of variables in the analyses, and the interbattery loading matrices for the personality inventory scales were orthogonally rotated to a simple structure.

Principal axis factor analyses and varimax rotation. Principal axis factor analyses (PAFs) with varimax rotation were then conducted on the correlation matrices reported by the test developers. Principal components analyses were used in the [O'Connor \(2002\)](#) analyses. PAF was used for the present analyses in order to confirm that the findings are essentially the same and do not vary across these two analytic methods.

Congruences between factor solutions. The Tucker–Burt–Wrigley–Neuhaus congruence coefficient was computed to index the degree of similarity between the varimax-rotated loading matrices (see [Guadagnoli & Velicer, 1991](#), and [ten Berge, 1986](#), for reviews). To save space, the Tucker et al. congruence coefficient was computed for all corresponding elements in the matrix comparisons (this procedure was recommended and used by [McCrae, Zonderman, Costa, Bond, & Paunonen, 1996](#)). The result is an overall fit coefficient, based on all factor loadings, instead of multiple congruence coefficients each based on the loadings for single factors. The overall coefficients are roughly equivalent to the mean of the factor congruence coefficients and are efficient summaries of the total degree of fit between two loading matrices (the individual factor congruences provide little additional useful information for the present purposes).

Targeted rotations. Targeted rotations of the PAF loading matrices were also conducted because the structure in a correlation matrix can be viewed from different vantage points and the views provided by popular rotational methods (e.g., varimax) are not necessarily the only or the best vantage points ([Watson, Clark, & Harkness, 1994](#), p. 20). Procrustes targeted rotations are considered most appropriate for testing complex models and for testing models that are not

consistent with a simple structure (McCrae & John, 1992, p. 189). Targeted rotations were used to answer the following question: When the interbattery factor structures are examined from the vantage point that maximizes congruence with the structures in the inventory scale intercorrelations, do the two structures resemble one another?

Tests of statistical significance. For every comparison of an interbattery factor structure with a personality inventory factor structure, 10,000 random data analyses were performed to assess the probability of the obtained congruences emerging solely on the basis of chance. This procedure was described by Paunonen (1997) and is a random data permutation test of statistical significance (Edgington, 1995). This Monte Carlo procedure was also used to assess the statistical significance of the congruence coefficients for the varimax-rotated (non-Procrustes) factor solution comparisons.

Overview of the methods and illustrative data. The primary steps in the analyses are easily summarized. For each inventory:

1. Compute the mean proportions of common, specific, and error variance in the scale intercorrelations reported by the test developers. Parallel analysis was used to determine the number of factors.
2. Conduct an interbattery factor analysis on the interbattery correlations.
3. Perform a varimax rotation on the interbattery factor loadings, and compute the overall congruence between the rotated loadings and the varimax-rotated loadings derived from a PAF of the scale intercorrelations reported by the test developers.
4. Rotate the interbattery factor loadings to maximum congruence with the varimax-rotated loadings derived from a PAF of the scale intercorrelations reported by the test developers.

Illustrative data for the Guilford–Zimmerman Temperament Survey (GZTS; Guilford, Zimmerman, & Guilford, 1976) are provided in Table 8.2. Parallel analysis revealed that there were three factors in the GZTS scale intercorrelations published by Guilford et al. (1976). The varimax-rotated loadings are displayed in the left-most panel of Table 8.2. The Pearson correlations between the GZTS scales and the FFM variables, derived from data published by McCrae (1989), are presented in the second panel. Interbattery factor analysis was performed on these interbattery correlations, and the varimax-rotated loadings are presented in the third panel of Table 8.2. The overall congruence between the rotated interbattery factor loadings (Panel 3) and the rotated loadings from the data of Guilford et al. (Panel 1) was very high ($R_v = .978$). The interbattery factor loadings were then rotated to maximum congruence with the loadings from the data of Guilford et al. (Panel 1), and these targeted rotation loadings are displayed in Panel 4. The overall congruence between these loadings and those in Panel 1 was once again very high ($R_t = .981$).

Results

Number of factors. The results of the parallel analyses for determining the number of factors in the personality inventory correlation matrices are provided in [Table 8.1](#). There were five or fewer factors in every case. The parallel analysis-based numbers of factors for the inventories were used in all subsequent analyses in the present study.

Variance components. The estimated proportions of common, specific, and error variance in the personality inventories, based on data published by the test developers, are also reported in [Table 8.1](#). The proportions of common variance were generally in the .35 to .75 range. The variation in portions of specific variance across inventories is more striking, ranging from close to zero for some inventories and as high as .57 for others. The mean percentages of variance accounted for by the FFM variables (mean *R*-squared values) for the scales in each inventory (see [Table 8.1](#)) are in the 30% to 50% range. The values do not seem particularly impressive when compared to 100%, but they seem much stronger when they are more properly compared to the proportions of common variance in the scales. The mean proportion of common variance was 50.1%, whereas the mean proportion of variance accounted for by the FFM was 38.8%.

Congruences between factor solutions. To examine whether the FFM captures the dimensions that exist in other personality inventories, the interbattery factor loading matrices were compared to the loading matrices for the original inventory scale intercorrelations. The congruence coefficients for the varimax and targeted rotations are listed in [Table 8.1](#), and they were generally very high (over .90) and statistically significant.

The weakest congruences to emerge were for the Edwards Personal Preference Schedule (EPPS; [Edwards, 1959](#)) and the Jackson Personality Inventory (JPI; [Jackson, 1976](#)). However, in all other cases, whenever a relatively low overall congruence coefficient emerged for an inventory based on one set of data, high congruence coefficients were obtained for either other versions of the same inventory or for the same version of the inventory based on analyses of other data (the reasons for the problematic evidence for the EPPS and JPI were described by [O'Connor, 2002](#)). For example, poor replication results emerged for the Millon Clinical Multiaxial Inventory (MCMII; [Millon, 1987](#)), perhaps because the interbattery correlations for this inventory were based on small samples ($N = 62$ and $N = 80$). Yet the congruence coefficients for the MCM-I ([Millon, 1983](#)) and MCM-III ([Millon, 1994](#)) were quite high. The factor structure in the [Johnson, Null, Butcher, and Johnson \(1984\)](#) alternative MMPI scales was not well replicated, yet the factor structures in the MMPI basic scales and in the [Costa, Zonderman, McCrae, and Williams \(1985\)](#) alternative MMPI scales were well replicated. For the Self-Directed Search (SDS; [Holland, 1985](#)), the factor structure

for the male data was not well replicated, but the congruences for the female data were reasonably strong.

Table 8.2. Principal Axis Factor Loadings and Interbattery Correlations from the Analyses for the Guilford Zimmerman Temperament Survey

	Panel 1			Panel 2					Panel 3			Panel 4		
	Varimax-Rotated Factor Loadings From Intercorrelations Published By Guilford et al. (1976)			Interbattery Correlations Derived From McCrae (1989)					Varimax-Rotated Interbattery Factor Loadings			Procrustes-Rotated Interbattery Factor Loadings		
	1	2	3	N	E	O	A	C	1	2	3	1	2	3
GZTS Scales:														
General Activity	-09	-63	-06	-06	49	07	-47	29	02	-44	-07	-15	-61	-07
Restraint	17	15	-65	-13	-35	12	18	61	19	07	-85	19	14	-64
Ascendance	14	-65	-05	-28	62	17	-21	16	11	-93	-05	07	-66	-06
Sociability	26	-49	24	-29	69	-09	06	-06	20	-66	08	21	-52	24
Emotional Stability	50	-16	01	-59	15	-09	05	14	67	-27	04	49	-21	01
Objectivity	60	-12	-00	-67	14	-08	15	13	85	-23	08	58	-18	-00
Friendliness	51	31	-19	-44	-24	-04	49	13	63	19	-18	54	25	-19
Thoughtfulness	-13	-15	-64	13	05	58	24	29	-15	-11	-48	-14	-13	-64
Personal Relations	53	-00	-04	-52	08	-14	29	15	61	-08	-04	53	-06	-03
Masculinity	20	-02	04	-39	-14	12	-22	-08	37	-06	09	-15	-61	-07

Overall Congruences Between Panel 1: The Varimax-Rotated Factor Loadings from [Guilford et al. \(1976\)](#) and Panel 3: The Varimax-Rotated Interbattery Factor Loadings: $Rv = 96$ and Panel 4: The Procrustes-Rotated Interbattery Factor Loadings: $Rt = 96$

Discussion

In sum, the factor structures that exist in the scales of many popular personality inventories can be closely replicated using data derived solely from scale associations with the FFM. The basic dimensions that exist in other personality inventories can thus be considered “well captured” by the FFM. If we are going to be concerned with percentages of variance, then distinctions should be made between the common, specific, and error variance components in personality scales. The percentages of variance accounted for by the FFM should be evaluated in relation to the proportions of common variance and not in relation to the total variance in personality scales. These distinctions have not been made in previous work, and relevant data have not been reported. The data from the present review indicate that the portions of scale variance accounted for by the FFM (the mean across inventories was 38.8%) are substantial when evaluated in relation to the

portions of common variance that exist in most personality inventories (mean = 50.1%), although there is still room for improvement (see [Table 8.1](#)).

More importantly, the preoccupation with percentages of variance and individual scales seems unwarranted when it is recognized that the FFM is a data reduction model designed to simplify the complex world of personality descriptors. The primary question is not whether the FFM completely accounts for, or differentiates between, specific personality constructs, but whether the FFM captures the dimensions that exist in other personality constructs. This question has not been quantitatively evaluated in previous work. The present findings are much less ambiguous than those of past studies, and indicate that the FFM generally does capture the dimensions in other inventories. [Block \(1995\)](#) identified biases and methodological problems with previous research on the FFM, but the present findings indicate that the consequences of these biases could not have been severe. The FFM may not always be fully recovered in other personality inventories, but it can apparently recover the dimensions in most other inventories.

Given that factor solutions usually involve a loss of information, how can differentiation and variance accounted for be increased? The most obvious solution would be to lower the stringency of dimensional cut-off criteria to increase the number of dimensions permitted in the analyses (a practice that is clearly not recommended). The addition of minifactors would raise an interesting question for further research: Do the minidimensions that exist in personality inventories resemble the (excluded) minidimensions that exist in the lexical and factor analytic data that led to the FFM? In summary, the FFM cannot be expected to provide representations of personality constructs that are noticeably superior to the representations provided by the data reduction solutions for those constructs. Facet-level improvements to FFM measures may help reach these ceilings, but they will not help surpass them. Further improvements require consideration of the “crumbs” from data reduction models, and these crumbs in the factor solutions for personality inventory scales may or may not be similar to the crumbs that have been discarded by FFM researchers.

We can readily see how a neglect of these considerations, combined with some strong statements by McCrae and Costa, have fueled the ongoing debate. Statements such as “the five factor model offers a universal and comprehensive framework for the description of individual differences in personality” ([McCrae & Costa, 1986](#), p. 1001), and “by assessing traits from each of the five factors, the clinician can obtain a comprehensive portrait of the client’s personality” ([Costa & McCrae, 1992a](#), p. 5), should be qualified. The FFM captures the primary dimensions, but not all the variation, in other personality constructs. The absence of this qualification, combined with the absence of quantitative tests of whether

dimensions have been captured, has unfortunately led some readers to focus on specifics, such as the inability of the FFM to capture particular scales completely. For example, [Butcher and Rouse \(1996\)](#) and [Ben-Porath and Waller \(1992\)](#) dismissed the FFM because it is too broad and does not provide enough specific information for the needs of clinical applications (i.e., relative to clinical personality inventories such as the MMPI). However, data reduction models will always be broad and cannot be expected to provide such specific information. The factors structures that exist in clinical personality measures do not provide such specific information either, yet they are well captured by the FFM. It would thus seem that progress in the FFM debate could be made if proponents toned down and qualified some of their strong statements (as they sometimes have, e.g., Costa & McCrae, [1990](#), p. 363, [1995a](#), p. 218; McCrae & Costa, [1995](#), p. 62, [1997](#), p. 509; McCrae & John, [1992](#), p. 177), and if critics realized that the FFM is about dimensions and not about scores on specific measures. Progress could also be made if more recognition and attention were given to the non-FFM, “nondimensional,” scale-specific variance in personality scales that is of interest to clinicians and FFM critics.

The scales within many personality inventories vary in breadth of measurement. Some scales tap broad dimensions of individual differences (neuroticism, extraversion), whereas other scales tap narrow, specialized constructs (e.g., self-harm, intellectual efficiency). These levels of measurement differences were ignored in the present mathematical focus on replicating the factor structures that exist in other measures. However, it is possible for a scale in a personality inventory to assess a broad dimension of individual differences and, at the same time, not show up in the factor structure for the inventory. This could occur if no other scales in the inventory tapped into the same dimension, causing the variance in the broad scale to appear only in the form of scale-specific variance. The broad dimension, perhaps unrelated to the FFM, would thus have been missed in the present analyses. Understanding the naturally occurring factor structures in personality inventories has nevertheless been a long-standing concern to researchers. The present study focused on these structures, and neglected the possibility of broad dimensions simultaneously existing and not showing up in factor analyses.

Directions for Further Research at the Scale Level

Facets of the FFM

If measures of the FFM were further improved, what likely findings would emerge for the comprehensiveness debate? Most discussions of this issue focus on facets of the five dimensions ([Costa & McCrae, 1995b](#); [Widiger & Trull, 1992](#)).

Additions and refinements at the facet level of measurement would likely further increase the degree to which the FFM captures the dimensions in other inventories, and increase the degree of differentiation between personality constructs. However, there might be only modest increases in variance accounted for in individual scales. The facet-level analyses that have been conducted have helped differentiate between inventory scales, but they have apparently not dramatically increased the variance accounted for (e.g., Church, 1994; Costa & McCrae, 1988; Dyce & O'Connor, 1998; Hahn & Comrey, 1994; McCrae et al., 1993; Montag & Levin, 1994; Trull et al., 1995). The FFM is a data reduction model and, for most inventories, the ceiling that can be reached by the FFM is roughly the amount of variance accounted for in the factor solutions for the original scale intercorrelations.

Validity of the Non-FFM Portions of Variance in Other Measures

As described above, the FFM typically accounts for between 30% and 50% of the total variance, or between 35% and 67% of the reliable, nonerror variance, in other measures. Ignoring their sizes, do the portions of variance that are not accounted for by the FFM matter? This is a question about the validity of the unaccounted for variance and the question remains (generally) unanswered and open for investigation. The research and analytic methods required to answer the question are simple. Measures of the FFM could be included in studies of the concurrent or predictive validity of non-FFM measures. The question then becomes how much variance in the relevant outcome variables is explained by the non-FFM measures after the variation that is accounted for by the FFM is removed. It would be difficult to argue that a non-FFM measure is unique or important if the FFM dimensions account for most of the validity evidence for the measure, a result that is empirically possible. If the non-FFM measure accounts for a nonnegligible portion of the variance in relevant outcome variables, then its specific variance clearly matters and requires more careful attention. A broad, quantitative review of the validity of the non-FFM portions of variance in other measures is required, but I suspect that sufficient relevant data are not available from previously published reports.

Locations in Five-Dimensional Space

The inherent potential of the FFM as an integrative, organizational family tree for other personality tests has not been fully realized. The many reports of associations between individual scales from other measures and the FFM remain scattered and unintegrated. One consequence is that the field remains unaware of which sections of the family tree are full and which sections are unpopulated. For

simplicity, assume that the five dimensions are orthogonal. This means that the space in which people and other personality tests exist is five dimensional. What needs to be known are the relative population densities of the many regions of this space.

The point is perhaps more clearly made via comparisons with a two-dimensional model, such as the interpersonal circumplex. The two orthogonal dimensions of dominance–submissiveness and friendliness–hostility together form a two-axis plot on which all interpersonal traits and behaviors can presumably be located. Other interpersonal traits are just blends of the two interpersonal dimensions. This simply means that other traits are vectors that run through the origin of the two-dimensional space, with each vector being defined by its weight or angular location with reference to each axis. The same principles apply just as well to five-dimensional spaces. The interpersonal circumplex can be described as having four broad regions (quadrants) stemming from the origin based on the two axes. When the five-dimensional space of personality is similarly broken up into high–low chunks based on its axes, there are 32 regions (e.g., + N + E + O + A + C, + N + E + O + A–C, +N + E + O–A + C, + N + E + O–A–C). These broad regions exist even though we are not able to visualize them (we are unable to visualize our own family tree!). Non-FFM personality measures can be thought of (if the FFM is indeed robust and comprehensive) as vectors that run through the origin of the five-dimensional space. The vectors are like FFM regression equations. A more detailed presentation of important geometric properties of the FFM was provided by [O'Connor and Dyce \(2001\)](#) in a report on personality disorders.

What is needed is a review that identifies the regions of the FFM space that have many or few vectors. The universe of 32 regions is perhaps too crude, but it would be a good start (also, given that the vectors run through the origin and are bipolar, the focus could be on 16 regions instead of 32). Regions that do not have vectors based on non-FFM measures are nevertheless still captured by the FFM measures. Scores on such vectors could easily be created. Regions left blank by other measures would raise questions about the reasons for the neglect, and about the validity or usefulness of the respective regions. Having a full index of the FFM vector locations would also be useful in evaluating new personality measures. Does a new measure merely give us another vector through the same region that has been assessed by previous measures? In what way is a measure new? It is difficult to answer such questions without the full index. Fortunately, the data for creating such an index already exist in the coefficients provided in previously published studies.

Corresponding important questions can be asked about the locations of people, rather than scales, in the five-dimensional personality space. The five dimensions

are presumably orthogonal and have normal distributions, but we do not know if people are evenly spread out or dispersed in this space. Some regions may be more populated with people than others. Do homogeneous groupings of people exist? If so, how many groupings are there and where are they located? Are there regions with people but with no vectors (personality tests)? Are there personality tests (vectors) through regions that have few people? Are there groupings of persons with distinct forms of psychopathology for which there are no personality tests (vectors)? Large, representative data sets would be required to answer such questions, along with creative statistical methods for revealing the population densities of different regions of the family tree.

The Five Dimensions as Moderator Variables

There is yet another way in which the FFM is robust. It is very common for researchers who are primarily concerned with nonpersonality questions to wonder whether the effects they are investigating depend on personality or individual difference variables in some way. Does the effect of an experimental manipulation or a particular kind of psychotherapy vary depending on the participants' personalities? This kind of question commonly arises in research proposals by students, by colleagues, and in grant applications. What personality measure should be used? A common strategy is to be safe, that is, be comprehensive and use a measure of the FFM dimensions. But although the use of measures of the FFM as potential personality moderator variables is an undoubtedly robust phenomenon, the analyses that are typically conducted once the data are collected are crude. This is another case of the potential of the FFM as an integrative model not being fully exploited.

Specifically, the problem is that the analyses of the FFM personality variables as moderators are typically conducted on just one dimension at a time. Researchers will test for treatment by personality variable interactions in the prediction of outcomes, and they will do so using each FFM dimension in turn, by itself. The full FFM space has five dimensions, 32 broad regions, and many hundreds of possible vectors running through it. Every vector is a possible moderator. When researchers assess the moderating role of just one dimension at a time, they are testing just one of the many possible vectors; that is, they are testing only the vector that corresponds to the FFM axis in question. When researchers run the search for interactions five times, that is, for each dimension in turn, they are examining just five of the many hundreds of possibilities. In many data sets, it seems likely that the largest personality moderator effect is for a FFM vector that is a particular blend of the FFM dimensions. In other words, researchers measure the FFM dimensions in their work in order to be careful and comprehensive, but

they then use analytic methods that do not permit the strongest moderator effects to be found in their data.

Fortunately, there is a solution to this problem. A simple but crude and time-consuming approach would involve compiling a long list of possible vectors and their FFM coordinates, computing participants' scores on each vector, and then sequentially testing each vector for an interaction. A more precise and elegant approach is to use an optimization routine, such as the FMINCON procedure in MATLAB or corresponding routines in R or SAS. There are three simple steps: (1) convert the scores on the FFM dimensions to orthogonal factor scores; (2) specify the function to be optimized; and (3) specify the constraints.

The function to be optimized is the f -squared value for the interaction term in a moderated regression. F -squared is the effect size for an interaction over and above the main effects. It is the proportion of systematic variance accounted for by the interaction relative to the unexplained variance in the outcome variable ([Aiken & West, 1991](#), p. 157). The optimization routine scans through the FFM space looking for the strongest interaction, represented by the f -squared effect size, while respecting the constraints placed on the search.

The constraints that are placed on the optimization routine pertain to the coordinates of possible FFM vectors. The optimization routine must be provided with geometrically meaningful bounds for the coordinates of the FFM vectors. The boundary values that can be used in computations are the cosines of the angles, which are 1.0 for zero degrees and -1.0 for 180 degrees. One further constraint must be placed on the model: The sum of the squares of the cosines for any vector must equal one ([Green & Carroll, 1976](#), p. 87). This constraint is a geometric necessity. A vector cannot have just any combination of cosines between 1.0 and -1.0 on the various dimensions.

This scanning-optimization procedure can be conducted for searches through the entire FFM space and through specified regions of the FFM space. The strongest pattern that exists for the whole space does not preclude the existence of different, weaker patterns in other regions. The FFM space can be divided into broad regions based on either high (positive) or low (negative) values for each dimension. Five dimensions, each with two regions (high and low), result in 32 possible combinations or regions, as described above. The searches for interactions within each of these FFM regions involve simple adjustments to the upper and lower boundary constraints on the FFM weights. Searches within the high or positive side of a dimension involve constraining the weights for the dimension to fall between zero and 1.0, and searches within the low or negative side of a dimension involve constraining the weights to fall between zero and -1.0.

Only minimal time and effort are required to set up these analyses and the potential payoff is great. The procedure will immediately reveal the FFM vector that has the strongest moderating effect in a data set. Researchers no longer need to be puzzled by having used personality moderator variables in their data collections and then finding nothing or wondering if the data have been thoroughly analyzed. I have used the optimization method in two previous studies. One study focused on the FFM as the universe of personality moderators of the validity of measures of social desirability responding (O'Connor, 2006). The other study focused on the FFM as the universe of personality moderators of the effects of parenting styles on adolescent psychopathology (O'Connor & Dvorak, 2001). Very many moderated relationships were found in both investigations, and almost none of the effects was for an FFM axis by itself. Most of the interactions in the data sets would have been missed by searches for interactions that proceeded one FFM dimension at a time.

It is also possible, and easier, to use the FFM in tests of theoretically or empirically based *a priori* predictions of moderated effects. For example, a researcher may suspect that a particular non-FFM measure could moderate the effect of a treatment or contextual variable on an outcome, but the researcher may have used measures of the FFM and not a direct measure of the (FFM) vector in question for the data collection. Scores on this vector could nevertheless be created from the FFM scores on the basis of theory or previous research.

Two examples were provided in the study by O'Connor and Dvorak (2001), who had scores on the FFM, parenting styles, and problem behaviors for a sample of 402 adolescents. The correlations between callous-unemotional traits and the FFM dimensions that were reported in a separate investigation by Harpur, Hart, and Hare (1994) were used to produce regression equation weights in the creation of proxy scores for callous-unemotional tendencies (an aspect of psychopathy). In the O'Connor and Dvorak (2001) data set, males who scored higher on the FFM callous-unemotional vector displayed relatively high levels of delinquency regardless of the degree of maternal control they received. In contrast, males who were low on the callous-unemotional FFM vector were delinquent only in the context of excessive maternal control.

Similarly, proxy scores for personality "resiliency" were produced using the correlations between ego resiliency and FFM scores that were reported by Huey and Weisz (1997). Numerous interactions between the FFM proxy resiliency scores and parenting styles in the prediction of adolescent problems emerged in the O'Connor and Dvorak (2001) data. For example, males with high proxy resiliency scores were low in aggression regardless of the degree of maternal harshness they received. In contrast, males with low proxy resiliency scores were increasingly aggressive as maternal harshness increased. The obtained interactions

were theoretically meaningful and consistent with previous findings that used specific, non-FFM measures rather than FFM proxy scores. Such findings suggest that the FFM may indeed capture the high validity portions of variance in non-FFM measures.

Directions for Further Research at the Dimensional Structure Level

An Unused Statistical Method for Clarifying Dimensional Structures

An unused statistical method can provide enhanced depictions of the associations between FFM and non-FFM measures. As described above, when researchers report Pearson correlations between FFM and non-FFM measures, readers are often left wondering if something is missing. The values of the correlations are rarely very high, and it is impossible to determine whether additional dimensions would help capture more variance. Alternatively, when the loadings from joint factor analyses of the FFM and other measures are reported, the factors may not directly align with the FFM dimensions, rendering the results difficult to interpret.

[ten Berge, Kiers, and Commandeur \(1993\)](#) described a factor analysis procedure that can assist in such situations. The correlations between the FFM and non-FFM measures can be factor analyzed in relation to a researcher-specified target matrix of fixed and free-to-estimate loadings. For example, assume a researcher had data for the five FFM variables and for 10 non-FFM scales. To more clearly determine where the 10 non-FFM variables are located in the FFM space, the loadings in a five factor target matrix could be arranged so as to force the five factors to align with the FFM dimensions. This would be accomplished by using 1s and 0s for the FFM loadings on the five factors. The loadings for the 10 non-FFM variables in the analysis would be left free and would be estimated by the factor analysis procedure. This analysis could then be followed by a second run that involved a sixth factor on which the FFM variables had 0s for loadings and with the loadings for the non-FFM variables on all six factors left free to be estimated by the procedure. It would then be clearer as to whether the non-FFM variables fall within the space that is defined by the FFM dimensions.

The Search for Missed Additional Dimensions

Do one or more additional dimensions of personality exist that have somehow been missed in the many years of lexical and personality inventory research? The consistent power and effectiveness of the FFM in capturing the dimensions that exist in other measures, as reviewed above, make it difficult to imagine that additional dimensions have been missed all of this time. Yet claims of additional dimensions are sometimes made. For example, [Ashton and Lee \(2007\)](#) claim that

honesty–humility is a major, previously neglected, sixth dimension of personality. Establishing the existence of additional dimensions requires at least two categories of empirical evidence. First, there must be validity evidence (concurrent or predictive), above and beyond the FFM dimensions, for any additional dimensions. And second, there must be evidence that the additional dimensions are broad enough to summarize substantial portions of common variance in personality data. Specific variances cannot be promoted to the status of dimensions, as described above.

Evidence for additional dimensions can be arranged. A researcher simply needs to identify a construct that is not strongly captured by the FFM and then build perhaps five or six new measures of different, related facets of this construct. When the correlations for the additional measures are included in joint factor analyses with FFM measures, there will be enough common variance among the new scales for the additional dimension to surpass the cutoff criteria for the existence of a sixth dimension. Build it, and you and others will find it. Additional, non-FFM dimensions did not naturally emerge in the history of research of personality inventories. If additional dimensions are now going to be deliberately built into new measures, then the evidence for their existence deserves careful scrutiny because it can be arranged.

Anchoring the Dimensions to Facilitate Research Integration

A variety of different measures of the FFM are now available and in use (see the chapter by [Simms](#)). The measures vary greatly in length, depth, and breadth. Some of the measures were designed to assess conceptualizations of the FFM dimensions that differ from other conceptualizations and measurements. But even scores on measures that were based on the same conceptualizations are not necessarily equivalent and may result in differing patterns of associations with non-FFM measures and with nonpersonality outcome variables. It is as if FFM researchers are all dedicated to roughly the same five-dimensional model but disagree on the preferred rotation or location of the five axes. Variability in the measurement of the FFM dimensions has surely resulted in apparently inconsistent or conflicting findings. The research literature would be more consistent and much easier to integrate if the field could agree on the nature, location, or rotation of the five axes.

Cartographers struggled with this same problem hundreds of years ago (this analogy was first provided by [Gifford & O'Connor, 1987](#), and Bob Gifford deserves all the credit). The concepts of latitude and longitude were proposed in the second century A.D. Latitude was easily measured, but not longitude. Navigation at sea in particular was a real problem until the chronometer, for longitude, was perfected in the 1750s. But then there were big squabbles, for

another hundred years, over where the prime meridian should be located. Each nation wanted it drawn through one of its own cities. Map making was a mess. In 1884, an international conference placed it in Greenwich, England. Maps then became more coherent and sea travel much safer.

Our own FFM literature could become more coherent if we were similarly able to agree on the locations of our prime meridians. In cartography, the location of the prime meridian was arbitrary, just as the many possible factor rotations of a dimensional structure in personality are somewhat arbitrary and equally valid. Or maybe not. Perhaps the FFM dimensions should be anchored in particular patterns of brain activity. In any case, it seems clear that the field now has a powerful, robust dimensional model, that the disagreements are over specifics, and that even more progress could be made if the field agreed on the measurement anchoring points for the dimensions. It would then become even more clear where other measures of personality are located within our five-dimensional map.

Universal and Specific in the Five Factor Model of Personality

Jüri Allik and Anu Realo

Abstract

Personality psychologists—perhaps even more than in some other disciplines—are deeply interested in what is common to personality descriptions in all cultures and societies. The purpose of this chapter is to discuss the potential universality of the Five Factor Model (FFM) of general personality structure. The chapter begins with a discussion of what is meant, or should be meant, by a universal. Discussed then is the empirical support, as well as the conceptual and empirical difficulty, in establishing universality in personality structure, for the FFM as well as other dimensional models. The chapter then considers different levels of analysis (including cultural and intraindividual analyses), higher-order invariants (including sex differences, age differences, and differences in perspective), and whether mean levels are universal. The chapter concludes with a discussion of the basis for personality universals, as well as addressing the common challenges to universality.

Key Words: Five Factor Model, universal, culture, personality structure, differences in perspective

There are many endemic diseases such as monkey fever or Russian encephalitis. One of them, Kyasanur forest disease, is specific only to some forested parts of India and the tick-borne encephalitis is widely distributed across Eurasia. In spite of their endemic character they both have an independent category in the International Classification of Diseases (ICD-10). Although these two diseases are encountered in only very specific places they are still universal in the sense that every human who contracts these infections develops the same Kyasanur forest disease or tick-borne encephalitis, each with their typical symptoms. Their symptoms look very similar because different human organisms react to these viruses in a highly similar, if not to say in a universal, manner.

Although sometimes challenged (Patel & Winston, 1994), mental disorders are comparable to physical disorders (as their inclusion in the ICD-10 implies) because their neurological and psychological substrates are

likewise universal. Personality traits provide the substrate of personality disorders (PDs), so the question of their pan-cultural invariance is crucial. This chapter continues to elaborate our previous arguments that in many respects personality traits are indeed universal, clearly dominating over specific aspects ([Allik, Realo, & McCrae, 2013](#)).

Personality Universals

When people describe their own personality or that of someone they know well, many of the descriptors typically go hand-in-hand. For example, individuals who are described by themselves or by their close acquaintances as talkative are also believed to experience positive emotions frequently, and those who are reported to be modest often describe themselves as willing to assist others in need of help. These covariations tend to group around the same five basic themes—Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness—([Goldberg, 1993](#); [McCrae & Costa, 1997](#)), which seem to transcend languages and cultures, giving a good reason to suggest that this structure of covariation may be a human universal ([McCrae & Costa, 1997](#)).

Strictly speaking, *universal* means that something is characteristic to all members of a certain class, without any limits or exceptions. Very little in nature and even less in culture meet this absolute criterion, but many characteristics appear to be relatively invariant. Psychologists are interested in universals at the level of both the individuals (e.g., “all people are mortal”) and the group (e.g., “women are more agreeable”), but these levels must be distinguished. The claim that gender differences in personality are universal does not mean that every female on earth scores higher (or lower) than every male on a certain trait; rather it means that in all groups of people, the same degree or direction of gender-related trait differences is found *on average*. Because only very few things exist without exceptions, the observed regularities are expected to hold not in all groups of people but in *most* of them. In this case it is more appropriate to talk about *near-universals*. Most of the properties of personality traits discussed in this chapter are (potentially) universal at the group level and consequently are near-universals. Thus, we are adopting a theoretical position according to which the concept of psychological universals is not a dichotomous distinction between universals and nonuniversals. Between these two

polarities there is a gradation of near-universals with various degrees of generality ([Norenzayan & Heine, 2005](#)).

The metric system, with its base of 10 units, was devised mainly because humans started to use their fingers for counting. If pigs could have developed their own counting system, they would probably have preferred an octal system because they have only four digits per hoof ([Leroi, 2005](#)). However, readers may be very surprised to learn that five digits per limb is an anatomical near-universal, not something that is characteristic of all humans. Surprisingly many people are born with extra digits. About 1 in 3,000 Europeans and about 1 in 300 Africans are born with extra fingers or toes (or both) ([Leroi, 2005](#)). Like many human traits, polydactyly represents a substantial genetic heterogeneity that varies across different populations and ethnic groups ([Malik, 2014](#)). So, if even fundamental anatomical features such as the number of fingers—which has influenced the whole history of civilization—are only near-universals, then it is more than expected that the majority of psychological universals simply cannot belong to the absolute category of universals.

Linguists were probably among the first who faced the problem of universality. Currently, the list of the world's languages, called *Ethnologue*, contains 7,106 living languages ([Lewis, Simons, & Fennig, 2014](#)). Most of these languages are distinctive so that without proper learning they are incomprehensible to speakers of other languages, sometimes living only a few miles away. In spite of this enormous variety, languages have features that occur systematically across all of them. For example, if a language is spoken, it has consonants and vowels. Even further, all known languages seem to have minimally three vowels including /i/, /a/, and /u/ and most languages, not all, contain nasals ([Burquest & Payne, 1993](#)). Thus, in addition to absolute universals—true for all languages, living or extinct—there are general tendencies that hold for most languages and that can pretend to have the status of near-universals in most. [Noam Chomsky \(1965\)](#) has famously argued that there is a universal grammar—general generative and combinatorial mechanisms that have an innate biological basis—used by all spoken languages. But even this one of the strongest universalist claims may have been violated since at least one of the world's living languages, Pirahã (spoken by about 300 Pirahãs living in Brazil's Amazonas state), arguably lacks some of the features of universal grammar ([Everett, 2005](#)).

In response to a dominant paradigm of the social sciences—cultural relativism—Donald Brown, a professor of anthropology at the University of California, started to compose a list of human universals ([Brown, 1991](#)). As it turned out, ethnographers have noticed many features common to all known human societies studied so far. For example, everywhere people live they have baby talk, jokes, magic, and a preference for sweet tastes, to say nothing, of course, about language. In the long list of universals or near-universals, many are associated with what we can call personality dispositions. For example, according to this list, in all human societies people have childhood fears, classification of behavioral propensities and inner states, and facial expression of anger; and in all known human populations males are more aggressive than females. [Steven Pinker \(2002\)](#) extended this list by adding, among other features, fear of death, tickling, and a desire to have a positive self-image.

The status of many of these and other putative human universals is still uncertain. For example, anger—mentioned in the above list of universals—is one of the fundamental human emotions that has emerged consistently across time and culture ([Chon, 2002](#)), and there are equivalents for the word *anger* in all major languages of the world ([Mesquita, Frijda, & Scherer, 1997](#)). Yet, there is one society—the Utkuhikhalingmiut (“Utku”) Eskimos—that does not have a special word for anger. Over 40 years ago, anthropologist Jean Briggs described the Utku society (which at the time of her research consisted of 35 individuals—the only inhabitants in an arctic area of more than 35,000 square miles) in her book expressively titled *Never in Anger* ([Briggs, 1970](#)). If these ethnographic observations are valid, the experience and expression of anger may be disqualified from the rank of the absolute universals and degraded to the rank of the near-universals. Similar fates, however, could happen to even more fundamental constituents of the human society: contrary to what [Claude Lévi-Strauss \(1969/1949\)](#) has claimed, there is at least one society in which there is no concept of fathers or husbands ([Hua, 2001](#)).

A Universal Structure of Personality

When it comes to personality dispositions it is not a trivial task to determine the rank of their universality. Even linguists acknowledge that there are still a large number of unidentified languages, and among the

above-mentioned 7,106 living languages only a minority is thoroughly described. Psychological research rooted in Western culture—sometimes called WASP (Western Academic Scientific Psychology)—is believed by some scholars to be of little relevance to the majority of the world (Berry, Poortinga, Segall, & Dasen, 2002), reflecting only a small minority of WEIRD (Western, Educated, Industrialized, Rich, and Democratic) people (Henrich, Heine, & Norenzayan, 2010a, 2010b; Jones, 2010). A recent survey of the top psychological journals found that 96% of all research participants were from Western industrialized countries (Henrich et al., 2010b). However, unlike many fields in psychology, personality research has been a truly international enterprise for a number of years (Allik, 2012). Even if questionnaires were mainly devised by WASP or WEIRD researchers, they were soon translated into many different languages. For example, Indian researchers translated the Revised NEO Personality Inventory (NEO PI-R; McCrae & Costa, 2010), developed in Baltimore, the United States, into Telugu and Marathi (Lodhi, Deo, & Belhekar, 2002; McCrae, 2002). This is a major advance, because there are 74 and 90 million Telugu and Marathi speakers, respectively, occupying the sixteenth and fifteenth positions in the list of the most spoken languages (Lewis et al., 2014).

Based on what was said above, it is unrealistic to expect that any aspect of personality dispositions would be absolutely universal or even very strongly near-universal. When McCrae and Costa (1997) proposed the bold hypothesis that the pattern of covariation among personality traits is a human universal they were able to rely on only six translations of the NEO PI-R, into the German, Portuguese, Hebrew, Chinese, Korean, and Japanese languages. Nevertheless, data from these diverse cultures with languages from five distinct language families were persuasive enough to suggest that the observed regularity in the pattern of covariation among personality traits will be not violated when more and more new cultures and languages are subjected to a critical examination (McCrae & Allik, 2002).

In addition to occasional failures to reproduce the basic five factor structure in certain cultures (Cheung, van de Vijver, & Leong, 2011; Panayiotou, Kokkinos, & Spanoudis, 2004; Zecca et al., 2013), there was a highly acclaimed study of Tsimane forager-horticulturalist men and women of Bolivia (Gurven, von Rueden, Massenkoff, Kaplan, & Lero Vie, 2013). The authors of this paper suggested that the Five Factor Model (FFM) may

not be a human universal. At variance from a typical five factor structure, Tsimane personality variation—both for the self-ratings and observer-ratings—displays only two principal factors that may reflect socioecological characteristics common to small-scale societies ([Gurven et al., 2013](#)). No doubt, this is an admirable study of a large ($N = 632$) illiterate, indigenous population and there must be a good reason why a habitual five factors did not emerge either in self-ratings or in informant-ratings. The same 44-item Big Five Inventory (BFI; [Benet-Martinez & John, 1998](#)) was successfully used for the study of 56 nations or territories and in each case the same relatively invariant factor structure was identified ([Schmitt et al., 2007](#)). Against this massive evidence of universality it is obviously too early to declare the FFM dead. Before the final verdict is pronounced it is necessary to eliminate all simpler or even “technical” explanations. For example, perhaps the five factors failed to emerge due to translation problems. Similarly, the BFI is not balanced in terms of positively and negatively worded items and it is characteristic of less educated samples to respond more to wording than to the content of items ([Schmitt et al., 2007](#)). Thus, before declaring that the structure of personality is not invariant across human societies it is more productive to use informants who are not subjected to the same literacy and educational constraints ([Allik & McCrae, 2004a](#)). It is not excluded that Tsimanes also have a rather conventional personality structure but they simply do not have enough skill to describe and report details of this structure.

However, there is no need to visit exotic cultures to find exceptions from universality. For example, [Toomela \(2003\)](#) proposed that those individuals who primarily use everyday concepts in thinking do not reveal a coherent Big Five personality structure. In this sense the FFM is a product of cultural development that can be achieved only when thinking in scientific concepts is accomplished. Participants who predominantly think in everyday concepts have a tendency to produce a pattern of covariation in which, similar to Tsimanes, not all five factors have been equally represented. However, a reanalysis of Toomela’s data demonstrated that a targeted rotation may be a remedy for most structural problems ([Allik & McCrae, 2004a](#)). Although people usually manage to make personality judgments that are accurate enough for navigation of the complex social world, the accuracy is achieved when relevant behavioral information is available to and detected by a judge who then utilizes that information correctly

(Funder, 2012). As we suggested above, the problem may be in the available personality information and how this information is used.

At least formally, universality of the FFM seems to signify that the same pattern of covariation between personality traits is observed in all age groups without exceptions. Even if personality appears to be preserved more or less intact through very old age (Martin, Long, & Poon, 2002; Mõttus, Johnson, & Deary, 2012) many researchers are sceptical about personality in very young age. Analogous to cognitive abilities, it is tempting to believe that personality traits emerge somehow in the process of development and it may take a considerable time to mature before they finally become identical to the adult personality structure. However, when well-informed adults were asked to rate kindergarten children (aged 4–6 years) four of the five personality factors were easily recovered from these ratings (Mervielde, Buyst, & De Fruyt, 1995). When children approach school age they became able to describe their own personality and their ratings in many countries group around the typical five themes (Bleidorn & Ostendorf, 2009; De Fruyt, Mervielde, & Van Leeuwen, 2002; Rossier, Quartier, Enescu, & Iselin, 2007). Twelve-years-old children are almost ready to answer adult personality questionnaires and the common five factor structure of personality is clearly recognizable in their self-ratings (Allik, Laidra, Realo, & Pullmann, 2004; McCrae et al., 2002). Nevertheless, the personality structure of 12-year-old children demonstrates only an approximate congruence with the adult structure, suggesting that not all children of that age have developed the abilities required for observing their own personality dispositions and for giving reliable self-reports on the basis of these observations (see also the chapter by De Pauw). The self-reported personality trait structure matures and becomes sufficiently differentiated around age 14–15 years and grows to be practically indistinguishable from adult personality by the age of 16 years (Allik et al., 2004). Thus, on the basis of self-reports alone it is not possible to maintain that younger children have a personality structure that is dramatically different from that of adults.

Large-Scale Cross-Cultural Studies

Although it is not entirely clear how to establish universality, it is inevitable that large-scale cross-cultural studies are necessary to provide evidence that something is indeed characteristic of all or nearly all human

beings. On the basis of data collected in three or four cultures it is impossible even to guess what is universal and what is specific in personality. However, the collection of personality data from many cultures is even more expensive than gathering data about all spoken languages. There are only a few ways to collect personality data from a sufficient number of countries. The first is to develop a popular inventory that will be translated into a large number of languages by enthusiastic colleagues. The Eysenck Personality Questionnaire (EPQ; [Eysenck & Eysenck, 1975](#)) and the NEO PI-R ([McCrae & Costa, 2010](#)) are good examples of this relatively slow and complicated method of collecting data ([Lynn & Martin, 1995](#); [McCrae, 2002](#); [van Hemert, van de Vijver, Poortinga, & Georgas, 2002](#)). Another way is to form an international research syndicate that is held together by the promise that the first two or three papers are co-authored by all those who participate in collecting data. For instance, David Schmitt, one of the most successful elaborators of this research mechanism, was able to obtain personality data from 56 countries or territories using the above mentioned BFI ([Schmitt et al., 2007](#)). In this study the BFI was translated from English into 28 languages and administered to 17,837 individuals from 56 nations ([Schmitt et al., 2007](#)). Although the differences in personality mean values and structure were small, their geographic pattern was replicable to what was previously established by more sophisticated measurement instruments (cf. [Allik & McCrae, 2004b](#)). Exploiting the same principle, with the help of a large number of collaborators McCrae and Terracciano gathered observer-reported personality data and national character ratings from 50 cultures ([McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#); [McCrae, Terracciano, & 79 Members of the Personality Profiles of Cultures Project, 2005](#)).

Another important development in research technology is, of course, the widespread use of the Internet, which allows the collection of huge samples during a relatively short period of time. Perhaps one of the best examples is the BBC Internet study, which examined sex differences on three personality traits—Extraversion, Agreeableness, and Neuroticism—for over 200,000 participants from 53 nations ([Lippa, 2010](#)). In another impressive study data were collected from more than a half million participants using the BFI ([Rentfrow, 2010](#); [Rentfrow et al., 2013](#); [Rentfrow, Gosling, & Potter, 2008](#)). Participants in this study were distributed very closely to the percentage of the total U.S. population for each state. Not only do

worldwide distributions of personality traits demonstrate a meaningful pattern (Allik & McCrae, 2004b) but statewide personality differences across the United States are also linked to a variety of important social indicators. Although it has been argued that Internet findings are consistent with results from traditional methods (Gosling, Vazire, Srivastava, & John, 2004), there is indisputable evidence that self-recruited Internet data may sometimes be biased compared to random sampling (Pullmann, Allik, & Realo, 2009), which may constrain their potential value.

Perhaps the most important lesson from all these large-scale comparative studies is the ease with which personality instruments can transcend language and culture barriers. The same basic pattern of covariations—the FFM—has been replicated, more or less accurately, in almost every language and culture studied so far (Kallasmaa, Allik, Realo, & McCrae, 2000; Rolland, 2002; Schmitt et al., 2007). Essentially the same factor structure was recovered from self-ratings (McCrae, 2002) and from observer ratings (McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005; McCrae, Terracciano, & 79 Members of the Personality Profiles of Cultures Project, 2005). Thus, the FFM appears to be reasonably invariant across methods of measurement.

There are only a few studies of personality in which geographic representativeness inside one country was achieved (Rentfrow, 2010; Rentfrow et al., 2013; Rentfrow, Mellander, & Florida, 2009). Perhaps it is not so urgent to achieve a sufficient geographic coverage for a small country such as Estonia (Allik et al., 2004), but it is desirable, if not imperative, for large countries such as the United States, China, or Russia. Recently, 7,065 participants from 39 samples in 33 administrative areas of the Russian Federation identified an ethnically Russian adult or college-aged man or woman whom they knew well and rated the target using the Russian observer rating paper-and-pencil version of the NEO PI-R (Allik, Realo, et al., 2009). The expected FFM structure was clearly replicated in the full sample, with factor congruence coefficients of .95–.96 for all five factors. When these analyses were repeated within the 39 samples, all showed reasonable to good replications of the FFM, with average factor congruence coefficients ranging from .90 to .98. In the first few studies published two other geographic giants—the United States and the People's Republic of China—are treated as consisting of different subregions

([Rentfrow, 2010](#); [Rentfrow et al., 2009, 2013](#); [Van de Vliert, Yang, Wang, & Ren, 2013](#)).

Although the five factor structure is clearly recognizable in nearly every language into which the NEO PI-R or BFI has been translated (for an exception see [Gurven et al., 2013](#)), in less developed countries the data seem to fit the FFM less perfectly than in industrialized, less agrarian countries ([Piedmont, Bain, McCrae, & Costa, 2002](#); [Zecca et al., 2013](#)). Research suggests that the degree of fit to the FFM depends primarily on the quality of the data ([McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#)). For example, one indicator of data quality is negative item bias ([Schmitt & Allik, 2005](#)). In less developed countries in which people live in economic need and access to education is limited, respondents are inclined to answer negatively worded items slightly differently than they answer directly formulated statements. The fit of the FFM may also depend on the cultural relevance of specific items. In several cultures the Openness factor has proved to be the weakest, especially in African countries ([Piedmont et al., 2002](#)). It seems that NEO PI-R items such as “Poetry has little or no effect on me” or “I often try new and foreign foods” may represent the Openness concept less clearly in Burkina Faso and Zimbabwe than they do in Western countries ([Rossier, Dahourou, & McCrae, 2005](#); [Zecca et al., 2013](#)). This implies that a more appropriate selection of items is needed to optimize the translation of the FFM into more exotic languages and cultures.

Alternatives to the FFM

However, the universality of the FFM does not rule out the possibility that some other covariance patterns, with smaller or larger numbers of factors, may also be replicable across many languages and cultures. For example, Eysenck’s three-factor ([van Hemert et al., 2002](#)) and psycholexical six-factor ([Ashton, Lee, & de Vries, 2014](#); [Lee & Ashton, 2008](#)) structures have also been replicated in many cultures. The compatibility of structures with different numbers of factors becomes understandable within a structural framework based on a hierarchy of personality traits ([Markon, Krueger, & Watson, 2005](#)). The hierarchy of traits can be cut on different levels of generalization and as a result has three, five, or six relatively stable factors.

It has been argued that imposing a factor structure derived from Western samples on non-Western cultures may leave unnoticed unique personality factors specific to these cultures alone, called *emic* dimensions of personality (Cheung et al., 2011). For example, it was noted that the FFM ignores an Interpersonal Relatedness factor that is unique to the Chinese (or more generally Asian) personality (Cheung, Cheung, Wada, & Zhang, 2003; Cheung et al., 2001). Because *ren qing*—friendly person—is believed to be deeply rooted in the Chinese mentality, European concepts are not sufficient to describe this specific aspect of Chinese culture. However, it was soon discovered that this supposedly specific Chinese or Asian personality trait could be reproduced fairly well in a European-American sample, indicating that the Interpersonal Relatedness factor is not unique to Asian populations (Lin & Church, 2004).

Travelers were probably the first to notice cross-cultural differences. Those who were raised with the Protestant working spirit may feel confused in their first encounter with the *mañana* cultures (House, Hanges, Javidan, Dorfman, & Gupta, 2004). Friendliness, politeness, and sympathy are highly valued in the Spanish culture in which there is even a special word for it—*simpatico* (Ramirez-Esparza, Gosling, & Pennebaker, 2008; Triandis, Lisansky, Marin, & Betancourt, 1984). It is also believed that Portuguese *saudade*—a deep emotional state of nostalgic or profound melancholic longing for an absent something or someone that is loved—has no appropriate translation into English or any other language (Bułat Silva, 2012). In spite of a premature optimism that *amae*—the pattern of attachment and dependence between mother and child—is unique to Japanese culture alone (Behrens, 2004), it is more realistic to assume universal mechanisms behind this concept (Cheung et al., 2011). Although it may not be easy to translate German *Schadenfreude* into English, nobody really doubts that feeling gloating pleasure, Dutch comfort, or mischief-joy is totally alien to Anglo-American culture (Leach, Spears, Branscombe, & Doosje, 2003; Smith et al., 1996).

In a similar vein, many domestic and foreign observers have claimed that Russians have a unique constellation of personality traits that mirrors their distinctive historical and cultural experience. In contrasting themselves with the industrialized and materialistic cultures of the West, Russians in the nineteenth century began to define themselves in terms of their spiritual qualities, their distinctive “Russian soul” or *dusha* (Allik et al., 2011). To

capture distinctive, emic aspects of Russian personality beyond the familiar Big Five dimensions, a set of emic personality items was developed. For instance, the widely perceived inclination of Russians toward fatalism was measured by items such as “Believes that he/she cannot escape his/her fate” and “Believes that he/she is an architect of one’s own fortunes” (reversed). As it turned out, most of the variance in the emic items could be explained by the known Big Five factors ([Allik et al., 2011](#)). There is no question that cultures may have their unique traits such as *ren qing* or *simpatico*. The problem is always about the exact proportions between specific and universal. If personality traits are understood as enduring tendencies to feel, think, and act in a characteristic way then universal aspects are clearly dominant over specific aspects in their worldwide distribution. It was observed, for example, that the mean differences between cultures or geographic regions are typically 10 times smaller than an average interindividual variance within those cultures or regions ([Allik, 2005](#)). Individual differences we encounter in our everyday experience are by an order of magnitude larger than typical differences between the mean values on personality traits of a group of people occupying a large geographic territory.

The FFM Structure at Different Levels of Analysis

The pattern of covariation in the FFM was established by means of factor analyses based on interindividual differences. From that level it is possible to move either higher to the level of cultures or lower to the level of single individuals.

Culture-Level Analysis

Collecting NEO PI-R self-report data from 36 cultures or territories was difficult ([McCrae, 2002](#)). However, it was still too small a dataset to subject the mean, culture-level, values on 30 facet scales to a factor analysis. A solution was to split each culture into four subgroups according to sex and age (females versus males; college age people versus adults), increasing subsamples to 114. With minor variations, the culture-level analysis of the means of these 114 samples replicated the five factor individual level factor structure (see [McCrae, 2002](#), Table 2). These findings were subsequently replicated in culture-level analyses of observer ratings of college-age and

adult targets from 51 cultures ([McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#)), and of adolescents from 24 cultures ([McCrae et al., 2010](#)).

Initially this replication of the FFM structure was interpreted as an empirical finding about the structure of personality on the culture level, but it soon became clear that is a statistical necessity. Assigning individuals randomly to an arbitrary 114 subsamples would have resulted in an even better replication of the individual level factor structure ([McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#)). Thus, only deviations, not resemblance, between individual and group-level factor structures are indicative of the possible involvement of culture. When culture-level factor structure replicates the individual-level structure it means that the influence of culture on personality traits (and their assessment) is negligible. Existing data show that culture contributes consistently but rather modestly to the pattern of covariances ([McCrae & Terracciano, 2008](#)).

Intraindividual Level of Analysis

Another direction of generalizability is to move from the level of the group to that of the individual. According to some researchers, personality trait covariation models such as the FFM provide information that holds true at the level of groups or populations but may not apply to the level of the individual ([Borsboom, 2005](#)). For example, it was demonstrated that if a latent factor model fits a given population, this does not guarantee the fit of the same model for each or even any individual subjects from that group, assuming that intraindividual variation is measured by repeated administration of the same instrument ([Borsboom, Mellenbergh, & Van Heerden, 2003; Molenaar & Campbell, 2009](#)): The structure of traits across individuals is not necessarily the same as the structure of states within the individual. Borsboom and colleagues concluded from this that models derived from between-subject variation cannot provide causal explanations for the behavior of the individual—a conclusion that has been challenged by others ([McCrae & Costa, 2008](#)). However, this work raises the question of whether, and in what sense, the FFM can be said to characterize individuals.

[Allik et al. \(2012\)](#) argued that the FFM characterizes an individual if scores on each of the indicators of a factor (e.g., the six facets that define

each factor in the NEO PI-R) are at similar levels (especially in contrast to variations in levels of facets across different factors). A person who is high on Anxiety *and* Angry Hostility *and* Depression *and* Self-Consciousness *and* Impulsiveness *and* Vulnerability can meaningfully be said to be characterized by the Neuroticism factor, whereas an individual who is high on the first three facets and low on the last three does not show a coherent Neuroticism factor. [Allik and colleagues \(2012\)](#) operationalized this concept using the intraclass correlation and concluded that most individuals are reasonably well characterized by the FFM structure.

Although the common pattern of covariations was dominant (e.g., individuals who are described as talkative are also believed to experience a need for excitement, and those who are reported to be modest are often described as amenable), this does not exclude the possibility that in infrequent cases some of the normally incompatible personality traits can coexist. It is possible, for instance, that individuals who are often described by themselves or by their close acquaintances as angry and hostile are very seldom believed to experience shame or embarrassment, which are other indicators of Neuroticism ([Allik et al., 2012](#), see Fig. 4C). Similarly, it is possible to find a person who is highly dutiful and carefully deliberates his or her actions but has a relative low need for achievement ([Allik et al., 2012](#), see Fig. 4B). In most cases dutifulness and achievement striving go hand in hand, but infrequently these two traits are disassociated or are even opposite. Despite being infrequent, these cases suggest that some atypical combinations of personality traits exist. Unfortunately, we know very little about these atypical combinations and even less about circumstances that make their occurrence possible.

Higher-Order Invariants

Debates concerning FFM focused mainly on the proper number of factors. Perhaps one of the most famous statements about the reality of five factors was formulated as follows: “We believe it is simply an empirical fact, like the fact that there are seven continents on earth or eight American presidents from Virginia. Biologists recognize eight classes of vertebrates (mammals, birds, reptiles, amphibians, and four classes of fishes, one extinct), and the theory of evolution helps to explain the development of these classes. It does not, however, explain why *eight* classes evolved,

rather than four or eleven, and no one considers this a defect in the theory” ([McCrae & John, 1992](#), p. 194). Indeed, one of the most vocal criticisms was that there is no good explanation as to why there are five and not, for example, seven factors ([Block, 1995, 2010](#)). Although a hierarchical approach to the number of factors ([Markon et al., 2005](#)) considerably relieved the tension, the five factors is still perceived to be the core of the FFM. However, the most significant progress has been achieved establishing universals or near-universals that are independent of the number of factors. We can call them higher-order invariants because their existence does not depend critically on how many personality factors are there.

Sex Differences

[Lynn and Martin \(1995\)](#) were among the first who reported a systematic pattern of gender differences: Women obtained higher mean scores than men on Neuroticism scales in all 37 nations in which the results of the EPQ were available; men scored higher than women on Extraversion in 30 countries and on Psychoticism in 34 countries. Subsequent studies using measures of the FFM show that women in most countries are higher in several traits related to Neuroticism, Agreeableness, warmth, and openness to feelings, whereas men score higher on scales measuring assertiveness and openness to ideas ([Costa, Terracciano, & McCrae, 2001](#); [Lippa, 2010](#); [Schmitt, Realo, Voracek, & Allik, 2008](#)). These differences are consistent with universal gender stereotypes ([Löckenhoff et al., 2014](#)), but the measured differences are generally rather small.

Although the direction of gender differences is near-universal, the magnitude shows systematic variation: These differences systematically increase with the level of development—including a long and healthy life, equal access to knowledge and education, and economic wealth ([Costa et al., 2001](#); [Lippa, 2010](#); [Schmitt et al., 2008](#)). This finding was counterintuitive, because most people assumed that gender equality would lead to diminished sex differences in personality. Several explanations have been offered to explain this puzzling finding. One explanation is that gender differences are illusory as a by-product of self-stereotyping, which occurs when between-gender social comparisons are made. Because these social comparisons are more likely to exert a greater impact in Western nations it is expected that the disparity between men and women appears to increase

with the level of development ([Guimond et al., 2007](#)). In a similar direction, [Costa and colleagues \(2001\)](#) speculated that it reflected different processes of attribution in traditional and modern cultures. [Schmitt and colleagues \(2008\)](#) proposed that heightened levels of sexual dimorphism result from personality traits of men and women being less constrained and more able to naturally diverge in developed nations. In less fortunate social and economic conditions, innate personality differences between men and women may be attenuated.

Do men vary more than women in personality? Data collected from 51 cultures or territories suggested that in most cultures, male targets varied more than female targets, and ratings by female informants varied more than ratings by male informants, which may explain why higher variances for men are not found in self-reports ([Borkenau, McCrae, & Terracciano, 2013](#)). Variances were higher in more developed societies and effects of target sex were stronger in more individualistic societies. It seems that individualistic cultures enable a less restricted expression of personality, resulting in larger variances, particularly among men ([Borkenau et al., 2013](#)).

Age Differences

Although the same Five Factor structure appears to persist through the major part of the human lifespan the mean traits change slowly but relentlessly. For example, it seems to be a universal rule that younger people are considerably more extraverted and open than older people, whereas older people are perceived to be more agreeable and conscientious than younger people ([Allik, Realo, et al., 2009](#); [McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#)). Existing data seem to favor an explanation according to which personality development through the lifespan follows a universal pattern that is largely independent of the economic and political environment ([Costa, McCrae, et al., 2000](#)). Consider a cross-sectional study of the observer-rated personality traits of 7,065 Russians. Most adult targets were born before the first satellite Sputnik was launched in 1957, and approximately 10% were born before Stalin's purges in 1937; there were even five targets born before the Bolshevik revolution led by Vladimir Lenin in 1917 ([Allik, Realo, et al., 2009](#)). In contrast, the college-age targets had lived most of their lives in the post-Soviet era. These major historical events, very different from those

experienced elsewhere in the world, might have left their imprints on the personality of targets, and uniquely Russian cohort effects might have created a distinctive pattern of Russian age differences. Instead, age differences in general showed the same pattern seen elsewhere: The difference profile between younger and older Russians across the 30 NEO PI-R facet scales has almost exactly the same shape as it has in the United States, Portugal, or Korea. These findings seem to support the hypothesis that intrinsic maturational changes in the mean level of personality traits are most likely genetically determined and relatively immune to social and historical influences ([Allik, Realo, et al., 2009](#)).

According to the social investment theory ([Helson, Kwan, John, & Jones, 2002](#); [Roberts, Wood, & Smith, 2005](#)), the normative personality trait development in adulthood can be explained not by biological processes but by societal demands and universal social roles faced in young adulthood. It is true, as many researchers have noted ([Donnellan, Conger, & Burzette, 2007](#); [Soto, John, Gosling, & Potter, 2011](#)), that most personality changes are in the direction of increased maturity. As a result, personality pathology tends to decline with age, notably in the case of borderline PD. Although plausible, the social investment theory is unable to explain some of the most basic facts about personality development. An almost complete lack of susceptibility to social and historic changes, which could radically modify social demands and roles, makes explanations based on intrinsic maturation more plausible.

Differences in Perspective

Social psychologists have conducted countless numbers of laboratory experiments to explore the idea that there is a fundamental disparity between the way people perceive themselves and the way they are perceived by others ([Jones & Nisbett, 1971](#); [Nisbett, Caputo, Legant, & Marecek, 1973](#); [Watson, 1982](#)). This disparity is believed to originate from an inevitable asymmetry between internal and external viewpoints: People are immersed in their own sensations, emotions, and cognitions at the same time that their experience of others is dominated by what can be observed externally ([Pronin, 2008](#)).

However, all these arguments about systematic differences between how people see the personality traits of others and their own personality traits are suspicious in view of the fact that normative self-rated personality mean

scores converge almost perfectly with normative observer-rated mean scores on personality questionnaires ([Allik, Realo, et al., 2010](#)). There are truly miniature differences between self-rated and observer-rated mean raw scores, amounting to less than one-quarter standard deviation for most traits.

Nevertheless, the small differences that are seen demonstrate a cross-culturally replicable pattern of difference between internal and external perspectives for Big Five personality traits. People everywhere see themselves (on average) as more neurotic and open to experience than they are seen by other people. External observers generally hold a higher opinion of an individual's Conscientiousness than he or she does about himself or herself. As a rule, people think that they have more positive emotions and excitement seeking but less assertiveness than it seems from the vantage point of an external observer. This cross-culturally replicable disparity between internal and external perspectives is not consistent with predictions based on the actor-observer hypothesis, because the size of the disparity was unrelated to the visibility of personality traits. Surprisingly, a relatively strong negative correlation ($r = -.53$) between the average self-minus-observer profile and social desirability ratings suggests that people in most of the cultures studied view themselves less favorably than they are perceived by others ([Allik, Realo, et al., 2010](#)). It is clear that our current theories cannot explain the direction of the small differences in personality trait perception, but once again personality processes have shown themselves to be universal.

Are Mean Levels Universal?

There are several lines of evidence that suggest that the observed differences in trait levels across cultures are real. As noted above, the FFM can be replicated in culture-level analyses, because cultures that score higher on some definers of a factor usually score higher on others: Variations in trait levels are thus not due merely to random fluctuations introduced by translation. Culture-level means show construct validity in a number of ways, including correlations of means based on self-reports versus observer ratings ([McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005; McCrae et al., 2010](#)) and

correlations with other culture-level variables, such as individualism-collectivism ([Hofstede & McCrae, 2004](#)).

Perhaps one of the most intriguing observations is that the geographic distribution of mean scores of personality traits has a systematic pattern for both self and observer ratings ([Allik & McCrae, 2004b](#); [McCrae, Terracciano, & 79 Members of the Personality Profiles of Cultures Project, 2005](#); [Rentfrow et al., 2008](#); [Schmitt et al., 2007](#)) across the world and with countries ([Allik, Realo, et al., 2009](#); [Rentfrow, 2010](#)). For example, it seems to be a general rule that extraverted and open-minded people live predominantly in economically prosperous, democratic, and individualistic countries ([Allik & McCrae, 2004b](#)).

However, the ranking of cultures on some personality traits may seem counterintuitive. Indeed, it is not highly expected that the most conscientious—determined, strong-willed, organized, dutiful, and deliberate—people live in Burkina Faso and Congo whereas the least conscientious, according to the self-reports at least, live in Japan and Korea ([Mõttus, Allik, & Realo, 2010](#)). These informal observations can be supported by more rigorous analyses. For instance, [Heine and colleagues \(2008\)](#) reanalyzed published data and showed that aggregate national scores of self-reported Conscientiousness were, contrary to the authors' expectations, negatively correlated with various country-level behavioral and demographic indicators of Conscientiousness, such as postal workers' speed, accuracy of clocks in public banks, accumulated economic wealth, and life expectancy at birth. [Oishi and Roth \(2009\)](#) extended the list of paradoxical findings by showing that nations with high self-reported Conscientiousness were not less but more corrupt.

What should be done if we encounter a paradoxic relationship between aggregate national scores of personality and some independent societal measures? Before we can come to a final verdict on faults of culture-level personality scores, we need to follow a simple list of prescriptions on how to react in situations in which trait measures are not related to external criteria in an expected manner ([Mõttus et al., 2010](#)). First, it is possible that the personality traits used in predictive validity studies are sometimes too broad and only some of their aspects are related to the expected criterion variable. Second, going for a refined description of personality should be coupled with a rigorous and comprehensive choice of external validity criteria. Ideally, the choice of criteria should be based on a clear,

theoretically sound account of the causal chain of events that connects the ways of responding on personality scales to variations in the expected external criterion variable. For instance, it has been tempting to hypothesize that high culture-level means of Conscientiousness should yield high accuracy of bank clocks (Heine et al., 2008). In fact, we need a causal explanation as to how a greater proportion of conscientious people in a given population help to get bank clocks, monitored by very small and probably very unrepresentative fractions of populations, more accurate.

The third prescription is to consider alternative ways of conceptualizing the puzzling relationships. The assumed links between external criteria and personality mean that scores are often based on broad theoretical generalizations. For instance, it is appealing to believe that the maintenance of democracy presupposes not only efficient regulation and a transparent legal system but also competent and responsible people. Therefore, it could be expected that in more democratic countries citizens are more responsible and disciplined, resulting in a positive correlation between the level of democracy and the mean national scores of Conscientiousness. However, the relationship may almost equally well go the other way around—it is a dictatorship that better enforces hard work, discipline, and order in society. In reality, an effective democracy is much more likely to be found in cultures with a strong emphasis on self-expression values, whereas dutifulness, order, and hard work are the correlates of survival, the opposite of self-expression (Inglehart & Welzel, 2005). Thus, it can be argued that in countries with higher scores of Conscientiousness—that is, where people are rule abiding, inhibited by social constraints, and keen on keeping order—people are not able to realize their potential for freedom and autonomy, which, in turn, are the cornerstones of democracy (Mõttus et al., 2010).

Scepticism concerning the validity of the country mean scores was also stimulated by the publication of surprising findings that indicated that national character ratings did not converge with assessed personality traits (Hřebíčková & Graf, 2013; McCrae et al., 2013; McCrae, Terracciano, Realo, & Allik, 2007; Realo et al., 2009; Terracciano et al., 2005). The lack of correspondence between national stereotypes and assessed personality traits elicited a vigorous debate (Ashton, 2007; McGrath & Goldberg, 2006; Perugini & Richetin, 2007; Robins, 2005). Among critical comments, Leon Festinger's social comparison processes—the idea that people estimate their attitudes or dispositions relative to social standards (Festinger, 1954)—was

repeatedly mentioned. These frame-of-reference explanations are very seductive in their simplicity, but they are certainly much easier to propose than prove. For example, Heine and colleagues (2008) proposed that people likely bring to mind a standard that lies outside their own culture, for example, a perceived international norm (Heine et al., 2008), in making their own ratings. Yet how could laypersons have such an extraordinary ability to obtain accurate information about the mean levels of personality traits across many countries when psychologists find it so difficult?

Other fields, also facing the reference-level problem, have learned to cope with it. Health studies, for example, are familiar with the paradox that in those countries and regions in which people complain more about serious health problems, people are in fact healthier and live longer (Sen, 2002). Another example are Americans who are decidedly less satisfied with their income than the Dutch even if their real incomes are more or less comparable (Kapteyn, Smith, & Van Soest, 2013). A Harvard political scientist, Gary King, proposed the use of anchoring vignettes—brief descriptions of hypothetical persons—along with self-reports (Hopkins & King, 2010; King, Murray, Salomon, & Tandon, 2004; King & Wand, 2007). Provided that the anchoring vignettes display various levels of the same characteristic that is being measured by self-reports, it is possible to determine the relative position of self-ratings among the hypothetical persons depicted in the vignettes. In a recent study, anchoring vignettes were used to test whether people from 21 countries (Australia, Benin, Burkina Faso, People's Republic of China, Estonia, Germany, Hong-Kong, Japan, Lithuania, Malaysia, Mali, Mauritius, Philippines, Poland, Russia, Senegal, South Africa, South Korea, Sweden, Switzerland, and the United States) have different standards for Conscientiousness (Mõttus, Allik, Realo, Pullmann, et al., 2012). All participants rated their own Conscientiousness and that of the 30 hypothetical persons portrayed in the short vignettes, with the latter ratings expected to reveal individual differences in standards of Conscientiousness. Contrary to expectations of the reference-level theorists, the vignettes were rated relatively similarly in all cultures, suggesting no substantial culture-related differences in standards for Conscientiousness. Controlling for the small differences in these standards did not substantially change the rankings of countries on mean self-ratings and the predictive validities of these rankings for objective criteria. These findings lend little support to the hypothesis that

mean self-rated Conscientiousness scores are influenced by culture-specific standards, considerably restricting the range of potential explanations for the puzzling country rankings in Conscientiousness ([Mõttus, Allik, Realo, Pullmann, et al., 2012](#)). Although it is premature to draw any firm conclusions, it may be that personality traits are estimated in absolute rather than in relative terms. It is possible, for example, that people have developed a more robust and unconditional way of judging their basic tendencies to feel, think, and behave than for judging the level of political freedom in their society or their work satisfaction ([Kapteyn et al., 2013](#); [King, Murray, Salomon, & Tandon, 2003](#); [Kristensen & Johansson, 2008](#)).

What Is Behind Personality Universals?

Searching for personality universals cannot be a goal in itself; they need to be explained, because they may reveal the most fundamental properties of human personality. The observation of universal properties has already stimulated some theoretical explanations. Five Factor Theory (FFT) emerged as a response to challenges posed by these recently discovered universalities ([McCrae & Costa, 1996, 1999, 2003](#)). In contrast to the FFM, which is an empirical summary about the covariation of personality traits, FFT is an attempt to explain universal or near-universal properties of human personality. How can we understand the extraordinary stability of personality traits across the human lifespan ([McCrae & Costa, 2003](#))? Why does the same pattern of covariation among personality traits emerge in countries with completely different economic prosperity, historical experience, and cultural traditions ([McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#); [Schmitt et al., 2007](#))? Why are the effects of heritability overwhelming compared to the vanishingly small effects of the shared environment ([McCrae, Jang, Livesley, Riemann, & Angleitner, 2001](#); [Riemann, Angleitner, & Strelau, 1997](#); [Yamagata et al., 2006](#))? Or why do life events show very little influence on the levels of personality traits ([Costa, Herbst, McCrae, & Siegler, 2000](#))? Or why a utopia to create a new human being, *homo sovieticus*, was a total failure ([Angleitner & Ostendorf, 2000](#))? The FFT was a response to these and other challenges and provides an explanation for most of these personality universals or near-universals established during the past few decades. According to the FFT, personality traits are

basic tendencies, deeply rooted in the organism, that are relatively immune to influences from the environment (McCrae & Costa, 1996, 1999, 2003).

The main purpose of that central “dogma”—in the sense that Francis Crick (1990) used that word—of FFT was to provide a clear basis for formulating a testable hypothesis (Allik & McCrae, 2002). Postulating a general heuristic principle that there is no “transfer” from culture and life experience to basic personality traits obviously stimulates the search for conditions—certainly not very frequent ones—in which this general postulate is violated (Allik & McCrae, 2002). However, finding these violations may be more difficult than is claimed by the critics of FFT. Typically those who oppose the central “dogma” concentrate on one particular detail, forgetting about the whole picture. Another source of opposition is a conflicting “dogma” according to which personality, like the human mind in general, is almost entirely shaped by culture (Barkow, Cosmides, & Tooby, 1992). Many critics of FFT seem to suffer from a false impression that it is an easy task to find evidence demonstrating how culture determines personality.

Challenges to Universality

More than 10 years ago Allik and McCrae (2002) reviewed evidence that could challenge the central “dogma” of the FFT in the context of cross-cultural research. There are four groups of findings that appear to be inconsistent with the basic hypothesis about the immunity of personality traits to cultural influences (Allik & Realo, 2013).

Unique traits. The first is related to an aspiration to find unique personality traits or exceptional combinations of common traits that are specific to one culture alone (Cheung et al., 2011). As we have argued above, all these attempts to establish unique or indigenous traits were mainly futile because what was believed to be a unique trait was found to be applicable to other cultures as well, although perhaps not exactly in the same degree of salience.

Acculturation. The second involves personality differences associated with acculturation. McCrae and colleagues examined Chinese undergraduates living in Hong Kong and Vancouver (McCrae, Yik, Trapnell, Bond, & Paulhus, 1998). Canadian-born Chinese shared many features of the Hong Kong personality profile, but they also demonstrated significant acculturation effects: Their profiles were more similar to

European Canadians than the personality profiles of recent emigrants from Hong Kong. It is quite appalling that it took so long to use the same study design to examine how acculturation shapes personality traits ([Güngör et al., 2013](#); [Söldner, 2013](#); [Zimmermann & Neyer, 2013](#)). This new wave of studies provided support for the view that personality can be subjected to cultural influence. For example, Japanese Americans became more “American” and less “Japanese” in their personality as they reported higher participation in the U.S. culture ([Güngör et al., 2013](#)). However, these studies also showed that a more sophisticated methodology is needed to study acculturation. To make firm conclusions about acculturation, it is necessary to determine personality traits before sojourning in a new cultural environment. It was shown that many acculturation effects can be explained by self-selection: Open and extraverted people are more likely to contact new cultures in which they become even more open and experience more positive emotions ([Söldner, 2013](#); [Zimmermann & Neyer, 2013](#)). Thus, acculturation is a specific case in which the central “dogma” could be violated. It seems, however, that the size of this violation is smaller than initially expected.

Language. Evidence from the third group attempts to demonstrate that language influences the personality of the speaker. When a speaker switches from one language to another, his or her gestures may change. Is switching languages accompanied by a change of personality? This is, of course, a part of a more general question: Does the language you speak affect the way you think ([Deutscher, 2010](#))? Some researchers are optimistic in answering this question; they believe that bilinguals may have two personalities that they can switch with the change of language ([Ramirez-Esparza et al., 2006](#)). For example, when German and Spanish versions of the NEO Five Factor Inventory were administered to two groups of bilinguals of these two languages both groups, regardless of the individual’s first language, scored higher on Extraversion and Neuroticism when Spanish was the test language ([Veltkamp, Recio, Jacobs, & Conrad, 2013](#)). This is a sufficient reason to conclude that language indeed modulates the way in which respondents answer personality items. It is less certain that these two shifts in scores for Extraversion and Neuroticism indicate the individual’s access to multiple cultural meaning systems and the ability of the individual to switch between different culturally appropriate behaviors. For example, it is possible that these two versions of the questionnaire were

not fully identical. To achieve the same level of expression on some trait it is necessary to use more extreme answers in one language than another. Nobody can exclude the possibility that switching languages results in small changes in the speaker's personality. To reach this conclusion, however, it is necessary to eliminate a number of more trivial explanations.

Unfortunately, the number of studies in which two versions of the same personality questionnaire are administered to bilinguals is regrettably small. In one of these relatively rare studies, [Konstabel \(1999\)](#) asked bilinguals to answer the NEO PI-R questionnaire both in Estonian and Russian. Except for some trivial differences these two versions were practically identical. Although personality stereotypes of these two ethnic groups are dramatically contrasting ([Realo et al., 2009](#)), the language in which personality items were formulated has only a negligible effect on answers ([Konstabel, 1999](#)). Likewise, the occurrence of cultural frame shifting was mostly negligible when Swedish-Finns switched their answers from one language to another ([Lönnqvist, Konstabel, Lönnqvist, & Verkasalo, 2014](#)).

Cohort effects. When the same questionnaire is used without change over a considerable period of time it is possible to determine whether men and women of the same age but born in different years have identical personality scores. Age differences in the mean level of adult personality traits are rather small and longitudinal changes of individual scores are even smaller ([McCrae & Costa, 2003](#)). Nevertheless, Jean Twenge has reported several meta-analyses showing dramatic cohort effects ([Twenge, 2000, 2001](#); [Twenge & Campbell, 2002, 2008](#); [Twenge & Im, 2007](#)). For example, American college students have increased in both Neuroticism and Extraversion by nearly a full standard deviation over the past half century ([Twenge, 2000, 2001](#)).

Surveys and polls show that people's values, habits, and social practices change all the time ([Inglehart, Basanez, Diez-Medrano, Halman, & Luijckx, 2004](#); [Putnam, 2000](#)). It is tempting to believe that these changes also affect personality traits. Do dramatic cohort effects demonstrate the way in which culture and society modify personality? Not necessarily. Personality scores are always a mixture of various components. For example, if respondents were asked to describe an ideal person their ratings were highly correlated with their self-description. These descriptions were, in turn, correlated with personality descriptions attributed to the typical representative of their own nation ([Allik, Mõttus, & Realo, 2010](#); [Allik, Mõttus, et al., 2009](#)). Thus,

along with the distinctive personality traits ratings there are also components representing information about an average person and social desirability. As already noted ([Allik & McCrae, 2002](#)), scales analyzed by Twenge are mainly keyed in a positive direction. It is well documented that cultures vary considerably based on extreme and neutral responding ([Mõttus, Allik, Realo, Rossier, et al., 2012](#)). Together with extreme and neutral responding it is possible that the acquiescence bias—a tendency to agree with all the questions ([Smith, 2004](#))—also decreases with time. Because artifactual explanations of the cohort effects cannot be automatically discarded, it is possible that the “true” personality scores, which remain after all potential biases are partialled out, have not changed much over the past years.

It is also important to remember that the interpretation of cross-sectional data is tricky. Secular trends reported by Twenge were difficult to replicate in more representative samples and the inspection of effect sizes provided little evidence for strong or widespread cohort-linked changes ([Terracciano, 2010](#); [Trzesniewski & Donnellan, 2010](#)). Moreover, separation of cohort effects from the age of participants and study period effects is not a trivial exercise (e.g., [Realo & Dobewall, 2011](#)). Usually there is simply not enough data to separate the cohort effect from the effect of age and study moment of participants. In these singular cases and acknowledging these distinctions it is indeed possible to demonstrate that people who were born in a particular year are on average less satisfied with their lives than those who were born only a decade earlier or later ([Realo & Dobewall, 2011](#)). Again, that the cohort effects on personality exist is not a real problem. The problem is their size, which might be too small to have any theoretical or practical consequences.

Conclusions

It is occasionally argued that personality psychologists are more interested in individual differences than in searching for universals as is done in physics or chemistry. Nobody seems to question, publicly at least, that it is an essential function of science to seek universals and if personality psychologists are determined to follow a scientific pursuit then they also need to look for invariant properties in their data. When Galileo dropped objects of different materials and weight from the Leaning Tower

of Pisa he looked for a property that is common to all matter (Allik et al., 2013). In the same way, personality psychologists—perhaps even more than in some other disciplines—are deeply interested in what is common to personality descriptions in all cultures and societies (McCrae, 2009). Only these universal features could provide a satisfying answer to the question of why some people are happy and others feel miserable, why some are laborious and others are lackadaisical, and why some are inquisitive while others are satisfied with what they already have.

The Lexical Foundation of the Big Five Factor Model

Boele de Raad *and* Boris Mlačić

Abstract

A dictionary is the tangible repository of the common stock of words, although dictionaries comprise at best 10% of the full lexicon. Part of the lexicon is made up of the words used to describe what people do and what people are like. The psycholexical approach to personality focuses on this subset of words and on its exploitation, or what can be said to be the glossary of personality. This chapter is concerned with the history of the psycholexical approach to personality description, from ancient history to the more recent efforts, albeit focusing in particular on its modern history. Psycholexical taxonomies from around the world will be considered, as well as taxonomies based on nouns, verbs, adverbs, and their combinations. Ongoing controversies, difficulties, and disputes regarding alternative psycholexical personality structures will be considered, as well as recommendations for future research.

Key Words: Big Five, Five Factor Model, lexicon, psycholexical, personality trait structure, taxonomy, etic, emic

In the history of personality psychology, the two related versions of the five-dimensional model of personality traits, the Big Five Model and the Five Factor Model (FFM), are probably most prominent because they are both built on the understanding of having virtually exhausted the full domain of traits. The broad acceptance of the model is certainly a popularity index, but more important, it is an index of its authoritative nature. The origin of the model is characterized by the divide between the psycholexically based Big Five approach and the questionnaire-based approach of the FFM.

The five-dimensional model of personality traits is the trait model constituted by the five factors of Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect or Openness to Experience. The two different wordings for the fifth factor are symbolic of

one of the differences between the psycholexical approach and the questionnaire approach, respectively.

In this chapter, the history of the model is covered, going back to Cattell's pioneering work to which the two related model versions are linked, and before, but also briefly reviewing some competing models, most notably that of Eysenck, because they add to the discussion of the best way to structure the vast domain of traits. Moreover, the ideas from the history of (personality) psychology that gave floor, flesh, and flavor to the concept of having a comprising system of traits are also considered. An effort is also made to sketch the context in which ideas about persons are formed and find their way into the lexicon in a summarized format, most notably through trait-descriptive adjectival expressions. The term "lexical" in the title of this chapter implies that the building blocks of the model are to be found in the catalogue of a language's words, the collection of all words of a language community. For practical purposes, we might refer to the dictionary as the tangible repository of that common stock of words, although dictionaries comprise at best 10% of the full lexicon. Part of the lexicon is made up of the words used to describe what people do and what people are like. The psycholexical approach to personality focuses on this subset of words and on its exploitation; we might call it the glossary of personality.

Introduction

Exploiting the Lexicon for Scientific Use

It took a long time for the scientific study of personality to recognize the value of natural language for advancing personality psychology. With that growing insight, the notion increased that everyday language had shortcomings. Taking the shortcomings into account, it would, however, be foolish "to ignore such a storehouse of accumulated wisdom as a natural starting-point for the study of behavioral attributes" (Wiggins, 1973, p. 329).

There are different possible ways to exploit everyday language. The systematic study of person-talk (De Raad, 1985) is one option. This could involve recording actual conversations, and studying those conversations for personality-relevant utterances. Another option is tracing personages and their trait-attributions in literary works (cf. Bromley, 1977; McAdams,

[1994](#)). Other possibilities may be found in letters and films. The psycholexical approach usually involves the use of a dictionary as the tangible representation of the lexicon. The advantage of this latter method is the systematic representation of the more useful part of a lexicon by generations of lexicographers. Yet, choosing the dictionary over other lexical resources may have consequences in terms of collecting lexical items with a specific momentum of representation and of function.

The Lexical Hypothesis

Before the two versions of the five factorial trait model started playing a significant role in the psychological literature, there is a rather clear timeline from [Galton \(1884\)](#) to Cattell ([1943a](#), [1943b](#)) in which ideas for a glossary of personality were given form and in which the large list of personality trait terms was summarized in an orderly system. During that timeline, the main principles of the psycholexical approach were formulated, starting with Galton and elaborated especially by [Allport and Odber \(1936\)](#), resulting, among other things, in a rationale that had, according to Allport and Odber, a “portion of plausibility”:

Linguistic symbols have demonstrated utility; they have been tested throughout the ages for their power of representing stable facts of experience.... If traits exist at all it is natural and proper to name them.... Naturally the more often a disposition ... is encountered in the population the more chance it has of being christened.

[\(Allport & Odber, 1936, p. 10\)](#)

The purport of this rationale was described as the so-called lexical hypothesis by [Goldberg \(1981\)](#), who stated that traits or individual differences found to be important by people are represented or will be represented in language. The significance of this hypothesis was independently phrased by the philosopher of language [Austin \(1970\)](#), the writer and semantic poet [Themerson \(1974\)](#), and the psycholinguist [Miller \(1991\)](#).

The Context of Everyday Differentiation

People form an important topic in daily conversations. What people do or not do, their achievements and failures, what happened to them, their

emotional reactions in regard to situational demands, etc. are talked over, evaluated, and explained.

In a cafe, possibly two-thirds of the conversation is person-talk, about who does what with whom, and whether that is good or bad; who is popular and who is not, and why; how we deal with a difficult child, a difficult partner, or colleague. The most frequently sold books are about how the main characters cope with their intimate experiences and how they react to changes of life. Everyday conversations at work or at home relate for a large part to behavior and traits of self or other. Ideas about people are put into words, as much as possible in a language that fits the idea. This is not only a matter of content—is the observation represented well? It is also a matter of use—how do people react to it? When there is a lack of words or when words fall short, new words or more prosaic expressions are invented or metaphors are used—and sometimes these new expressions are adopted by others. The practical usage provides feedback on the effectiveness of the expression: are feelings relieved, did we strike the right note, did we pluck someone's heartstrings? Words are continuously tested for their usefulness.

This everyday person-talk, and also written text, does form a kind of continuous “survival test.” Lingual expressions (e.g., *egoistic*, *aggressive*, or *shy*) that have proven their use in often longtime testing for their capacity to represent facts of experience, and to communicate about those experiences, have a good opportunity to create a firm position in the lexical storehouse. The more often a trait or disposition in the behavior of people is observed, the greater the chance that the trait is labeled and that it becomes a communicative commodity.

By focusing on what the lexical storehouse has in reserve for personality, expression is given to the appreciation of the descriptive and detailing potential of the lexicon of personality. That archive of everyday language with that enormous differentiating potential forms the rough material for the construction of a scientifically acceptable medium for the description of personality traits.

A problem of course is that everyday language is not a neutral language. The lingual elements that stood the test of survival are loaded in all kinds of respects. “Everyday interactions can thus be considered as the stage where conceptions about people, particularly concerning these peoples’ personality or character, come into being, are maintained, or are changed” ([De Raad, 1985](#), p. 1).

Sedimentation of Person-Talk

Interestingly, spontaneous everyday conversation of persons is not typically characterized by the types of words that are used in personality trait research. In addition to the fact that everyday person-talk is often incomplete, without explicit intention, and serves transient goals, most utterances are in behavioral wordings. Perhaps in 10% of the cases trait-descriptive adjectives are used (De Raad, 1985). Of immediate interest for the psycholexical procedure is not so much the single utterances that people may use to make sense of behaviors, but rather how they summarize and communicate those meanings. Hampson (1982, 1984) referred to this as a constructivist process: when it is observed that a person gives money to charity, remits someone a debt, and manages matters for someone else, for example, this may lead to the impression that the person is generous. We focus on the sedimentation (cf. Berger & Luckmann, 1966) of such impressions from person-talk into the lexicon of a language.

The Study of Abstract Trait Words

When the abstract trait-descriptive adjective forms the unit in studying personality, we may ask indeed whether we are studying words and their semantics or the behavior referred to by those words. A pressing issue in the psycholexical research, almost from the very beginning, has been the question: "What are we really studying, human behavior or relations between words on the basis of semantic similarity?" Both methods have explicitly been used, the one involving ratings of people and their behaviors on sets of trait-descriptive adjectives, and the other involving judgments of similarity between trait descriptive words. Wiggins (1973) suggested that the first method produced so-called external structures, and the second produced internal structures. D'Andrade (1965), a fervent critic of personality, equated the two methods, claiming that inferences on human behavior are derived from the semantic similarity judgments. D'Andrade (1965) was drawing on his study using Norman's 20 Big Five scales. He found the same factors in studies of judgments about people and in judgments of similarity of meaning. He repeated his conclusion in a subsequent publication (Shweder & D'Andrade, 1980). Peabody (1987) also studied internal structure using a much larger set of personality descriptors with 57 scales and 114 adjectives, totaling 6,498 judgments. He

found six factors, much like the Big Five; the factors were, however, uneven in size, with three bigger factors (Agreeableness, Conscientiousness, and Surgency) and three smaller ones (Intellect, Emotional Stability, and Values). Opposed to D'Andrade, Peabody (1987) argued that the internal structure is simpler and that it is derived from external judgments. In a follow-up study, Peabody and Goldberg (1989) compared the results based on five external data sets and two internal data sets and found variants of the Big Five in all seven data sets. However, in every instance there were three larger factors, Surgency, Agreeableness, and Conscientiousness, thus giving birth to the Big Three model. Peabody and Goldberg (1989) also corroborated the finding that conceptual judgments or semantic similarity ratings were simpler than judgments of people. Church and Katigbak (1989) studied the internal and external structure in the Filipino language, found factors similar to the Big Five, and supported the cross-language generalizability of the Peabody and Goldberg (1989) study, and also further refuted D'Andrade's claims that judgments of people simply reflect semantic similarity or implicit personality notions.

The Questionable Nature of Everyday Language

Trait words are often contaminated by their context of development and application. Traits are named in terms of standards and interests of a certain space of time. For some words the meaning is particularly articulated under the influence of Christian values, such as "devout," "compassion," and "patience." The term "jovial" comes from astrology (under the influence of Jupiter), "radical" from politics, and "neurotic" from psychology. Not only the time frame, but also the spirit of the age is of influence. The extravert was once described as spiritually poor and superficial and the introvert as high and inwardly rich. Now the introvert is rather the eccentric and individualistic and the extrovert is energetic and sociable. Some words are used only in specific contexts (they are region specific), belong to a certain jargon, or serve a fashionable purpose. Words can reveal secrets, frustrate, or hurt. Trait words can be used as weapons. As invectives they can become the verbal vitriol with which reputations are sometimes ruined and people are brought to stand apart.

John, Angleitner, and Ostendorf (1988) summarized the main criticisms regarding the use of ordinary trait language for scientific purposes, including the laypeople origin (cf. Block, 1995), the contextual loading, and

the additional complication of communicability across languages. [Saucier and Goldberg \(1996\)](#) agreed that the natural language has shortcomings, but they argued that it represents the best approximation of the total population of personality variables. In addition, the lexical approach minimizes a prestructuring of variables according to theorists' preconceptions of personality ([De Raad, 2000](#); [Saucier & Goldberg, 1996](#)). [Hofstee \(2003\)](#) argued that we can dispute that ordinary language is not subtle enough for scientific purposes, yet, in studies with questionnaires built on expert language (e.g., [Digman & Inouye, 1986](#)), the Big Five were also recovered.

History

Ancient History

Trait archives from the past. Plato (427–349 bce) seems to be responsible for the earliest known register of traits of the human personality, a list of no more than four cardinal traits: courage, justice, temperance, and prudence. These traits may be seen as the result of a virtual dispute over the most important traits: basic traits needed for the foundation of an ideal society. People who were endowed with prudence expressed in traits of wisdom and intellect would be well-qualified for leading positions; those who were endowed with traits of courage, bravery, and duty would be fit for the protective and executive tasks in a society; and the masses of workers would ideally be equipped with temperance expressed through moderation and self-control. Finally, the basic trait, justice, was considered as a general trait important for the different layers of a society. Plato's student Aristotle (384–322 bce; [Ross, trans., 1988](#)) amplified this trait register to a system with character traits, and provided each with its extremes in which its deficiency or excess was expressed, thus accounting for 39 distinct character traits. In turn, a student of Aristotle, Tyrtamus (called "Theophrastus" by Aristotle because of his divine writing style, 371–287 bce), undertook the task of describing 30 characters, seemingly to give a fuller portrait of moral character, each provided with examples of strengths and weaknesses in a contextualized sketch. These ancient character descriptions all implied suggestions of what kind of persons we ought to be. The type of character writing introduced by Theophrastus became very popular since the renaissance. [Aldington \(1925\)](#) has brought together some

500 short character studies, including that of Theophrastus, thus providing a rich resource of moral character traits.

[De Raad and Ceulemans \(2001\)](#) studied the semantics of the 30 characters of Theophrastus, by identifying 345 typical actions in the character sketches and classifying them using the Abridged Big Five Circumplex (AB5C) model ([De Raad, Hendriks, & Hofstee, 1992](#)) as the accommodative system. Both the 345 typical actions and the 30 characters were best described by combinations of the negative poles of the factors, Agreeableness, Conscientiousness, and Intellectual Autonomy, thus supporting the often heard conjecture that Theophrastus' characters conveyed a moral message.

Recently, [Dahlsgaard, Peterson, and Seligman \(2005\)](#) have taken up the study of moral character traits again by examining philosophical and religious traditions around the world. They constructed a long catalogue of positive traits (character strengths, virtues) and classified them into six core virtues. [De Raad and Van Oudenhoven \(2011\)](#); see also [Cawley, Martin, & Johnson, 2000](#)) studied the Dutch lexicon of virtues from a psycholexical perspective, and concluded that six factors of virtues covered a lot of ground of the Big Five (Emotional Stability excluded). The lexically based virtue factors showed only partial overlap with the core virtues described by [Dahlsgaard et al. \(2005\)](#).

Characters in text in ancient times. Another interesting resource for trait descriptors, and the use of those descriptors in characterizing people, is evident in the literary text, as in a novel. In some novels certain psychological qualities are explicitly staged through the novel's protagonist, often with the function of furthering the plot of the story. Examples are *greed*, a main theme in [The Great Gatsby](#) by F. Scott Fitzgerald, and *apathy* and *drowsiness*, forming the theme in [Ivan Goncharov's Oblomov](#). Going far back in history, an intriguing case can be found in Homer's *Iliad*, because of the hundreds of personages playing a role in the story, many of whom are provided with character descriptions. [Passakos and De Raad \(2009\)](#) identified 1,713 so-called epithets in the *Iliad*, which are adjectival phrases in which an adjective is combined with the name of a personage. A total of 1,057 of these epithets could be identified as trait-descriptive epithets. Those epithets were classified in the AB5C segments of the Big Five model. Whereas the *Iliad* is generally understood to form a display of the heroic character, the Big Five viewpoint specifies more than before the

various sides of heroism as recorded in the lexicon of the time. Facets from all Big Five factors were used to capture the meaning of heroism, as in *venturesome*, *good*, *powerful*, *bellicose*, *resourceful*, and *fearless*. For treatises on how personality is conceived of in ancient Greek times, see, for example, [Gill \(1996\)](#) and [Adkins \(1970\)](#).

Modern History

The German inception of an alphabetical psychology: from Galton to Baumgarten. While Germany became the main region for the development of psychology at the end of the nineteenth century and different psychological subdisciplines emerged, the lexical approach commenced in this fertile environment as well. The approach was later called “alphabetical psychology” by [Kouwer \(1963\)](#). The first who pointed to a dictionary as a valid resource was possibly [Galton \(1884\)](#), who examined Roget’s *Thesaurus* and estimated that it contained “fully one thousand words expressive of character” (p. 181), with “character” referring to moral qualities. Some years after Galton, [Rümelin \(1890\)](#) pointed again at the availability of hundreds of character traits in language waiting to be exploited for scientific use. It took a few decades before [Klages \(1926\)](#) again took up the rationale of the lexical approach for the study of personality, and he roughly estimated that around 4,000 words in the German language could be useful for that purpose. Just a few years later [Baumgarten \(1933\)](#) made an effort to empirically test Klages’ hypothesis by examining various German dictionaries and other publications, using frequency criteria for the occurrence of trait descriptive words, and she came up with a list of 941 adjectives and 688 nouns useful for describing personality.

Fruits from Webster’s Unabridged Dictionary: from Allport and Odber to Cattell. In the years during which the center of the psychological evolution shifted from Germany to the United States, the lexical approach moved along. [Allport and Odber \(1936\)](#) undertook the task of scrutinizing Webster’s unabridged dictionary and they were able to select almost 18,000 words that might be useful for the description of personality. Those words were classified into four categories, differing in level of descriptiveness for everyday conversation and differentiation, thus taking into account the contextual issues mentioned earlier. Those categories were “Neutral terms designating possible personality traits,” “Temporary moods or activity,”

“Evaluations,” and a “Miscellaneous” category. The first category contained “most clearly ‘real’ traits of personality” ([Allport & Odbert, 1936](#), pp. 24–38), with 4,504 lexical items. Interestingly, lexical items symbolizing abilities (e.g., able, competent, gifted, talented) ended up in the third or fourth category.

Starting with this first category of “real” personality traits, Cattell ([1943a, 1943b](#)) stretched the criterion for this category by adding a few hundred terms mainly from the second category of “temporary state” terms, following by removing rare and archaic terms and doubles that differed only through prefixes, thus yielding a list of between 2,100 and 2,200 terms, which were classified into 160 clusters on the basis of synonymy. Cattell next searched the psychological literature for personality-relevant terms that psychologists had used during a century or so, which led to an amplification with 11 new categories, not well represented in the dictionary, mainly in the areas of abilities and interests. The final set of 171 categories or trait variables was supposed to comprise the complete personality sphere. On these 171 trait variables peer ratings from 100 participants were collected. Based on empirical correlations among these ratings, Cattell dropped quite a few variables and clustered the remaining ones into a final set of 35 traits.

Cattell’s trait sphere summarized: 35 trait variables in 12 or 5 primary factors. The set of 35 trait variables or somewhat reduced subsets has been used by different investigators who arrived at different sets of factors. Cattell ([1945, 1947](#)) conducted factor analyses using ratings on the 35 personality variables, and identified 11 to 12 factors, similar across samples. Cattell added four questionnaire-specific scales to complete a system with 16 primary personality factors (16PF). [Fiske \(1949\)](#), [Tupes and Christal \(1958, 1961\)](#), and [Norman \(1963\)](#) each collected their own ratings on the 35 Cattell variables and none of them was successful in replicating that many factors but rather arrived at a much simpler structure with five independent dimensions. Since [Norman’s \(1963\)](#) study, those five factors had been referred to as the “Norman five” and were labeled Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Culture. The factors were dubbed the “Big Five” by [Goldberg \(1981; cf. Goldberg, 1990\)](#) in whose work the fifth factor shifted labels from Culture to Intellect ([Goldberg, 1993a](#)).

Norman's 2,800 stable traits. The drastic reduction of the personality lexicon to a set of only 35 trait variables was “a matter of unhappy necessity” to Cattell (1945, p. 70), due to the technical limits of the time. Tupes and Christal (1961) thought that it was possible to find fundamental concepts other than those described by the five factors based on the set of 35 trait variables. Norman (1963) suggested going back to the total pool of trait names in the natural language. Norman (1967) actually started building a new taxonomy that would be “sufficiently exhaustive, precise and well structured to be useful for purposes of scientific communication and assessment” (p. 2). He used a new edition of Webster’s *International Dictionary*, searching for trait terms not yet included in the Allport-Odbert list. To his surprise, he found only 171 new terms, yielding a complete set of 18,125 terms. In several rounds of reduction, Norman (1967) excluded about 11,000 terms according to criteria adopted by most lexical researchers to date, and sorted the remaining 7,000 terms into the three main rubrics of stable “biophysical” traits, temporary states and activities, and social roles, relationships, and effects, more or less similar to the classification made by Allport and Odbert (1936). Next, Norman collected a massive set of data for the 2,800 terms, or more precisely 2,797, from the category of biophysical traits, including ratings of their functionality, familiarity ratings, self and peer ratings, and social desirability ratings. Those terms were first clustered into categories defined by the Big Five poles, and subsequently into more narrow synonym clusters, thus forming 75 clusters of trait terms.

Goldberg's taxonomy of personality descriptive terms. About a decade after Norman instigated his ambitious project, Goldberg embarked on bringing the project “to its logical fruition” (Goldberg, 1975). Goldberg (1981) laid the foundation for the contemporary methodology of the lexical approach through a series of careful analyses and by giving some first answers to important considerations: descriptions along a continual dimension are to be preferred over a typological approach; unipolarity and bipolarity of dimensions should both be given a role; orthogonality of dimensions has certain advantages but oblique dimensions should be considered because they seem to be more realistic; and the level of description should be neither too abstract nor too specific.

Goldberg (1982, 1990) shortened Norman’s 2,797 list to 1,710 trait-descriptive adjectives using criteria of familiarity, removing dialect terms, and adding 40 adjectives, mostly from Gough’s Adjective Check List.

[Goldberg \(1990\)](#) aggregated the self ratings collected by Norman on the 1,710 adjectives into the 75 Norman clusters, thus obtaining cluster-scale scores, and applied different methods of factor extraction and rotation on those cluster scores, and repeatedly obtained five factors. [Goldberg \(1982, 1990\)](#) further reduced the 1,710 set, using various exclusion criteria, to the 479 most commonly used trait adjectives. A clustering of these 479 terms into 133 synonym clusters took place, and factor analyses on these 133 cluster variables in four samples of participants, including two self-rating samples and two peer-rating samples, again yielded clearly five factors. When the analysis of a further reduced set with 100 synonym clusters based on 339 adjectives produced again the Big Five, [Goldberg \(1990, p. 1223\)](#) was enthusiastic of Big Five breadth: “Consequently, it now seems reasonable to conclude that analyses of any reasonable large sample of English trait adjectives in either self- or peer-descriptions will elicit a variant of the Big Five factor structure and therefore that virtually all such terms can be represented within this model.” [Goldberg \(1992\)](#) eventually developed a set of 100 unipolar and 50 bipolar scales, calling them “standard markers of the Big Five factor structure.” Goldberg’s taxonomic endeavor continued with the development of an evaluation-explicit taxonomy, and three preliminary taxonomies, namely a taxonomy of nouns, one of temporary moods, states, and activities, and one of social roles and relationships or effects ([Goldberg, 1982](#)).

Cattell revisited: three secondary factors. The early studies of Cattell ([1943a, 1947](#)) were also a valuable source of information for [Costa and McCrae \(1985\)](#) who were interested in using a measure of personality in the context of aging studies. A first cluster analysis of the Cattell’s 16PF ([Costa & McCrae, 1976](#)) scales revealed two recurring clusters, i.e., Extraversion and Neuroticism, but also a hint of their future important dimension of Openness to Experience. The origin of [Costa and McCrae’s \(1985\)](#) addition of Openness to Experience was Coan’s ([1972, 1974](#)) Experience Inventory developed to measure components of Openness to Experience. The instrument formed part of Coan’s strategy to study the humanistic-oriented concept of an optimal personality, which was felt to have openness to experience as a core quality. [Coan \(1974\)](#) agreed that Cattell had done a remarkable job in describing the common personality trait vocabulary. That vocabulary made it possible to differentiate people by their observable behavior and by their ways of expressing emotions. According to Coan,

however, our language would be deficient in describing unexpressed experiences and thoughts (Coan, 1974, p. 21). The Experience Inventory was developed to fill that gap, and contained seven scales to measure the various facets of experiences. For the original NEO Personality Inventory (Costa & McCrae, 1985) six facets were selected to measure openness to experience, and subsequently also six facets for both the Neuroticism and Extraversion scales. The correlations of the three NEO scales with Goldberg's Agreeableness and Conscientiousness scales turned out to be essentially zero (McCrae & Costa, 1985a, 1987).

From the NEO-plus-two to the Five Factor theory. Costa and McCrae (1992b) later added Agreeableness and Conscientiousness to their model, which then constituted the FFM, so crucial for the popularization of the model and its expansion to the domain of questionnaires. In subsequent years Costa and McCrae conducted numerous studies (e.g., Costa, Busch, Zonderman, & McCrae, 1986; McCrae & Costa, 1985b, 1989a, 1989b) relating the five factors to other prominent personality instruments and models such as MMPI, MBTI, Eysenck's model, and Wiggins' circumplex. Those studies found substantial and meaningful relations between all the investigated personality instruments and the FFM dimensions and convinced Costa and McCrae (1992a) that five factors are basic dimensions of personality. This was corroborated by Goldberg and Rosolack (1994) who viewed the Big Five as an integrative framework for personality research. In recent years Costa and McCrae (e.g., McCrae, 2010; McCrae & Costa, 2008) built a Five Factor Theory (FFT), going a step further from the usual Big Five interpretations, and claiming that five factors have not only descriptive but causal status, and that they are universal with strong genetic and biological bases.

Trait Taxonomies Around the World

A Diversion of Lexical Methods

Some 40 years after departing from Germany to the United States, the lexical approach to personality found its way back to Europe, mainly in the Netherlands and again in Germany. The first two studies followed different procedures. The first study was conducted in Dutch by Brokken (1978) who followed a straightforward procedure of selecting terms from the lexicon that had trait descriptive meaning. Those terms were identified using a

practical definition of traits in the form of identification sentences. This was referred to later as the Dutch method. [Angleitner, Ostendorf, and John \(1990\)](#) performed the first German psycholexical study for which they developed an explicit and detailed schedule involving a variety of characterization terms, including, for example, traits, roles, and reputations. The distinctive significance of the German project is in the detailed explanation on which terms are trait relevant, the minute development of the trait classification system, and the elaboration of the importance of the word class of nouns for personality description.

Central issues in these selection procedures involve (1) the definition of the lexical documentation used for finding trait terms; (2) the definition of the domain of characteristics that defines personality; (3) the definition of a trait to be selected from those documents; and (4) defining the lingual categories of description. With respect to the first, typically dictionaries are used as the type of lexical documentation that is probably most comprehensive. However, it is also possible to use novels, or other types of documentation in which personality characterizations are provided. The use of dictionaries has been such that each and every page was scanned for personality descriptive terms. [Tellegen and Waller \(1987\)](#), however, sampled pages from a dictionary to arrive at a full and unrestricted set of traits. Regarding the second, the German lexical team, for example, defined personality in a very broad sense, including not only traits but also roles, attitudes, reputations, etc., because all these concepts may convey information on personality. With respect to the third, a general theoretical definition that is mostly used, explicitly or implicitly, is “disposition” or another term with the same intent (e.g., inclination). In the Dutch lexical program, practical definitions were used in the form of sentences in which a trait term should fit. Different practical definitions apparently produce different sets of traits ([Brokken, 1978](#)). Related to both the second and third issue, [Tellegen and Waller \(1987\)](#) proposed broadening the definitions of traits so as to also include evaluative descriptors.

Regarding the fourth, several studies have been performed with word categories different than adjectives, with [De Raad and Barelds \(2008\)](#) providing the ultimate study with word sorts from all relevant categories in one single study. The main idea was to capture all personality descriptive content in a lexicon, not only the semantics conveyed through adjectives.

The Dutch Taxonomic Project

[Brokken \(1978\)](#), in a major phase of reducing the starting set of 8,690 adjectives, devised two criteria for deciding what personality descriptors are the so called “Nature criterion” and the “Person criterion.” According to the former, the Nature criterion, an adjective is useful for personality description if it could be meaningfully inserted in the following sentence: “He (she) is ... by nature.” In accordance with the Person criterion, an adjective serves the purpose of personality description if it answers the question: “Mr/Mr X., what kind of person is he/she?” ([De Raad, 2000](#)). For the development of the taxonomy of personality verbs, a similar identification sentence was used: “If someone [verb]s more often than others, then that behavior shows his/her personality” ([De Raad, Mulder, Kloosterman, & Hofstee, 1988](#)). For the taxonomy of personality descriptive nouns for each noun judges were asked its usefulness in “describing, typifying, characterizing, etc. a person” ([De Raad & Hoskens, 1990](#)). In a study comparing the replicability of the Big Five using different trait descriptive word classes, [De Raad \(1992\)](#) concluded that the five factors are most clearly found in the structure of adjectives, but the structure of nouns and verbs can be also interpreted in terms of some of the Big Five factors or their blends. The Dutch method was also proven useful in lexical studies in other languages, such as in Italian by [Caprara and Perugini \(1994\)](#). Aspects of both the Dutch and the German methods were used in, for example, the Hungarian taxonomy ([De Raad & Szirmák, 1994; Szirmák & De Raad, 1994](#)).

The German Taxonomic Project

[Angleitner et al. \(1990\)](#) elaborated on [Allport and Odbert's \(1936\)](#) definition of personality relevance by dividing it into three main steps. The first step related to their expectation of six categories of person description to appear in the dictionary, such as (1) stable traits, (2) states and moods, (3) activities, (4) social aspects of personality, (5) abilities and talents, and (6) appearance. The second step related to exclusion criteria indicating that terms are not personality relevant if they could apply to all individuals or if they could be related to geographical origin, to occupational identity, only to a part of the person, or be doubtful and metaphorical. In the final and third step the Dutch method was drawn on and terms from the lexicon were

considered personality relevant if they could be meaningfully inserted in any of two identification sentences.

The German team also included other word classes beyond adjectives, and distinguished between attribute nouns and type nouns. The former are abstract words and relate indirectly to people, describing their traits, behavior, and experience, such as *friendliness* (Angleitner et al., 1990, p. 93). The latter refer directly to people, characterizing their personality types, such as *nerd*.

The German method is reflected in the majority of the personality taxonomies developed later, including another Italian Roman taxonomy (Di Blas & Forzi, 1998), Czech (Hřebíčková, 2007), Polish (Szaroła, 1996), Filipino (Church, Katigbak, & Reyes, 1996), Croatian (Mlačić & Ostendorf, 2005), Slovak (Ruisel, 1997), and Spanish (Quevedo-Aguado, Iraegui, Anívarro, & Ross, 1996).

The Replicability of the Big Five in Germanic and Slavic Languages

In the late 1980s and 1990s, the lexically based taxonomy approach was followed in many languages, mainly in Europe, with the replication of the Big Five being most successful in Germanic and Slavic languages (Saucier, 2009).

The Dutch and German findings corroborated the Big Five structure. The Dutch studies (De Raad, 1992; De Raad & Hoskens, 1990; De Raad et al., 1988) found the Big Five in the structure of adjectives, but also to a greater or lesser extent in the structure of nouns and verbs. The noun and verb structures also suggest new meaningful dimensions or facets not covered by the adjective structure. Whereas the German structure gave a clear confirmation of the American-English-based Big Five structure, including an articulate intellect factor, in the Dutch taxonomy the fifth adjective-based factor not only covered more typical intellect facets but also those of rebelliousness and progressiveness, as opposed to conventionality, thus emphasizing intellectual independence (cf. De Raad, 1994).

The first study using the detailed German method clearly replicated the Big Five in the German language (Ostendorf, 1990), using self and peer ratings and corroborating Norman's (1967) finding that Agreeableness is the largest factor in the natural language, and Emotional Stability belongs to the smallest. Studies in the Slavic languages that followed the German method were also supportive of the Big Five. Szaroła (1996) replicated the

Big Five in Polish. The five factor structure found in Czech ([Hřebíčková, 2007](#)) showed four factors similar to the first four of the Big Five, but the fifth factor was peculiar in that it referred to both abilities and dexterity. When exploring the trait structure in Czech with personality-descriptive verbs, [Hřebíčková, Osecká, and Čermák \(1999\)](#) found Big Five elements, but Intellect was absent. The Croatian personality taxonomy ([Mlačić & Ostendorf, 2005](#)) replicated the Big Five using self and peer ratings based on adjectives with three larger factors (Agreeableness, Extraversion, and Conscientiousness) and two smaller ones (Intellect and Emotional Stability), thus supporting the Big Five as well as the Big Three model. The Croatian study also yielded a clear relationship between Croatian emic dimensions and the respective imported American Big Five factors ([Mlačić & Ostendorf, 2005](#)). Even the study in Russian ([Shmelyov & Pokhil'ko, 1993](#)) that investigated the internal structure of traits found substantial congruencies between the Russian factors and the Big Five, but it should be noted that those five Russian factors were identified in a Six-Factor structure.

The Replicability of the Big Five in Other Indo-European Languages

Unlike Germanic and Slavic languages, the replication of the Big Five in other Indo-European languages was far from perfect. The first study that appeared in Romance languages was done in *Italian* by [Caprara and Perugini \(1994\)](#), and they settled on the five factor solution. The factors, interpreted as Extraversion/Energy, Quietness versus Irritability, Conscientiousness, Selfishness versus Altruism, and Conventionality, did not align clearly with the Anglo-Germano-Slavic Big Five. The fifth factor in [Caprara and Perugini \(1994\)](#), Conventionality, was much more like the fifth factor in the Dutch structure, emphasizing the rebelliousness and progressiveness at the nonconventionality pole. In addition to this there was a clear shift in content between the Italian factors Quietness and Altruism and the classic Big Five Agreeableness and Emotional Stability. The other study in Italian language, done by [Di Blas and Forzi \(1998\)](#), also partially replicated the Big Five in two sets of data in a structure with a clear set of three factors (Conscientiousness, Extraversion, and Agreeableness), and the Emotional Stability dissipated into two factors, while a five factor solution did not yield an Intellect factor. In a study by [De Raad, Di Blas, and Perugini \(1988\)](#) combining the data sets of the two Italian taxonomies, and

comparing the two structures, it turned out that the two taxonomies had produced essentially the same Five Factor structure, with four typical Big Five factors and the fifth factor emphasizing Integrity versus Nurturance.

The study in *Spanish* ([Benet-Martinez & Waller, 1997](#)) was one of the first to demonstrate the so-called Big Seven model with factors interpreted as Positive Valence, Negative Valence, Pleasantness, Engagement, Temperamence, Agreeableness, and Openness. Because Pleasantness was based on sociability, joy, energy, and self-assurance, [Saucier and Goldberg \(2001\)](#) saw a clear replication of the Big Three in the Spanish data, in addition to the Positive and Negative Valence factors. It should be noted that [Benet-Martinez and Waller \(1997\)](#) followed a specific methodology in which every fourth page of the Spanish dictionary was inspected for trait descriptors. That kind of sampling may have systematically influenced the exclusion of terms beginning with, for example, “un” or “in” that denote the relative lack of a certain quality; this could, for example, have influenced the size of the negative poles of resulting factors.

Another taxonomy in the Romance language, *French* ([Boies, Ashton, Pascal, & Nicol, 2001](#)), in Canada was one of the first Indo-European studies distinctive in two aspects, namely the extraction of six factors, rather than five, and the interpretation of one of the factors as Honesty. The six factors in that study reported by their relative size were Agreeableness, Emotional Stability, Extraversion, Conscientiousness, Honesty, and Imagination (with the notable absence of Intellect-related terms). However, it must be noted that the factors of Agreeableness and Honesty shared some of the aspects regarding their cross-correlations with the adjective markers of noncorresponding factors, that is, the factor of Agreeableness had the highest correlation with the adjective markers of Agreeableness, but also a substantial secondary correlation with markers of Honesty and vice versa.

A study in the modern *Greek* language ([Saucier, Georgiades, Tsaousis, & Goldberg, 2005](#)) that used a modified German method examined both ipsatized and raw-data factors and it was concluded that only one- and two-factor solutions were invariant. The one factor was labeled as Evaluation and the two factors as Morality/Social Propriety and Dynamism ([Saucier et al., 2005](#)). Beyond that, the authors considered that the five- and Six-Factor solutions were also stable, but the factors did not resemble the classical Big Five interpretation. For example, the five factors in the ipsatized data set were labeled as Negative Valence, Morality/Agreeableness,

Conscientiousness, Prowess/Heroism, and Positive Affect/Sociability whereas in the Six-Factor solution the Morality/Agreeableness factor broke into Honesty and Even Temper.

A recent taxonomy in *Hindi* (Singh, Misra, & De Raad, 2013) confirmed the stability of three factors in self ratings and peer ratings, but not the so-called Big Three. The three Hindi factors reflected the ancient Hindi cultural concept of Triguna, namely rajasic, tamasic, and sattvic. According to Singh et al. (2013) the rajasic factor represents ambition, friendliness, and humility, tamasic represents egoism, mean mindedness, and concealment, and sattvic represents competence, organization, and soberness. Singh et al. (2013) also concluded that the triguna factors covered much of the Big Five content and variance, which prevented the Big Five from appearing beyond triguna.

In conclusion, the studies in Indo-European languages other than Germanic and Slavic gave varying structures, with three, five, and up to seven factors, and the replication of the Anglo-Germano-Slavic Big Five was sporadic, usually with the lack of the Intellect factor and a dispersion of the Emotional Stability factor. Those studies also offered first versions of models that later became the competitors of the Big Five, such as the Big Six (Ashton & Lee, 2001) and the Multi-Language 7 (ML7; Saucier, 2003a) models. It seems, however, that the kernel structure that could be drawn from most of these studies, if not all, is the Big Three model with often broad versions of Agreeableness, Extraversion, and Conscientiousness.

The Big Five in Non-Indo-European Languages

Studies in *Hungarian*, a Finno-Ugric language (De Raad & Szirmák, 1994; Szirmák & De Raad, 1994), were not directly supportive of the Big Five. A Five Factor solution did not contain Intellect, but a factor called Integrity (De Raad & Szirmák, 1994); only a Six-Factor solution additionally gave the Intellect factor. In a Five Factor solution Agreeableness was well covered but had split into two factors, respectively called Agreeableness and Integrity. The Six-Factor solution formed the first appearance of the structure later confirmed in work of Ashton as the Big Six.

Studies in *Turkish*, a member of the Altaic language family, were more supportive of the Big Five (Goldberg & Somer, 2000; Somer & Goldberg, 1999). Somer and Goldberg (1999) reported a clear Five Factor structure in

both self and peer ratings with the first four factors being very similar to the corresponding factors of the Big Five, but the fifth factor being closer to an Openness reading rather than to an Intellect reading. In a study with a restricted item pool, [Goldberg and Somer \(2000\)](#) replicated these findings, however, with the fifth factor combining Intellect content with Unconventionality.

A study in Hebrew ([Almagor, Tellegen, & Waller, 1995](#)) led to the conclusion of seven factors, labeled Agreeability, Dependability, Negative Valence, Positive Valence, Positive Emotionality/Agentic, Negative Emotionality, and Positive Emotionality/Communal. Although this finding seems to corroborate the Big Seven model found in Spanish with the dissipation of Emotional Stability, it must be noted that, unlike the Spanish study, Extraversion divided into two factors of Positive Emotionality; the Intellect terms were attached to the Positive Valence factor and Negative Valence was somewhat bipolar ([Almagor et al., 1995](#)). The study in Hebrew also suffered from the same limitation as the Spanish study; that is, it inspected only every fourth page of the dictionary, which could have systematically affected the outcomes.

Studies in Filipino, or *Tagalog* ([Church, Katigbak, & Reyes, 1998](#); [Church, Reyes, Katigbak, & Grimm, 1997](#)) also settled for a Seven-Factor structure but, unlike the above Big Seven, the factors were interpreted as Concern for Others, Conscientiousness, Gregariousness, Intellect, Self-Assurance, Temperamentalness, and Negative Valence. The authors concluded that the first five factors were similar to the Big Five (with Agreeableness, Conscientiousness, Extraversion, Intellect, and Neuroticism, respectively), whereas the factor Temperamentalness covered aspects of three Big Five factors: Agreeableness, Conscientiousness, and Neuroticism ([Church et al., 1997](#)). A new study ([Church et al., 1998](#)) replicated this Seven-Factor structure, albeit with the positive evaluation or positive valence terms blending with the Intellect factor. However, the seven factors were found only in an Eight-Factor solution with an additional small factor labeled as Uninhibited or Flamboyant ([Church et al., 1998](#)). [Church et al. \(1998\)](#) concluded that the cross-cultural generalizability of the Spanish Big Seven model was not complete; however, it must be noted that the fusion of Positive Valence and Intellect also occurred in Hebrew.

[Saucier \(2003a\)](#) compared the Hebrew and Filipino structures. He emphasized the convergence between the studies, which he expressed in the

so-called Multi-Language Seven (ML7), which he subsequently found to be recoverable in English and in Italian.

A study in *Korean* ([Hahn, Lee, & Ashton, 1999](#)) could be seen as supportive of the Big Three, like many studies discussed so far, but also of the model with six factors. [Hahn et al. \(1999\)](#) interpreted Three-Factor to Six-Factor solutions where the Three-Factor solution closely aligned to the classical Big Three; the Four-Factor solution correlated strongly with the first four Big Five factors and the five factors represented the Big Five with some rotation of Conscientiousness and Intellect. The Six-Factor solution unveiled the additional factor of Truthfulness, similar to the Hungarian Integrity factor ([Hahn et al., 1999](#)), a factor that later became known as Honesty ([Ashton & Lee, 2001](#)).

The first study in *Chinese* ([Yu et al., 2009](#)) selected a set of 6,000 personality descriptive adjectives, reduced them to 650, and interpreted five factors in self-ratings of 610 students: Intelligent, Emotional, Conscientious, Unsocial, and Agreeable. Although the labels of the Chinese factors seem supportive of the Big Five, it must be noted that there was a lack of descriptors describing the positive pole of Extraversion at the factor Unsocial, while the same factor gathered some adjectives describing the negative pole of Intellect. Nevertheless, based on the results of that study, [Yu et al. \(2009\)](#) developed a set of 100 marker adjectives and interpreted the same five factors in self-ratings of 720 students.

A second study in Chinese ([Zhou, Saucier, Gao, & Liu, 2009](#)) was less supportive of the Big Five. [Zhou et al. \(2009\)](#) started with 3,150 personality-descriptive adjectives, reduced them to 413, and applied them to obtain self ratings from 451 students as well as 500 peer ratings. [Zhou et al. \(2009\)](#) interpreted a hierarchical pattern of structures from one to seven factors and concluded that the One-Factor (Evaluation/Social Propriety) and Two-Factor (Social Propriety and Dynamism) structures agreed with those from previous studies. Moreover, [Zhou et al. \(2009\)](#) concluded that the Seven-Factor structure, consisting of the factors Extraversion, Conscientiousness/Diligence, Unselfishness, Negative Valence, Emotional Volatility, Positive Valence/Intellect, and Dependence/Fragility, was most stable across self ratings and peer ratings as well as across ipsatized and original data.

Judging by the lexical studies in non-Indo-European languages, it must be concluded that the results were mixed in terms of the support for the Big

Five model. Although in some languages structures close to the Big Five model were found, in other languages only traces of the Big Five were identified, and some studies settled on interpreting various structures, from two up to seven factors. Some additional support was found for the Big Six-Factor and the Seven-Factor structures (e.g., ML7), but reservations remain about the methodology of some studies. Interestingly, just as was the case for the Indo-European languages, the Big Three factors seem to be identifiable in almost all non-Indo-European languages.

Exploiting the Lingual Means to Characterize Personality

Grammatical Categories and Semantic Coverage

From a linguistic viewpoint it seems logical to use the category of adjectives for the description of personality traits, because adjectives describe qualities of objects and persons, as in “an *honest* person.” The psycholexical approach has indeed been largely dominated by the use of trait-descriptive adjectives. However, communication concerning persons allows for a great variety of linguistic forms for person characterization, including single nouns (he/she is a *comedian*), single adverbs (he/she behaves *aggressively*), single verbs (he/she *influences* people), but also more natural or even poetic expressions (he/she is a person who *looks at things from different angles*). [Ryle \(1949\)](#) argued that the personality vocabulary does not consist only of dispositional words: “The judge, the teacher, the novelist, the psychologist, and the man in the street are bound also to employ a large battery of episodic words when talking about how people do, or should, act and react” (p. 113). Episodic acts (is smoking a cigarette) may be used to derive tendency statements (is a cigarette smoker) (see also [Osgood, 1970](#)). Psychologically, all such characterizing sentences or derivative sentences are useful as long as they fulfill the “adjectival function”; that is, they communicate on dispositional qualities of persons. [Allport and Odber \(1936\)](#) did not exclude other grammatical categories for personality description, and actually included adjectives, adverbs, nouns, and participial terms. To avoid duplication of semantics, nouns and other word classes appeared in their list only if no corresponding adjective existed. [Allport and Odber's \(1936\)](#) first column, with terms that “seem to symbolize most clearly ‘real’ traits of personality,” was suggested not to be

the final list (p. 26). Compounds and idioms might well be added as “useful and apt phrases” (p. 30) for personality characterization.

In sum, there is more to language than just adjectives for personality descriptive purposes, and the lexical approach would do a “suboptimal” job ([De Raad, 2000](#)) if it would exclude classes of potentially relevant terms describing personality. The most obvious candidates in this respect would be adverbs, many of which appear in both adjectival and in adverbial format (e.g., *aggressive* and *aggressively*), verbs, expressions, and nouns. For the latter category, [Angleitner et al. \(1990\)](#) distinguished between type nouns (conservative) and attribute nouns (conservatism).

Nouns

The first to explore a different domain of lingual descriptors was probably [Goldberg \(1982\)](#) who studied the use of nouns especially within the framework of developing an evaluation-explicit taxonomy of trait terms. [Goldberg \(1982\)](#) catalogued 1,947 nouns from different sources, of which 1,342 were commonly used terms. [Goldberg \(1982\)](#) concluded that, compared to adjectives, nouns carry more negative implications and they are more colloquial and slangy. Although this observation generally holds, [De Raad and Hoskens \(1990\)](#) reasoned that it is probably a matter of degree and that there may be nouns for which the evaluative component does not dominate the potential descriptive component.

[De Raad and Hoskens \(1990\)](#) selected 8,450 possible personality-descriptive nouns from a database comprising two comprehensive Dutch dictionaries, reduced them to 3,200 nouns, using criteria of familiarity and of usefulness in personality description, and finally reduced them to a list of 755 nouns, on which self and peer ratings were collected from Dutch and Belgian participants. [De Raad and Hoskens \(1990\)](#) concluded that in the different data sets the Big Five factors can be easily identified with the noun-factor Anxiety representing Big Five Emotional Stability, the noun-factor Perseverance representing Big Five Conscientiousness, Antagonism representing Big Five Agreeableness, Culture representing Big Five Intellect, and same-named Extraversion. In addition, they found a factor they labeled Malignity, the largest in terms of accounted variance, a finding that corroborates [Goldberg's \(1982\)](#) observation that nouns carry more negative implications.

Henss (1995, 1998) investigated type nouns in the German language, starting with the list of around 5,500 type nouns, reduced it to 192, and used them in ratings of prominent persons as stimuli. Henss (1998) concluded that his noun factors are related to the Big Five factors, with an additional Physical Attractiveness factor, which may make sense considering the stimulus persons that were rated (cf. De Raad & Ostendorf, 1996).

Saucier (2003b) investigated the structure of English personality type nouns, starting with Goldberg's (1982) list of 1,947 type nouns. He made a reduction to the 557 nouns with the highest frequency of use and a further reduction to 372 by excluding role nouns and profane terms. Analyses of self ratings and peer ratings of those 372 type nouns yielded one- and two-factor structures robust across samples, while within-gender analyses yielded a structure with eight orthogonal factors. The first of these was labeled Social Unacceptability, a factor closely related to the Malignity factor in Dutch. The second factor, labeled Autonomous Intellect, was similar to the Dutch Culture factor, and the third factor, Egocentrism, was related to the Dutch Antagonism. The seventh factor, called Liveliness, was related to the Dutch noun factor Extraversion. The sixth factor, Attractiveness, was related to the German factor with the same name. The remaining factors, Masculinity, Delinquency, and Disorientation, seemed to be more specific to the English study.

Di Blas (2005) investigated *attribute* nouns in the Italian language, starting with a list of 3,200 potentially personality-relevant attribute nouns, reduced to a final list with 447 nouns, using ratings of familiarity, frequency of use, and personality relevance. Analyses of self-rating data revealed a stable Three-Factor solution, corroborating the Big Three model, while the search for a stable solution beyond the three factors was unsuccessful (Di Blas, 2005). An unstable Six-Factor solution represented deviations of the Big Five with factors of Conscientiousness, Self-Assurance, Sociability, Placidity, Honesty/Humility, and Cleverness/Sophistication, which made Di Blas (2005) conclude that in the Italian context personality language reflects the Big Three and the Big Six, but not the Big Five.

Verbs

Apart from adjectives and nouns, the third word class that was sometimes investigated by the psycholinguistic researchers is the class of verbs. De Raad (2000) suggested that verbs somehow dropped from sight because they

refer to phenomena of a transitory nature and most of the lexical researchers were interested in phenomena of a more permanent nature. However, De Raad et al. (1988) considered that verbs are important for personality description since they could be seen to be relevant not only for specific behavior but also for general behavior if coupled with an adverb “often.” De Raad et al. (1988) started with a list of 1,557 potentially personality-descriptive verbs and reduced the list to 543, making use of ratings of usefulness for personality descriptions by indicating whether a verb would fit in the following sentence: “If someone [verb]s more often than others, then that behavior shows his/her personality” (p. 85). De Raad et al. (1988) interpreted 10 factors in both self ratings on verbs and in partner ratings, with six factors recurring in both self and other ratings, namely factors called Malignity, Support, Antagonism, Verbal Aggression, Perseverance, and Suppression. The largest factor in terms of accounted variance was Malignity, just as in the case of nouns (De Raad & Hoskens, 1990). De Raad (1992) compared the adjective, noun, and verb structure, using only self ratings and comparable criteria of factor extraction. Moreover, the ratings were all ipsatized. The direct visible effect was the removal of the Malignity factors from both the noun structure and the verb structure. The ratings on adjectives provided the Big Five structure with the possibility of an Agreeableness split-off in the form of sixth factor Boastfulness versus Sincerity. The noun structure consisted of the Big Five minus Emotional Stability. The verb structure was most optimal in the form of a Two-Factor structure with an Agreeableness factor and a factor then called Emotional Stability. This second factor may, however, be better understood in terms of being active and decisive, emphasizing striving features.

Hřebíčková et al. (1999) investigated the structure of Czech personality-descriptive verbs, starting with a list of 2,374 personality-relevant verbs and reduced them to 1,530 by eliminating archaic, dialectal, and rarely used verbs. Subsequently, judges rated clarity of meaning and personality relevance of those verbs, after which they were classified into a category system that was developed by Semin and Fiedler (1988). That system distinguished descriptive action verbs (e.g., to call, to kiss, and to talk) from interpretative action verbs (e.g., to help, to cheat, and to patronize) and state verbs (e.g., to like, to hate, and to trust). These latter steps yielded a final list of 289 verbs from the latter two categories. Those 289 verbs were used to obtain self ratings from 473 participants, and factoring after ipsatization

provided solutions with two to six factors, without preference for any of the structures. A Two-Factor solution turned out to be much like the corresponding solution in Dutch. Hřebíčková et al. (1999) concluded that the structure of Czech personality descriptive verbs resembled the structure produced by adjectives, with the exception of content referring to Intellect or Openness to Experience. Such an absence was also the case in the Dutch study.

Adjectives, Nouns, Verbs, Adverbs, and Other Expressions Combined

Using this so-called nonrestrictive approach in selecting personality descriptors, allowing also the inclusion of evaluative terms and state terms, Almagor et al. (1995) succeeded in producing the Big Seven model, which included versions of the Big Five plus two additional factors called Negative Valence and Positive Valence (cf. Benet & Waller, 1995; Tellegen & Waller, 1987). Regarding the use of word categories, a truly unrestricted approach would be one that makes use of all lingual forms in a single study. The adjectives may form the most typical carriers of trait meaning, but De Raad and Barelds (2008) argued that the exclusion of other word categories does not agree with the psycholexical aim to arrive at full coverage of personality semantics in ordinary language and it may also produce a biased and incomplete personality structure.

For this reason De Raad and Barelds (2008) once more undertook the task of going through the Dutch lexicon to register all words and (standard) expressions that could be used to characterize persons. All those units of description were put in a brief sentence format before they were administered to participants to obtain ratings. A total of 2,365 such items were finally administered to 1,466 participants for self ratings and for other ratings. Examples of items were “a friendly person,” “someone one can trust,” “someone who helps people,” “a balanced person,” “someone who rouses public sentiment,” “a horny person,” “a fortune hunter,” and “someone who has wanderlust.” Eight factors were ultimately extracted, were stable across subsamples, and were well interpretable. Those eight factors included four factors that related well to four of the Big Five, namely, Extraversion, Agreeableness, Conscientiousness, and Emotional Stability; a broad factor called Competence and a smaller factor called Conventionality, both reflecting aspects of Intellect; a factor called Virtue

relating to both Big Five Agreeableness and HEXACO Honesty-Humility; and a last factor Hedonism capturing aspects of Sensation Seeking.

Other Categories of Words and Other Aspects of Personality

There is more to personality than dispositional traits. In the “constructive” process leading to conceptions of peoples’ personalities (cf. [Hampson, 1982](#)), a variety of features may contribute to how persons think that people are and how they differ. This may include the physical appearance, the attitudes people have, their roles, their relationships to others, and so forth. The German taxonomic project has been most explicit in selecting these terms from the lexicon, covering most or all classes of person characteristics (see [Angleitner et al., 1990](#)).

Physical appearance. [Ostendorf and Angleitner \(1994\)](#) investigated the structure of adjectives describing *overt characteristics and appearance* (one of the subordinate categories in the German classification system). Analyses of self ratings and peer ratings yielded six factors: Fatness, Height, Sturdiness, Stylish Appearance, Untidiness versus Well-Groomed Appearance, and Body Deformations versus Harmonious Body. Relations between these factors and the NEO-FFI scales showed that Conscientiousness was positively related with Well-Groomed Appearance, and to some extent with Stylish Appearance and Sturdiness; Neuroticism was negatively related to Sturdiness and Well-Groomed Appearance; Agreeableness was positively related to Well-Groomed Appearance.

[Saucier \(1997\)](#) investigated a range of terms, including references to dispositions, but also to state terms, social evaluation terms, and physical appearance terms. The terms were selected from pools of terms constructed by [Norman \(1967\)](#) and by [Goldberg \(1982\)](#). Ratings on the finally chosen set of 525 terms were factored and seven factors were extracted: the Big Five factors plus two additional factors, one describing Attractiveness and the other resembling Negative Valence.

[Imperio, Church, Katigbak, and Reyes \(2008\)](#) also conducted a study involving, among other things, 268 terms representing social and physical attributes, and markers of the Big Five, HEXACO, and the ML7. Considerable redundancy was found between the social and physical attribute dimensions and trait and evaluative dimensions. The conclusion was that social and physical attributes communicate information on personality, and vice versa.

Attitudes. Ostendorf (1996) investigated the structure of the subcategory of *Attitudes and Worldviews* from the German classification system in relation to measures of the Big Five, with both lexically based dispositional measures and the NEO PI-R scales. An interesting question put by Ostendorf was whether attributes such as conservative, liberal, and traditional, co-defining the Openness to Experience scale, should be regarded as traits or as attitudes. Both self and peer ratings of 104 prototypical attitude terms yielded two dominant factors labeled as (1) Religiousness and (2) Conservatism versus Radicalism. A joint factor analysis with both dispositional terms and attitude terms showed that the two attitude factors were independent of the Big Five in a Seven-Factor solution. Moreover, correlations between these seven factors and the NEO PI-R scales revealed that the Conservatism versus Radicalism factor was substantially negatively related to both the Openness to Experience domain scale and to all its facet scales, thus giving flesh to Ostendorf's proposal.

Saucier (2000) studied the structure of social attitudes by selecting terms from the dictionary that represented attitudes and beliefs, almost all attribute nouns, and almost all ending with "ism" (e.g., liberalism, utilitarianism, Marxism), henceforth called "isms." An initial list contained 721 terms, with often more than one definition, totaling 1,208 definitions. These definitions were rated on relevance to the domain, and the relevance ratings were used to reduce the list to 374 definitions. After an adaptation of this latter list to a questionnaire format, ultimately 335 definitions remained as distinct ism-variables. Ratings of agreement-disagreement with the constructs were factor-analyzed. Three broad factors were obtained, of which the first two were suggested to have some cross-cultural generality. The first related to traditional religiosity, the second was defined by items containing egoistic and materialistic attitudes, and the third emphasized liberal, humanitarian, and enlightenment values (see also Saucier, 2013).

Roles and effects. Saucier (2010) investigated social effects, a subcategory in the German classification system, interpreted as "an individual's footprint on the social world" (p. 224). Saucier (2010) started with an initial pool of 326 terms for social roles and effects. This list went through different rounds with familiarity ratings, and frequency of use ratings, ultimately ending in a classification with categories that described not only social effects but also social roles and relationships, social evaluations, and attitudes and worldviews. The result was a list of 27

prototypical terms describing social effects. Factoring of peer and self ratings of those terms resulted in a Two-Factor structure with one factor representing whether a person is a source of pleasure to others and the other factor representing whether a person is a source of pain to others.

[Mlačić \(2016\)](#) studied the terms belonging to a German superordinate category of social and reputational aspects of personality that includes roles and relationships, social effects, evaluations, and attitudes and worldviews. An analysis of self-ratings using 532 terms belonging to that larger more inclusive category of social and reputational aspects resulted in a Four-Factor structure with factors labeled as Religiosity and Patriotism, Nurturance, General Social Effects, and Modernism ([Mlačić, 2016](#)). An investigation of relations of those factors with measures of personality (IPIP-NEO, [Mlačić & Goldberg, 2007](#)) and social attitudes (as measured by ISMS, [Saucier, 2000](#), and by SAS_G, a social attitude scale, [Milas, Mlačić, & Mikloušić, 2013](#)) led to the conclusion that the lexical factors describing social and reputational aspects of personality are partly rooted in social attitudes and partly to dispositions (“personality proper;” [Mlačić, 2016](#)). For example, the factor General Social Effects was strongly related to Big Five Extraversion and the factor Nurturance was substantially related to Big Five Agreeableness. The factor Religiosity and Patriotism was strongly related to traditional religiosity factors from both social attitude measures whereas the factor Modernism was related to the Modern Technology attitudes factor and the Big-Five Intellect.

Intellect or Openness to Experience

[John \(1990\)](#) observed that there seemed to be no single Big Five. Referring to a list of studies all reporting on Big Five dimensions, the variation in factor naming was striking, yet understandable considering the broadness and inclusiveness of the Big Five factors. Differences were clearest for factor five, referred to as Culture, Intellect, and Openness to Experience. Of special interest here are the two labels Intellect and Openness to Experience, of which the first, proceeding from lexical studies, is said to emphasize “intellectual” traits such as intelligent and insightful, and the second, boosted by [Costa and McCrae \(1985\)](#) using the questionnaire approach, emphasizes “open” traits such as imaginative and artistic. The question about the precise meaning of the fifth factor had led to

a special issue of the *European Journal of Personality* (De Raad & Van Heck, 1994).

The underlying issue here is the understanding of the lexical hypothesis, which was introduced to encode distinctions made in daily transactions. McCrae (1990) argued that everyday language “does not register all the significant ways in which individuals differ in regard to Openness” (p. 123), and the concept Openness “appears to knot together a wide variety of traits and topics of interest to personality psychologists” (p. 123). This may well be true. De Raad et al. (2010), for example, found that Emotional Stability (or its opposite Neuroticism) appeared relatively weak in cross-cultural lexical studies, which contrasts with its historical prominence. Emotional Stability may have less representation in most natural languages, in comparison to clinical language, in which its appreciation has led to many nuances of emotional experiences. Questionnaire developers may sample widely from the rich variety of specific variables from those clinical contexts.

McCrae's (1990) argument that Openness is inadequately represented in natural language trait terms was tested by Mulder (2006), who demonstrated that, in Dutch, there is no problem finding a sufficient number of descriptors in the natural language to reliably define both the domain of the Openness to Experience and the corresponding six facets. Making use of De Raad and Barelds' (2008) unrestricted lexically derived list of 2,365 descriptors, 127 items could be identified to represent Openness to Experience and its different facets. Factoring the ratings on those 127 items produced a lexically based Openness to Experience structure that matched the NEO PI-R Openness structure, with the exception of the Esthetics facet.

The Dutch lexical fifth factor has been described as capturing traits such as original, philosophical, broadminded, rebellious, constructive, nonconformist, critical, poetic, and creative (De Raad et al., 1992; cf. De Raad & Doddema-Winsemius, 2006). It is a factor capturing a rich variety of facets, of which some, for example the rebellious connotation, are not represented in the NEO PI-R Openness factor. Taking Openness instead of this Intellect factor would impoverish the complexity of everyday language, just as taking Openness instead of the lexical Intellect might impoverish psychological language. Hofstee (2003) argued that it is possible to dispute at length that ordinary language is not subtle enough for scientific purposes.

Yet, in studies with questionnaires built on expert language (e.g., [Digman & Inouye, 1986](#)), the Big Five were also recovered.

The difference of opinion here lies in what should be considered as important or relevant differentiating traits. [Costa and McCrae \(1985\)](#) adopted Openness to Experience from [Coan \(1972\)](#), which they felt would capture the contents of a cluster of traits in their own work that they had referred to as an Experiential Style dimension. [Coan \(1972\)](#) had developed the Openness to Experience scale on the basis of a study using a battery of existing instruments ([Coan, 1974](#)). [Coan \(1972, 1974\)](#) distinguished various facets for his Openness to Experience scale for the purpose of expanding the humanistic psychology concept of the optimal personality, and [Costa and McCrae \(1985\)](#) made extensive use of those facets for their own purpose. That questionnaire origin in Coan's work may at least in part be held responsible for the expansion of Openness to Experience as the fifth factor, in comparison to what the lexical approach had been said to have generated (see also [McCrae, 1994](#)).

[Block \(1995\)](#) also criticized the ordinary language origin of the concepts proceeding from the lexical approach. [Costa and McCrae \(1992a\)](#) and [Eysenck \(1992\)](#) disputed the criteria to arrive at basic dimensions of personality. Much of these disputes relate to personality dimensions found elsewhere in the personality literature, which were hardly or not at all visible in the Big Five framework. Some of those dimensions covered specific areas of interest, such as locus of control ([Rotter, 1954](#)) and ego development ([Loevinger, 1976](#)); other dimensions were part of multidimensional systems, thus offering alternatives to the Big Five.

Competition and Validation

Competing Systems

Assuming the relevance of both the comprehensiveness and the trait semantic coverage of the Big Five approach, an important question for competing systems is whether they account for more or for less of the domain of traits (see also [Chapter 19](#) by O'Connor). Are certain traits possibly theoretically inevitable? Just as in the case of Neuroticism and Openness to Experience, certain other concepts may be found to be underrepresented or completely missing in the presentation of a trait model. [Zuckerman \(1984\)](#), for example, made a strong point in showing that

sensation seeking is a basic trait, particularly because of its temperamental meaning. Others may find that, for example, moral characteristics are underrepresented. Some other such “devoted” constructs are achievement motivation, field dependence, and locus of control. [Zuckerman \(2002\)](#) suggested an alternative five-factorial model, starting with the assumption that important traits are assumed to have a biological-evolutionary basis. [Eysenck \(1967\)](#) and [Strelau \(1983\)](#) have also emphasized the temperamental connotation of personality.

It is important to realize that the Big Five system does not reveal the whole story of personality. It is a comprehensive and differential descriptive system that is understood to form a rich starting point for further specification. Issues, such as change, unconscious processes, and heredity of traits, are not contained in the lexical trait vocabularies. Yet trait taxonomy helps to semantically understand the different features of those issues; moreover, empirical research around those issues often makes use of instruments based on the Big Five.

Psycholexically Based Departing Models

In recent years there has been an increase in propositions concerning the proper structure of lexically derived traits. Some focused on replicability in almost all languages or cultures around the world, and others focused on maximal semantic representation for which replicability might be found in as many languages or cultures as possible. Propositions that focus on cross-cultural validity contain structures that tend to have fewer factors than the Big Five, most often two or three, and propositions that focus on optimal semantic coverage contain structures that tend to have more factors than the Big Five (see also [Chapter 20](#) by Wright).

Big Two. [Digman \(1997\)](#) was possibly the first to suggest a recurrent Two-Factor solution. Digman made use of 14 studies of which the correlation matrices for Big Five scales were available, nine based on ratings from adult participants and five using children and adolescent participants. [Digman \(1997\)](#) found that his first factor, which he named α , was related to the Big Five factors Agreeableness, Conscientiousness, and Emotional Stability, whereas the second factor, labeled β , was related to the Big Five factors Extraversion and Intellect. [Digman \(1997\)](#) interpreted the α factor in terms of a socialization process and the β factor as personal growth. Those higher-order factors were related to the metaconcepts of

Communion and *Agency*, respectively, understood to underlie the domain of interpersonal behavior (Bakan, 1966; Wiggins, 1991). Digman's factors found support in DeYoung (2006), who used the term Stability for the α factor and the term Plasticity for the β factor. Stability was described as "the need to maintain a stable organization of psychosocial function," and Plasticity as "the need to explore and incorporate novel information into that organization" (DeYoung, 2006, p. 1149). DeYoung also offered a neurobiological interpretation of those two factors, linking Stability to the functioning of the serotonergic system and Plasticity to the functioning of the dopaminergic system. A Two-Factor structure was also found in modern Greek (Saucier et al., 2005), with the factors being interpreted as Morality/Social Propriety and Dynamism, and in Chinese (Zhou et al., 2009) with factors named Social Propriety and Dynamism.

Big Three. The Big Three model, with broad versions of the first three Big Five factors, Extraversion, Agreeableness, and Conscientiousness, which originated from the work of Peabody and Goldberg (1989), has proven itself to be a more serious competitor to the Big Five in terms of cross-cultural replicability. Throughout the text above, the Big Three, or its kernel aspects, were found in studies of adjectives in Italian (Di Blas & Forzi, 1998), Spanish (Benet-Martinez & Waller, 1997), Croatian (Mlačić & Ostendorf, 2005), Korean (Hahn et al., 1999), and Hungarian (De Raad & Szirmák, 1994; Szirmák & De Raad, 1994), in a study of personality-descriptive nouns (Di Blas, 2005), and in studies with internal data (Peabody, 1987). A study in Hindi (Singh et al., 2013) also referred to three factors, but those three reflected the Indian Triguna instead of the Big Three.

Big Six. Judging by the number of publications in the past 10 years and by the apparent interest of the scientific community in finding out what is beyond the Big Five, another serious competitor for the Big Five is a model with six factors, in two versions: one is Ashton and Lee's (2007) HEXACO model and the other is Saucier's (2009) Big Six.

A first report of a lexically based Six-Factor structure with an additional factor beyond the Big Five was made for Hungarian by De Raad and Szirmák (1994). That additional factor, called Integrity (*veracious, just, trustworthy*), was considered as an incidental finding, tentatively explained in terms of the pertaining sociopolitical system. A similar factor (called Trustworthiness) was later found in Italian by Di Blas and Forzi (1999), and

also in Korean ([Hahn et al., 1999](#)) and in French ([Boies et al., 2001](#)). In a discussion of various lexical studies, [Ashton and Lee \(2001\)](#) were led to the conclusion “that a six-dimensional taxonomy of personality variation provides the most parsimonious and comprehensive framework for understanding the structure of personality characteristics” (p. 350), and this HEXACO consists essentially of the Big Five factors (with rotated versions of Agreeableness and Emotional Stability) plus an additional factor describing Honesty-Humility. The Honesty-Humility factor, defined by traits of sincerity, unassumingness, and fairness versus slyness, pretentiousness, and greed, appeared to be a split off from Big Five Agreeableness. This split had the effect of a reduced HEXACO-Agreeableness, defined by traits of patience, gentleness, and flexibility versus ill-temper, quarrelsomeness, and stubbornness. Another effect was that HEXACO-Emotional Stability lost the ill-temper content, which had moved to HEXACO-A. The later Openness naming of the HEXACO-O is peculiar, since the main defining traits in [Ashton et al. \(2004\)](#) stem from lexical studies with Intellect/Imagination factors. This change is based on their belief that intellectual ability lies outside personality proper ([Lee & Ashton, 2004](#)), and it implies that the HEXACO model is not directly rooted in the psycholexical approach to personality.

The additional factor in [Saucier \(2009\)](#) is not Honesty-Humility but a Negative Valence factor. According to [Saucier \(2009\)](#), Ashton and Lee’s Six-Factor model should be seen as a “narrowband” model, because it was based on lexical studies that primarily excluded highly evaluative and emotional state terms. Consistent with the suggestions made by [Almagor et al. \(1995\)](#), Saucier followed a “wideband” approach, and analyzed studies from seven languages, namely Chinese, English, Filipino, Greek, Hebrew, Spanish, and Turkish, that all followed an inclusive variable selection approach, meaning that terms included in those studies did not reflect just dispositions, but also state terms, evaluative terms, and physical appearance. [Saucier \(2009\)](#) concluded with a “wideband cross-language six” structure on the basis of those studies with the factors Conscientiousness (Consistency/Organization), Negative Valence (versus Non-Violativeness), Agreeableness, Resiliency versus Internalizing Negative Emotionality, Gregariousness/Cheerfulness, and Originality/Talent. According to Saucier, those factors corresponded well with the disposition terms of the “narrowband,” cross-language six of

Ashton et al. (2004). Specifically, “wideband” Negative Valence and “narrowband” Honesty corresponded in their emphasis on amoral/moral traits. This correspondence agrees with the finding in De Raad and Barelds (2008), in which a Virtue factor (sincerity, honesty, friendly versus unfair, indecent, dishonest), correlated substantially with both Honesty-Humility and Negative Valence (negatively).

Big Seven. The inclusion of evaluative terms and mood state terms in the Hebrew taxonomy (Almagor et al., 1995) led to the proposal of the Big Seven model. A similar study was done in Spanish (Benet-Martinez & Waller, 1997). The Big Seven forms the final Big Five competitor in the realm of the psycholexical approach, culled Multi-Language seven or ML7 by Saucier (2003a). ML7, with the factors Gregariousness, Self-Assurance, Even Temper versus Temperamentalness, Concern for Others, Conscientiousness, Originality/Virtuosity, and Negative Valence or Social Unacceptability, is based on the study in Hebrew and one in Filipino (Church et al., 1997) that also comprised seven factors. Saucier (2003a, p. 186) translated markers of the terms from the Hebrew and Filipino studies, applied them to the American sample, and concluded with a synthesis in the form of the ML7. None of the Seven-Factor studies was clearly fully replicated in any of the other languages; only some four or five of the Big Five factors recurrently appeared.

Cross-Cultural Findings

Cross-cultural psychologists have often endorsed the universality of psychological characteristics, as can be seen in cross-cultural studies on dimensions such as achievement motivation, anxiety, and authoritarianism (Church, 2000). Mayer, Lin, and Korogodsky (2011) studied the possibility of universality of personality conceptions in cultural traditions as different as Confucianism, Buddhism, and Judaism. They concluded that judging personality was an important aspect of all those different traditions.

With respect to the psycholexical approach, systematic cross-cultural studies using a good variety of languages or cultures have been performed with a focus on two factors (Saucier et al., 2014), on three factors (De Raad & Peabody, 2005; De Raad et al., 2010, 2014; Peabody & De Raad, 2002), on five factors (De Raad, Perugini, Hrebícková, & Szarota, 1998; De Raad, Perugini, & Szirmák, 1997; Hofstee, Kiers, De Raad, Goldberg, & Ostendorf, 1997), and on six factors (Ashton et al., 2004; De Raad et al.,

2010). The emphasis here will be on the replicability of five factors (the Big Five). Other studies are referred to when they contribute to information on the cross-cultural validity of the Big Five.

The Big Five model has found cross-cultural support generally in two ways; these two are often linked to the distinction between *emic* and *etic* (Berry, 1969; see also Chapter 23 by Allik and Realo). The *etic* approach is typically followed by constructing a trait system (a questionnaire) in one language, and then translating and applying it in another language or culture. Studies with the Five Factor Personality Inventory (FFPI; Hendriks, Hofstee, & De Raad, 1999) in 13 languages provided evidence that the FFPI was a reliable and valid measure in a large variety of countries (Hendriks et al., 2003). Similarly, studies with the NEO PI-R (Costa & McCrae, 1992b) showed replicability of the five factors in most cultures (McCrae et al., 2005). A lesson drawn by Allik, Realo, and McCrae (2013) from studies such as these was that it is apparently easy to transcend language barriers using such personality instruments. Notwithstanding such excellent cross-cultural findings, criticism has been expressed repeatedly, especially from the side of the cross-cultural methodologists (e.g., Berry, Poortinga, Segall, & Dasen, 2002). An important issue is that translated instruments tend to be relatively insensitive in detecting individual differences of interest in the target language. Ashton and Lee (2001), for example, found that certain FFM-Openness to Experience facets were not very applicable in many Asian samples.

The *emic* approach in this case aims at finding a trait structure that best summarizes the trait domain of a particular language or culture. Linked to this first approach has been the repeated finding that independent psycholinguistic studies in various Western languages led to the Big Five structure. Studies comparing lexical Big Five structures from different languages, and leading to the conclusion that the Big Five is replicable across those languages, are often done through the analysis of the contents of the structures. Notwithstanding the recurrence of the Big Five, the structure is reproduced better in some languages than in others (Saucier & Goldberg, 2001).

Cheung, Van de Vijver, and Leong (2011) proposed an approach that would integrate *etic* and *emic*. Such a combined approach can be found in some studies that investigated the replicability of the Big Five across languages (De Raad et al., 1997, 1998; Hofstee et al., 1997), and in other

studies that were not particularly restricted to only five factors (De Raad et al., 2010; Peabody & De Raad, 2002). De Raad et al. (2010) summarized those earlier studies focusing on the Big Five and concluded that the Big Five were not all cross-culturally replicable, a finding that was corroborated in Peabody and De Raad (2002), who found instead more support for a recurrent three-factorial structure (cf. also De Raad & Peabody, 2005).

De Raad et al. (2010) compared 14 independently developed trait structures. For each structure, the starting point was taken in the lexicon of the pertaining language. The trait terms of that language were used to obtain ratings, and those were factored to arrive at a trait structure meaningful to that language. The 14 taxonomies were pairwise compared, after finding a common part of the factor structures on the basis of acceptable translations of items into the languages of a pair. On average, the results indicated that not five, but rather three factors were well replicable across the languages under study. Beyond the first three factors (with traits that are typical of Extraversion, Agreeableness, and Conscientiousness, respectively), the equivalence of factors across languages tends to diverge.

When focusing on replicability of psycholexically based factors across most languages or cultures around the world, the Big Five tends to lose in competition with structures that have just two or three factors. Recently, Saucier et al. (2014) investigated whether a hypothesized Two-Factor structure (Saucier & Goldberg, 2001), with one factor describing Dynamism and the other describing Social Propriety or Social Self-Regulation, could be detected in nine diverse languages. These included seven data sets that were previously published taxonomies, namely Chinese, Korean, Filipino, Turkish, Greek, Polish, and Hungarian, and two new data sets, namely for Maasai and Senoufo. Those nine languages also represented, in addition to Indo-European languages, seven other language families: Sino-Tibetan, Korean, Austronesian, Altaic, Finno-Ugric, Nilotic, and Niger-Congo. Saucier et al. (2014) extracted two factors for each data set that could be interpreted as Dynamism and Social Self-Regulation in each language involved. They subsequently selected 50 markers for each of the two factors per language, totaling 900 markers. Of the translatable terms (into English), ultimately 10 turned out to mark Social Self-Regulation in most of the languages, and seven were found to mark Dynamism. These two factors are easily identified as being similar to Digman's (1997) socialization and personal growth and to DeYoung, Peterson, and Higgins'

(2002) Stability and Plasticity factors, respectively. [Saucier et al. \(2014\)](#) noted that those two factors represented a “common denominator necessary-but-not-sufficient model” (p. 12), meaning there was substantial within-language personality variation that could not be covered by those Big Two factors.

A strong case for a cross-culturally tenable Three-Factor model was made by [De Raad et al. \(2014\)](#). In a previous study, [De Raad et al. \(2010\)](#) concluded that only three factors are replicable across languages. In a subsequent study [De Raad et al. \(2014\)](#) looked for the joint structure of personality descriptors from 11 psycholexical studies by merging all the data in a “super matrix” with 1,993 trait terms and 7,104 participants. The results of a simultaneous component analysis ([Kiers & ten Berge, 1994](#)) again yielded the Big Three, interpreted as Dynamism, Affiliation, and Order, with traits from Extraversion, Agreeableness, and Conscientiousness, respectively, as kernel traits. Drawing on the results of those two studies, [De Raad et al. \(2014\)](#) referred to those factors as the “Pan-cultural trait structure.”

Structuring the Big Five Trait Domain

The majority of factor structures of personality offered in the literature are presenting independent factors, whether they are three, five, eight, or another number. Such a structure is imposed upon the data through the application of the psychometric technique, most typically Principal Components Analysis followed by Varimax rotation (see also [Chapter 20](#) by Wright). The related dominant viewpoint in factor analysis has been the “vertical viewpoint” ([Goldberg, 1993b](#); [McCormick & Goldberg, 1997](#)). Under this viewpoint each factor is interpreted in terms of the variables that have high loadings on it. The underlying ideal is the *simple structure*, in which each trait variable loads substantially on only one factor and the loadings on the other factors are close to zero. The simple structure form is also hierarchical, since trait variables are specifications of factors. Whereas those factors are superordinate to the more specific traits, the factors are rather narrow in meaning, with high internal consistency and a rather fixed angular position in the trait space ([Hofstee, 2003](#)). A simple conception of the Big Five trait factors is thus the vertical view including a representation with five independent dimensions. Although there are trait variables that load on one factor only, the majority of trait variables tends to have

substantial loadings on two factors (Hofstee, De Raad, & Goldberg, 1992); variables that load on more than two factors tend to be vague in meaning.

Given the observation that clear and meaningful traits load on no more than one or two factors, traits can be represented in two-dimensional arrangements, by using the pairs of loadings for all trait variables as coordinate values. The arrangement of traits that is thus formed in the two-dimensional space is called a circumplex (Guttman, 1954). In contrast to a simple structural understanding of traits, with narrow coverage of meaning, a circular arrangement of traits demonstrates the breadth in semantic coverage through the dispersion of the trait items along the circle (cf. Gurtman, 1997). Hofstee et al. (1992) integrated the Big Five model and the circumplex understanding of traits into a comprehensive representation. The interesting thing about the circumplex representation is that the positions of the trait variables relative to each other become clear, to variables with similar meaning, to variables belonging to adjacent clusters of meaning, and to variables with opposite meaning.

The importance of hierarchy has been discussed repeatedly by researchers in the field of personality (e.g., Cattell, 1947; Eysenck, 1970), with relations among traits running from more abstract to more specific (cf. John, Hampson, & Goldberg, 1991). The behavior “laughing at jokes” is more specific than “being lively,” which in turn is more specific than “extraversion.” This example from Eysenck (1970) represents what might be called a strict hierarchy (cf. De Raad, 2009). Most typically, hierarchies are studied in two ways, a bottom-up approach and a top-down approach (see Goldberg, 2006). The bottom-up hierarchies start with individual items, which are then clustered into semantic groups, which in turn are clustered into larger groups of traits, until the highest level is reached. The more recently developed top-down approach has been applied in Principal Components analyses of traits, in which structures are considered with one factor or component, two factors, up to a structure with the maximum number of factors considered relevant. The factors from adjacent levels of factor extraction are then correlated yielding the hierarchical configuration (cf. De Raad & Szirmák, 1994; Zuckerman, Kuhlman, & Camac, 1988). If all levels of extraction from one to the maximum number of interest are included in the hierarchy, the result may be conceived of as a continuum of abstraction (Goldberg, 2006). Since, theoretically or empirically, the interest has been in specific sets of recurrent factors, two, three, five, or six, we may

well present only those levels of interest. An example can be found in [De Raad et al. \(2014\)](#), in which the relations between three and six factors are given.

Final Comments

The FFM and the Big Five model do not tell the full story of personality, but they do tell an important story. The potential of the psycholexical approach to taxonomize the trait domain has not been exploited to its fullest. Yet, the approach has made good progress. In this chapter the thoughts, procedures, and findings, particularly in reference to its main finding, the Big Five, have been reviewed and put in a context of criticism.

The psycholexical approach has been seriously questioned from the very beginning, for several reasons. Criticisms have been recurrent regarding the use of ordinary language for scientific purposes, and the fact that the most exploited tangible form of a lexicon, the dictionary, contains single words, and not sentences in terms of which people spontaneously convey their opinions of persons. A convincing argument to exploit the ordinary language documentation of trait terms is its overwhelming richness. Generations of lexicographers have scrutinized and documented on a regular basis the many, many ways people have communicated during generations, and still tend to communicate on things and people, and this includes the vast domain of person-talk. It is almost impossible to generate, for example in one or more scientific sessions, a vocabulary of traits that is as complete and as rich as what has already been sedimented and documented in a lexicon. Yet, as has been observed for Neuroticism and for Openness to Experience, professionals may build up their own vocabulary for certain trait domains that agrees with their research or with their theory, and the specifics of such a vocabulary may or may not correspond to what can be found in ordinary language. In each case, it may be important to check such specific vocabularies for its ordinary language equivalence. Ultimately, psychological constructs with specific technical meaning may have to be translated into everyday language, if only for the purpose of arriving at intelligible items in a questionnaire that should cover the meaning of such constructs. As a more general note, when professional psychologists aim at generating a specific trait vocabulary, they are actually drawing upon their own individual (and restricted, and possibly even

biased) lexicon, and are therefore operating along the lines of psycholexical procedures.

A dictionary as the tangible representation of a lexicon consists of single words and their explanations. The single words of interest, namely trait-descriptive words, are taken to contain abstracted information based on observations of actions and events in which people participated. Single trait-descriptive adjectives, for example, have been used extensively in research and they usually function well in communicating on traits. However, improvement is very possible, by turning each single trait-adjective into one or more behavioral sentences that cover the meaning of the trait well (cf. [Goldberg, 2014](#); [Hendriks, Hofstee, & De Raad, 1998](#)).

The psycholexical approach has too extensively been restricted to trait-adjectives. Other word categories with adjectival potential should be exploited more systematically; in particular, unrestricted procedures should be followed, possibly in the format reported by [De Raad and Barelds \(2008\)](#). That study included the various word categories, used brief sentences, and was less restrictive in the coverage of trait phenomena than most other lexical studies.

An issue that has not been dealt with directly in this chapter is the use of facets. Yet, implicitly, it has been discussed in relation to the full exploitation of ordinary language and the many distinctions that are found in the lexicon for the description of certain traits. Hierarchies imply specificity, and circumplexes explicitly deal with trait nuances. A question is how many facets may be necessary or desired to communicate efficiently and economically on the many trait nuances. Professional psychologists may tend to exaggerate distinctions as compared to what laypeople do. A large part of the problem may be solved empirically, by factoring within specific trait domains; this may lead to different numbers of facets per trait domain. The other possibility is the use of circumplexes. The Abridged Big Five Circumplex ([Hofstee et al., 1992](#)), for example, defines a fixed set of facets related to combinations of pairs of factors. Some of those facets may turn out to be practically or nearly empty.

With respect to coverage of the domain of traits, particularly in relation to evaluative terms, there has been interest in subareas of traits that could serve the description of devoted research questions. Some studies have, for example, recently been performed to provide a full portrait of virtues, a specific subarea of traits that is relevant to discussions about morality. Such

specific vocabularies indeed tend to provide “decomposed” representations in greater detail than the full trait taxonomy gives as the ultimate result. Examples include [De Raad and Van Oudenhoven \(2011\)](#) and [Morales-Vives, De Raad, and Vigil-Colet \(2014\)](#).

The 30 or so trait taxonomies that have been performed thus far do cover a rather restricted number of languages, with many belonging to the Indo-European language family (see [De Raad et al., 2014](#)). Many more lexical studies are needed, particularly in non-Indo-European languages, and in Asia and Africa, to arrive at a stage at which we might start to talk of global research findings, and draw tentative conclusions on a proper cross-culturally valid trait structure. More indigenous studies in Africa, Asia, and also South America may also provide more insight on more culturally typical trait characteristics.

There is as yet little reason to expect some canonical solution for a trait structure; it seems to make more sense to focus on a consensually acceptable model that does justice to central trait concerns in most languages, and that may play a role in the development of instruments that are useful in integrated emic–etic research and practice (cf. [Cheung et al., 2011](#)). For such an approach it is crucial that large pools of trait descriptors are collected from the languages of the world and put in a joint catalogue after being translated into a common language, expectedly English. Such a pool of globally relevant trait words could then be used in a process of reduction taking the various cultural trait interests into account as much as possible.

Factor Analytic Support for the Five Factor Model

Aidan G. C. Wright

Abstract

The Five Factor Model (FFM) has risen to prominence over the past 50 years, and currently represents the most widely used structural model of personality attributes. By definition, the FFM is built upon a foundation of factor-analytic techniques. This chapter is divided into three parts. In the first, a methodological primer is provided for those who may be less familiar with factor analytic techniques. Second, the FFM and factor analysis are understood through a historical review, along with updated exemplars of contemporary techniques and applications to personality. Finally, several new directions in factor analytic research of the FFM are reviewed, including its application to psychiatric disorders.

Key Words: Five Factor Model, factor analysis, exploratory factor analysis, confirmatory factor analysis, ESEM, personality structure

If determining the structure of personality traits has been the primary métier of personality psychology through much of the twentieth century and the early part of the twenty-first century, then factor analysis has been the primary tool of the trade. The importance of structure in understanding personality traits and the inventories intended to measure those traits is difficult to overstate—from structure flows the framework that facilitates organization and comprehension of an ever-expanding body of research. In this regard, the consensual Big Five or Five Factor Model (FFM) is often heralded as one of the crowning achievements of psychological science in the past century. As the predominant structural model of personality traits, much has been written on the conceptual and quantitative roots of the FFM. That is not to say, however, that all structural issues in the personality trait domain have been settled. On the contrary, there remain rapidly expanding literatures and ever-more quantitatively sophisticated and complex studies on a variety of germane topics. Therefore, this chapter goes beyond the historical factor analytic evidence for the FFM, and considers the contemporary questions motivating a lively (and at times spirited) scientific

debate about the structure of personality and the role that factor analysis plays in this discussion.¹

Methodological Underpinnings

To appropriately evaluate the factor analytic evidence for the FFM, it is necessary to keep in mind what factor analysis can and cannot do, and, in a more nuanced way, how factor analyses perform under different conditions. As such, this chapter starts with a nontechnical methodological review of factor analysis (for a more thorough and technical coverage see, e.g., [Fabrigar, Wegener, MacCallum, & Strahan, 1999](#); [Mulaik, 2009](#)). Readers with a strong methodological background in factor analytic techniques and latent variable models may prefer to skip this section. The review proceeds chronologically, starting with exploratory factor analysis (EFA), a technique in its second century ([Spearman, 1904, 1927](#)), confirmatory factor analysis (CFA), approaching its golden anniversary ([Jöreskog, 1969](#)), and exploratory structural equation modeling (ESEM), still in its infancy ([Asparouhov & Muthén, 2009](#)).

Exploratory Factor Analysis

The aim of factor analytic techniques is to explain patterns of covariation among *observed* or *manifest* (i.e., directly measured) variables using *unobserved* or *latent* constructs. That is to say, given that responses to some stimuli (e.g., questionnaire items) show patterns of covariation, it is reasonable to hypothesize that there is an explanation for this patterning (e.g., a personality trait). In fact, this was exactly the logic that prompted Spearman to develop factor analysis. He had observed that those individuals who performed well on one mental test tended to perform well on others, which gave rise to his general theory of intelligence and the need for a quantitative method to test it. Factor analysis was thus born. Since then, EFA has been widely applied as a technique to determine the appropriate number of dimensions that can account for observed patterns in a larger set of variables.

The hallmark of EFA is that the investigator does not specify the estimated parameters and the patterning of items loading on factors, and instead these are determined by the analysis. [Figure 11.1A](#) provides a graphic representation of EFA. Square boxes represent observed variables,

circles represent latent variables or factors, straight arrows connecting circles and squares represent factor loadings, arrows only pointing toward squares represent observed variable uniqueness (i.e., variability not accounted for by the latent factors, which includes both unique variance and error variance), and curved arrows represent covariances/correlations. Additionally, solid lines represent model specified parameters, whereas dashed lines represent parameters that can be specified by the investigator. In this example there are six observed variables and two correlated factors (i.e., an oblique model), and each of the observed variables loads on each of the two factors. This is a basic feature of EFA, and one reason why it is referred to as exploratory—the investigator does not assign observed variables to factors, rather the relationship between each is estimated and the pattern of loadings is evaluated or “interpreted” after the analysis is run.

Some have called EFA an atheoretical data analytic approach, which is a glaring mischaracterization. Many aspects of EFA are theoretically driven. One of the most fundamental theoretical assumptions that can be made in EFA is that underlying dimensions account for patterns of observed responses to stimuli. This is reflected in structural diagrams that represent factor loadings as arrows emanating *from* the latent factors *to* the observed variables.² Furthermore, it is frequently the case that the investigator has a hypothesis about how many factors are needed to account for the observed variables (e.g., Spearman’s theory of general intelligence would suggest a one-factor model). And, usually, there is a theory about which observed variables serve as markers for the same factors. More generally, modeling decisions should ideally be made based on substantive theory. For instance, factors must be interpreted and labeled, and the emergence of a factor that is uninterpretable may prompt us to select fewer factors, drop some items, or collect more data.

EFA is, however, a very interactive technique, in the sense that several models are often run under different conditions and compared before settling on a final solution. Several considerations are involved in arriving at an acceptable model, but the two primary ones include selecting the number of factors to retain and the rotation for those factors. In each case theoretical considerations should be the primary deciding factor, although quantitative indices have been developed to aid in this process. As powerful desktop computing has become ubiquitous, coarse rules of thumb such as the Kaiser-Guttman rule (i.e., retain only factors with eigenvalues greater than 1.0) and

visual tools such as Cattell's (1966) scree plot have given way to more quantitatively rigorous criteria such as Horn's (1965) parallel analysis, Velicer's (1976) minimum average partial test, Ruscio and Roche's (2012) comparison data technique, and fit criteria [e.g., chi-square, root mean square error of approximation (RMSEA)] when available based on the estimator (e.g., maximum likelihood). Regardless of which methods are used, and it is advisable to enlist the aid of at least one of the more rigorous approaches, these are fallible tools that should be weighed in the decision but not followed blindly. The investigator is still required to make careful choices based on all pertinent information, especially theory.

Once the number of factors has been decided on, the next step generally involves selecting a *rotation* for the factors. Rotation refers to adjusting the relationship between the observed variables and latent factors through a linear transformation. In other words, the exact pattern of factor loadings is not fixed, and can be quantitatively adjusted to improve the interpretability of the factors. Many rotation schemes exist (e.g., Varimax, Geomin; see Sass & Schmitt, 2010, for a review) that attempt to maximize specific criteria (e.g., factor or variable simplicity), with a frequent goal of achieving a simple structure (Thurstone, 1947). In a perfect simple structure each observed variable loads strongly and exclusively on a single factor, allowing for easier interpretation. Despite the many options available for factor rotation, the most important distinction is whether it generates *orthogonal* or *oblique* factors. In an orthogonal rotation, the factors are forced to be unrelated to each other, whereas in an oblique rotation factors are allowed to correlate. As will be discussed below, choosing between oblique and orthogonal rotation can have implications that go beyond an individual factor analysis.

Because all items load on all factors in EFA, rotation of the factors is arbitrary, quantitatively speaking. This is not to say that any single loading can be adjusted to whatever the investigator wants. On the contrary, rotating a factor causes all of its factor loadings to change based on the linear transformation. However, there is no mathematical superiority in selecting one rotation over another, and the decision rests on interpretability. Some have sharply criticized EFA because of this aspect, claiming that because factor rotations are quantitatively arbitrary, factors are therefore conceptually arbitrary and merely conventions of human cognition. Although not a reason to disregard EFA as a useful technique, knowledgeable factor analysts keep

in mind that a factor represents a hypothetical latent construct, and neither does it reflect a 1:1 correspondence with any particular natural phenomenon, nor can differing interpretations for a factor be adjudicated quantitatively without external validation.

Several other considerations require attention when conducting or evaluating a factor analysis. Of these, the selection of variables to include is perhaps the most important because it will constrain the resulting factor structure. In some respects this point is so obvious as to not bear mention, but it plays out in subtle ways. Recall that factor analysis seeks to account for patterns of covariation, which follows directly from the included variables. If sufficient measures of a construct are not included, it will not emerge as a factor in the analysis. For instance, if too few measures of a construct are included (e.g., a single openness scale), it is unlikely to emerge as a stand-alone factor, and instead these indicators may join another factor or be orphaned with low loadings on all factors. A reasonable but flexible heuristic is that a factor analysis should include at least three primary indicators of a hypothesized construct. Indeed, much of the early work on personality traits suffered from small sets of variables that could hardly be considered comprehensive, thereby precluding any definitive solution ([Digman, 1996](#)). On the flip side of this coin, overloading an analysis with many variables of a very similar nature virtually guarantees that a specific factor will emerge, even if the variables are individually conceptually related to others in the same analysis (i.e., a grouping of variables tightly related relatively speaking, even with marked associations with the other variables, will stand out). As might be apparent, this can cause spurious factors to emerge that better reflect the density of measurement as opposed to substantive distinctions between observed variables. For instance, adding six measures of anxiety disorders to a factor analysis of normative personality traits will likely result in an Internalizing factor separate from neuroticism that accounts for the disorders, even as it correlates highly with neuroticism. When the variables forming a factor are highly redundant it has been termed a “bloated specific” factor, denoting the excess of items used to measure a narrow piece of information.

In sum, EFA seeks to account for shared variance among observed variables with a smaller set of reduced factors. The investigator must choose which variables to include in the analysis, and then interpret the resulting factor solution, deciding on how many factors to retain and how to maximize

interpretability of the loadings by selecting a rotation. Because of the high degree of investigator decisions, EFA has been criticized as being arbitrary and more art than science. This criticism ignores the principled nature of most decisions and the high degree of investigator decision making in all statistical analysis. A well-conducted factor analysis is no more subjective than any other complex data analytic technique.

Confirmatory Factor Analysis

As the name indicates, unlike EFA, CFA was intended to serve primarily as a hypothesis *testing* analytic approach. CFA shares the major conceptual basis of EFA, in that the goal is to represent patterns of covariation among a set of observed items with a smaller set of unobserved factors. The confirmatory aspects are that (1) the user specifies all³ of the model parameters, and (2) the fit (or, more specifically, the lack of fit) of the specified model to the observed data is tested. [Figure 11.1B](#) illustrates a hypothetical typical two-factor CFA. In this model the observed variables Y1–Y3 serve as indicators of latent factor F1 only, and Y4–Y6 serve as indicators of F2 only. Note that one major distinction from the EFA in [Figure 11.1A](#) is that each factor loading was specified, and not all items load on each estimated factor. Much like the EFA model the factors are allowed to correlate, making it an oblique model. However, there is no rotation to choose, factors are either correlated (oblique) or uncorrelated (orthogonal). Furthermore, each observed variable has a residual variance, reflecting unique variability unaccounted for by the factor plus error. Finally, notice the curved arrow between Y2 and Y5. This reflects an error covariance, indicating that there is shared variance in items Y2 and Y5 unaccounted for by the factors that the investigator is modeling.

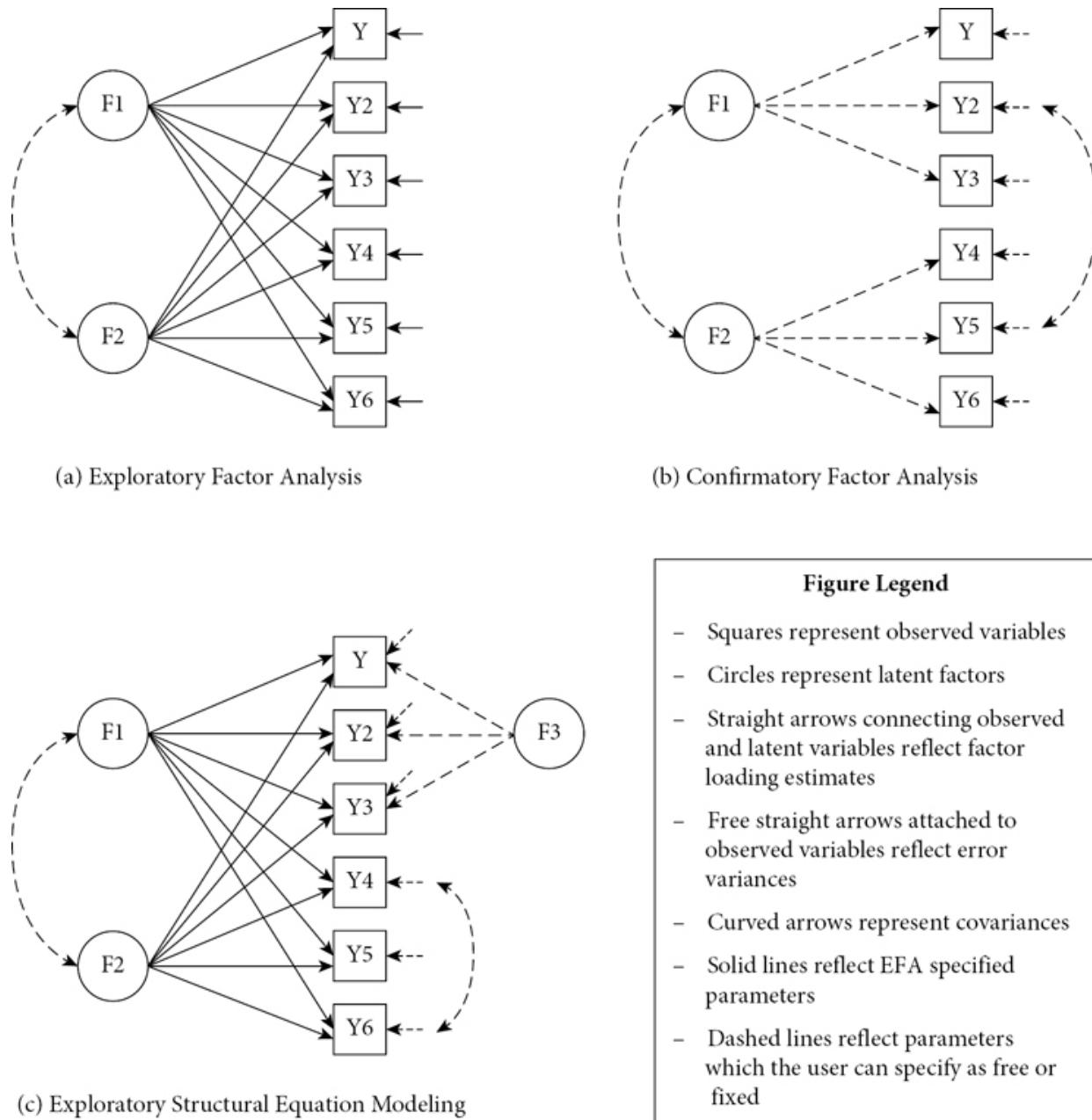


Figure 11.1. (A) Exploratory factor analysis. (B) Confirmatory factor analysis. (C) Exploratory structural equation modeling.

Were we to actually test this model, our chosen statistical package would first optimize the values of the parameters in an effort to match the data set we were using with some form of estimator (e.g., maximum likelihood, weighted least squares); it would then compare the fit of the model implied covariance matrix to the observed covariance matrix and generate goodness-of-fit indices based on the degree of match and other criteria. It is worth

noting that each model implies a certain pattern of covariation based on its parameterization. For instance, in the case in which there are no free error covariances, the factors must account for *all* of the covariation among the observed variables. Any unaccounted for residual covariation in the actual data will contribute to worse fit.

A detailed discussion of various fit indices goes beyond the purview of this chapter. However, each fit index is specified quantitatively and under certain modeling conditions it may not match *the statistical test the investigator intends*. For instance, the model chi-square is often written off because it “performs poorly in large samples.” This is inaccurate; the statistic is performing exactly as it is intended to do. It is more appropriate to recognize (and state) that the chi-square statistic tests whether the model’s implied covariance matrix fits the data *perfectly*, and in large (i.e., highly powered) samples it is sensitive to very minor sources of ill fit that are unlikely to have practical significance. In studying personality structure we are infrequently interested in the level of precision afforded by the chi-square statistic, but are usually interested in using large (and therefore highly powered) samples and large variable sets that will also contribute to a poorly fitting model as judged by the chi-square test unless large numbers of complex factors are included. Thus, the chi-square test is often at odds with the aims of applied personality researchers. There is nothing dubious about selecting alternative fit indices that more closely match the desired level of precision and account for modeling features that will be encountered in personality structure studies. But the investigator should be making this choice understanding the issues involved.

In CFA strict simple structure can be specified and tested by allowing each observed variable to serve as an indicator for only one factor (e.g., as in [Figure 11.1B](#)). However, this is not a requirement, and variables may serve as indicators for more than one factor. There are important implications for deciding whether to make an indicator simple or complex. Recall that the estimator will attempt to fit the model parameters to the data first. Thus if an indicator is complex, meaning that it is influenced by more than one underlying factor, and it is allowed to load only on a single factor, then this will result in a stronger covariation among the factors. To provide a concrete example, consider depression as an indicator, which is known to be associated with high neuroticism and low extraversion ([Clark & Watson, 1991](#)). If depression is allowed to load on neuroticism only in a model that

includes other markers and latent factors for both neuroticism and extraversion, this will result in an increased negative correlation among neuroticism and extraversion. Alternatively, if the depression variable is allowed to load on both, it will decrease the latent factor correlation because the patterns of association have now been accounted for at the level of the item loadings. As will be discussed below, this has important implications for the way trait hierarchies are studied and the conclusions that are drawn from them.

Another attractive feature of CFA is that it allows for principled deviation from the assumption of conditional independence. Factor models are often specified such that there is no covariance among the item residuals, the assumption being that the observed variables are independent of each other once the factors are accounted for (i.e., conditional on the factors). Although reasonable given the goal of factor analysis, relaxing this assumption has legitimate uses. For instance, it can be used to account for method variance between specific item sets (e.g., items that share the same stem). However, the unprincipled use is to be discouraged, as it can capitalize on chance in any given data set, especially when sample size is large, and result in nonreplicable model complexity.

Though CFA has many advantages (e.g., confirmatory nature, full control in the ability to free and fix parameters), it is unwieldy for use as a purely exploratory tool (i.e., when the latent structure of the data is not well understood or is unknown), especially with large variables sets. Admittedly, many investigators use CFA in a semiexploratory fashion in applied research (e.g., making modifications based on Lagrange multiplier tests, also known as modification indices), but as confidence in the precise structure decreases, and item set size increases, the utility of CFA for exploration declines. Yet there are many situations in which the investigator is most interested in the data-derived structure, or, more frequently, wants to relax the assumption of no cross-loadings, but does not want to go through parameter by parameter testing them.

Exploratory Structural Equation Modeling

Exploratory structural equation modeling (ESEM) is a relatively recent development in latent variable modeling ([Asparouhov & Muthén, 2009](#)), and it allows for EFA-derived latent variables to be included within the broader SEM framework. Another way to think about ESEM, especially as it relates

to the types of models we are discussing here, is that ESEM blends the features of EFA (i.e., exploratory factors, range of rotations) and CFA (i.e., the ability to specify parameters, user-specified factors, multiple group analysis) allowing for near total flexibility in modeling. A number of considerable advantages are gained by this innovation. These include the ability to add method factors to EFA analyses of multiple scales from different measures, correlated residuals, and adding parameter equalities across two scientifically interesting groups (e.g., genders, patient versus nonpatients). [Figure 11.1C](#) provides a hypothetical example of an ESEM model. In this diagram, in addition to two obliquely rotated EFA-defined factors (F1 and F2), there is a third investigator specified factor (F3) that is orthogonal to the other two. F3 could perhaps represent shared method variance for observed variables Y1–Y3, or the assumption that they are markers for more than one construct. Finally, the residuals for Y4 and Y6 are allowed to correlate. In the modeling of complex personality data that has large item sets, ESEM benefits from the efficiencies of the EFA framework, while allowing the investigator to have control over specific study design features that are afforded with CFA.

Similar to CFA, ESEM relies on estimation methods that ultimately result in an implied covariance matrix that can be compared to an observed matrix in various ways to generate goodness-of-fit indices. The fact that the EFA portion of the structure can model a large number of potentially conceptually negligible but statistically significant cross-loadings generally results in considerable improvement in fit over a strict simple structure imposed by many CFAs (see [Booth & Hughes, 2014](#), for a summary). However, it is worth belaboring the point that factor analytic techniques are in large part separable from the estimation approach. Although certain estimation methods (e.g., principle factor analysis) are reserved for EFA, estimations such as maximum likelihood and weighted least squares can be applied to EFA, CFA, or ESEM. This underappreciated fact often results in claims that an ESEM has been conducted, when in reality only an EFA has been conducted with maximum likelihood-generated estimates. Although this produces fit criteria, no additional confirmatory work or alteration of the structure by the user has been done. As noted above, EFA is a legitimate and very useful technique, and the objection with labeling a maximum likelihood EFA as ESEM is related to perceived inflation of the rigor of analysis without having done anything other than a standard EFA. Alternatively, a

maximum likelihood-based EFA could be considered one very basic form of an ESEM, but this would seem to muddy the methodological waters. Now armed with the contemporary thinking on factor analysis, both historical and recent studies will be considered.

Factor Analysis of Personality Attributes

The historical development and ongoing research on the FFM are intimately intertwined with factory analysis. The preceding review of the statistical techniques was intended to garner a better appreciation of the model's early fits and starts and the challenges it is facing today.

Historical Foundations: Exploring the Structure of Personality Attributes

Domains that in hindsight are easily interpreted through the lens of the current FFM were identified by factor analysis as far back as 1930s by investigators such as Cattell (1933) and Guilford (Guilford & Guilford, 1934). At the time, however, both the technical and conceptual state of affairs limited the ability of early researchers to arrive at a replicable solution. Considering first the technological capacities available at the time, the earliest factor analyses had to be conducted by hand. Although calculators eventually supplanted longhand calculations, it would be almost two decades before computers were available for routine use. Conducting a factor analysis by hand is an incredibly time-consuming and grueling proposition, thus limiting early efforts to a minority of variables. Early studies were conducted with approximately 20–30 personality variables. Contrast this with Goldberg's (1990) definitive analysis of three data sets of trait-descriptive terms. In the first of three studies, he factor analyzed 75 terms (more than twice that of Cattell's 35 scales), using five different extraction methods (e.g., principle axis, maximum likelihood, and principle components) and two different rotations per method. Performing even one analysis with that many terms in the early part of the twentieth century would have been unthinkable, let alone 10, plus two additional studies with variable sets of 100 and 133, respectively. The effect of this early limitation precluded the analysis of anything resembling a comprehensive list of variables, thus requiring more circumscribed and idiosyncratic sets (e.g., Thurstone, 1934). This clearly resulted in some domains being underrepresented [e.g., agreeableness in Guildford & Guilford (1934) and

conscientiousness in [Thurstone \(1951\)](#); see [Digman \(1996\)](#) for a detailed review], and other less conspicuous influences were likely in operation as well. Recall that the results of the EFA are driven by the covariation of the included variables—inadequate representation of a construct precludes the emergence of a related factor. As a result, the most convincing and replicable solutions for this type of question will be those that adequately sample from the full domain of personality terms. In the early part of the twentieth century, however, it was as if investigators were attempting to solve the personality puzzle without a full set of pieces.

Another early stumbling block beyond idiosyncrasies in early variable selection was the view, promoted by [Thurstone \(1947\)](#), that “too many factors can do no harm” (p. 509). Offered in the Old Testament of factor analysis, this perspective is apparently responsible for Cattell’s decision to extract improbably large numbers of factors from his datasets in the 1940s ([Cattell, 1943, 1944, 1945, 1947, 1948](#)). Drawing from [Allport and Odbert’s \(1936\)](#) comprehensive list of terms, Cattell factored a set of 35 scales, and across three studies retained 12, 11, and 11 factors, respectively. Surprisingly by today’s standards, Cattell decided to bundle all of the factors that emerged across all of his studies in his 16-factor model of personality, despite the fact that only some of these factors replicated. Indeed, one major danger resulting from factor overextraction is that as more and smaller factors are extracted, they are less likely to reflect important, replicable domains, and more likely to reflect dataset-specific variability. This is similar to the principle in CFA described above that we should not blindly free error covariances, even if suggested by modification indices, because it is likely capitalizing on chance variation in a specific sample. These analyses were conducted several decades before modern quantitative procedures were developed to inform the appropriate number of factors to retain (e.g., Parallel Analysis, MAP Test), which would have been much more conservative in their selection of factors. In the context of this chapter, these early studies are worth revisiting because they demonstrate just how closely intertwined the history of the FFM is with the history of factor analysis. Factor analytic methods were in their infancy and their performance was not yet fully understood, and therefore early misses are to be expected.

Over the next decade there was little advancement, aside from one notable study that found a solution near to the Big Five ([Fiske, 1949](#)), which in fact found a familiar four, excluding a clear agreeableness. Some have argued

that this is the provenance of the modern structure (see also the chapter by [de Raad and Mlačić](#)). However, in the early part of the 1960s, a series of seminal studies hammered out the structure that would ultimately come to form the FFM that is evident today. First, Tupes and colleagues ([Tupes & Christal, 1961](#); [Tupes & Kaplan, 1961](#)) settled on five replicable factors in their analyses. Despite the fact that these were mostly obscured from view by being published in U.S. Air Force reports, several researchers (e.g., [Borgatta, 1964](#); [Norman, 1963](#); [Smith, 1967](#)) did take notice and followed up with work of their own resulting in very similar structure using different sets of scales rooted in the Allport and Odber terms ([Norman, 1963](#); [Smith, 1967](#)), or as newly generated items ([Borgatta, 1964](#)). The fertile grounds laid in the 1960s mostly lay fallow as trait psychology entered its lost decade, ushered in by critics such as [Mischel \(1968\)](#).

However, the seeds had been planted, and they would bloom in the 1980s. Interestingly, among the seminal investigations in this era was a reanalysis of Cattell's and Fiske's earlier scales using more modern factor retention rules. In this study, [Digman and Takemoto-Chock \(1981\)](#) found that when more stringent criteria were employed, five replicable factors emerged across the earlier datasets. These factors conceptually matched those found by [Tupes and Christal \(1961\)](#) and [Norman \(1963\)](#), and are recognizable as the five factors that comprise the FFM of today. At around the same time, Goldberg published two chapters ([1981](#), [1982](#)) summarizing and distilling much of the existing factor analytic evidence of the time, arguing that most contending models could be organized within the framework of Norman's adequate taxonomy (i.e., Norman's five traits). According to [Goldberg \(1993\)](#); see also [Digman, 1990](#)), it was based on these writings ([Goldberg, 1981](#), [1982](#)) that he was invited to a conference held in 1983 by Drs. Costa and McCrae. Up to that point, Costa and McCrae had invested their time in studying and developing a measure for a three-factor model of personality comprised of neuroticism (N), extraversion (E), and openness to experience (O). Based on Goldberg's work, they adopted agreeableness (A) and conscientiousness (C) into their model, and the NEO Personality Inventory (NEO PI; [Costa & McCrae, 1985](#)) was published with multiscale domains for N, E, and O, and single scale domains for A and C (see also the chapter by [Costa and McCrae](#)). By 1992 this structure was expanded to include an equal number of facets—six—per domain in the incomparably popular NEO PI-Revised (NEO PI-R; [Costa & McCrae, 1992](#)). Throughout the 1980s and continuing

through to today, the Costa and McCrae team produced studies on the FFM with leporine speed. As [Goldberg \(1993\)](#) stated, Costa and McCrae are the “world’s most prolific and most influential proponents of the five factor model” (p. 30), and the same has remained true for the more than 20 years since.

Paralleling Costa and McCrae’s work, numerous other investigators contributed to the factor analytic evidence for the FFM during the 1980s in a variety of samples, cultures, and criteria sets (e.g., [Amelang & Borkenau, 1982](#); [Digman, 1989](#); [Digman & Inouye, 1986](#); [John, 1989](#); [McCrae, Costa, & Busch, 1986](#); [Peabody & Goldberg, 1989](#); [Trapnell & Wiggins, 1990](#)). The decade culminated with the seminal study by [Goldberg \(1990\)](#) mentioned above, which showed that large sets of scales derived from the Allport and Odberst terms resulted in highly consistent conclusions across factor analytic techniques, rotations, and even across large and diverse sets of items (i.e., 75–133).

The early era of FFM research was based almost exclusively on EFA. Several of the initial stumbling blocks that delayed the arrival of the five factor structure are easily understood, in retrospect, as emerging from the state of factor analysis and computing technology at the time. As EFA came into its own and the methodology was better understood and its application standardized, results became more consistent, and consensus could be achieved on the structure of broad personality domains. One of the major take home messages of this line of work has less to do with factor analysis per se, and more to do with good science in general: replicate, replicate, replicate.⁴

Model Fit in the Modern Era: Confirming the Structure of the FFM

By the 1990s, with the FFM firmly established, researchers turned away from explorations of basic structure and toward validation of the current model and prediction of external variables (e.g., [Ozer & Benet-Martinez, 2006](#)). In many respects, it could be argued that EFAs conducted and replicated in reasonably comprehensive but different sets of trait-relevant variables (e.g., scales, items, ratings) provide the strongest evidence for the FFM as a natural phenomenon. Nevertheless, around this same time, CFA began gaining in popularity and was being widely disseminated via commercial statistical packages (e.g., LISREL), and naturally investigators

sought to test the FFM structure in this more stringent confirmatory framework.

To my knowledge, the first study to use CFA to *test* the FFM structure was conducted by [Borkenau and Ostendorf \(1990\)](#). For the primary analyses, [Borkenau and Ostendorf \(1990\)](#) included three sets of FFM scales as observed variables in CFA models: the self-rated NEO PI, self-rated Norman scales, and peer-rated Norman scales. In many ways, this early study was exemplary in its application of CFA. A series of CFA models were estimated that allowed the relevant scale scores from each measure/rater to load on one, and only one, of five corresponding content factors, with three method factors included to account for shared variance associated with the measure or rater. For instance, the extraversion factor had as indicators the NEO PI extraversion, self-rated Norman extraversion, and other-rated Norman extraversion, and all NEO PI scales loaded on a single factor accounting for shared method variance. The same was true for the remaining four domains and the Norman self-report and other-report scales.

One variant of this model constrained the factor correlations to 0.0, consistent with the theoretical view that the five factors are orthogonal or close to it, but fared poorly in terms of fit. In contrast, an oblique model did achieve acceptable fit, and was a significant improvement in fit (i.e., change in chi-square) over the orthogonal model. This type of model comparison highlights the attractive features of CFA, providing the researcher with the capacity to test interesting theoretical questions (e.g., completely distinct versus related domains). However, building on these results, the authors then examined a CFA model that included the full set of lower-order markers (or facets) from each of the measures. In contrast to the model based on domain-level scales, the expanded model resulted in an abysmal fit leading to tempered enthusiasm by the authors for the results as a whole.

A detailed review of this initial study is warranted, not only because of its temporal primacy, but because many of the issues with which Borkenau and Ostendorf were grappling have plagued the long string of CFA studies of FFM measures since (e.g., [Church & Burke; 1994](#); [Donnellan, Oswald, Baird, & Lucas, 2006](#); [Gignac, Bates, & Jang, 2007](#); [Hopwood & Donnellan, 2010](#); [Lim & Ployhart, 2006](#); [McCrae et al., 1996](#); [Parker, Bagby, & Summerfeldt, 1993](#); [Vassend & Skrondal, 1995, 1997](#)). The major issue was that CFA makes highly restrictive assumptions about the structure of personality, assuming a very strict simple structure, with each item or scale

loading on one, and only one, factor. Although this strict simple structure *is not a requirement of CFA models*, it is often how they are taught in introductory structural equation modeling courses and presented in the literature. Furthermore, [Borkenau and Ostendorf \(1990\)](#) rightly pointed out, as many others have since (e.g., [DeYoung et al., 2007](#); [Hofstee, De Raad, & Goldberg, 1992](#); [Hopwood & Donnellan, 2010](#); [McCrae et al., 1996](#)), that markers of the FFM, be they individual items or scales, are generally complex, meaning they often reflect more than one domain's content (e.g., NEO PI-R Warmth loads on both extraversion and agreeableness; [DeYoung, 2013](#); [McCrae et al., 1996](#)). This leaves investigators interested in CFAs of the FFM faced with somewhat of a Catch-22. Specifically, CFA holds the promise of providing a test of theoretical structure, or the rigorous comparison of structure across important groups (e.g., males versus females, Germans versus French, patients versus nonpatients), and therefore all expected cross-loadings should be modeled. And yet, at the same time, were we to actually consider specifying each reasonable cross-loading manually *a priori*, it would require a seemingly impossible number of predictions that would likely really be revealed only via exploratory work. For instance, take the NEO PI-R scales; for each facet there is one clear prediction associated with the domain it is intended to mark, but for each facet there are also four additional choices to be made for a total of 120 possible secondary loadings —this doubles to 240 for the 60 items of the NEO-Five Factor Inventory (NEO-FFI). Alternatively, we could allow cross-loadings post hoc based on significant modification indices; but now the structure could hardly be considered confirmatory. This latter practice of allowing error covariances to correlate in CFA, although perfectly allowable quantitatively speaking (i.e., there is no necessity to make the assumption of conditional independence), if done in a post hoc fashion to maximize fit will generally result in many parameters that do not replicate across samples.

[Borkenau and Ostendorf \(1990\)](#) further noted that it was likely possible, moving forward, to create narrow-band scales that maximized within-scale correlations and minimized associations with other scales in such a way that reasonable fit could be achieved in a CFA. But they also immediately discredited this as a solution because this would be an unacceptable prioritizing of statistical fit over the conceptual breadth of each of the five factors (i.e., a poor bandwidth versus fidelity tradeoff). Others have suggested abandoning the enterprise of CFA when considering the FFM, and

instead reverting to EFA, and either employing targeted rotations (i.e., Procrustes rotations; [McCrae, Zonderman, Costa, Bond, & Paunonen, 1996](#)) or using maximum likelihood estimated EFAs ([Hopwood & Donnellan, 2010](#)) that generate the same fit statistics as CFAs. In each case the proponents have emphasized replicability across samples as opposed to statistical fit between the model and the data within one sample, paired with tests of replicability with congruence indices. By this standard, the NEO PI-R measures ([McCrae et al., 1996](#)) and other measures of the FFM (and non-FFM personality inventories; [Hopwood & Donnellan, 2010](#)) fare quite well.

In contrast to [Borkenau and Ostendorf's \(1990\)](#) early investigation that focused on cross-measure and rater confirmation of the theoretical structure of the FFM, the majority of the CFA studies since have focused primarily on whether a specific measure's item-set or scales conform to the expected structure. This is notable in several respects. In part this reflects the maturing nature of the science, which has moved from unconstrained and, frankly, highly variable criteria sets across research groups to refined and better delineated instruments that are providing consistency of measurement across laboratories. Accordingly, only the most extreme researchers suggested that the results of CFA studies indicted the FFM proper (e.g., [Vassend & Skrondal, 1997](#)), and most others limited their questions to suitability of specific measures. Yet others have highlighted the fact that more recently developed measures, those that have been developed in the CFA-dominated modern era, are at a disadvantage because they will be judged against criteria that are difficult for any broadband personality inventory to meet ([Hopwood & Donnellan, 2010](#)). This is despite the fact that established measures developed earlier also do not meet the CFA standards for fit, generally speaking.

Regardless of any mismatch between the overly restrictive ways in which CFA is customarily applied, the highly sensitive nature of CFA fit indices, and the goals of delineating the broadband structure of personality and developing instruments to measure it, there are many attractive features of a CFA framework that would be a shame to discard. These include the ability to test for measurement invariance across time, groups, and possibly even different item sets. Also, the ability to model additional factors that might influence fit, such as method factors (e.g., [Marsh, 1996](#); [Quilty, Oakman, & Risko, 2006](#)), or as will be discussed more below, hierarchical structures (e.g., [Digman, 1997](#)), is a desirable quality of CFA. An ideal method would

be able to accommodate the attractive features of EFA and CFA within a common framework.

ESEM was developed precisely to facilitate this compromise ([Asparouhov & Muthén, 2009](#)). As noted above, ESEM allows for the estimation of exploratory structures while also including researcher-specified constraints, paths, or factors. Among the earliest practical applications of ESEM was the examination of the measurement invariance of the full NEO-FFI's 60 items ([Marsh et al., 2010](#)). In a highly detailed exposition, [Marsh and colleagues \(2010\)](#) demonstrated the full capabilities of ESEM for furthering FFM structural research by examining invariance across gender and time and modeling additional sources of shared method variance among items. First, the authors showed, unsurprisingly, that the ESEM model achieved better fit than a strict simple structure CFA. Second, they noted that NEO-FFI uses items that come from different facets to calculate domain scores, which could lead to residual covariation among items. As such, they allowed item residuals to freely covary if they came from the same facet. For those unfamiliar with the NEO item sets, some facets contain highly redundant items (e.g., Impulsiveness), making this a reasonable approach. Allowing these items to correlate resulted in a much better fitting model. Third, they then tested for invariance across genders (using a multigroup approach) and time (using a longitudinal invariance approach), which required the fixing of parameters to equality across groups or time. Although a full summary of the results go beyond this chapter, in brief [Marsh and colleagues \(2010\)](#) found support for partial measurement invariance across gender and time.

This study highlighted just how flexible the ESEM approach can be in practice. [Marsh and colleagues \(2010\)](#) also noted that there has been an artificial schism between research that has investigated the factorial structure of personality using omnibus sets of items and inventories, and research that has studied the measurement invariance of scales. These two literatures are not at odds with each other, and are actually interested in the same questions. However, the differences in methodology have kept them apart. ESEM makes invariance testing with larger personality inventories tractable, and could lead to improvements in measurement and the certainty of conclusions drawn in practical research.

Another interesting feature of this study is that the authors chose to use an oblique rotation. In part this choice made it possible to illustrate the fact that going from a CFA with no cross-loadings, to an ESEM framework in which

all items can freely cross-load, factor intercorrelations will markedly diminish (although they do not entirely disappear). [Booth and Hughes \(2014\)](#) have since demonstrated a similar decrease in factor intercorrelations with several other FFM measures going from a CFA to a maximum likelihood EFA framework. These observations are not new, and in fact have long been recognized. Indeed, [McCrae and colleagues \(1996\)](#) argued strongly for the use of exploratory solutions as opposed to confirmatory solutions because the five factors are theoretically orthogonal, and this can be specified in EFA without loss of fit. Accordingly, McCrae and like-minded colleagues have tended to view the larger correlations among the FFM factors obtained with CFA as being “inflated” or even “biased upwards.”⁵ It is important to recognize, however, that this is a theoretical argument, and is not based on a quantitative rationale. That is to say, given that items and scales that form the basis of factor analytic models of personality appear to be complex (i.e., share variance not only with other putative markers of the same domain, but also with scales that are presumed to be markers of other domains), factor correlations will be smaller or larger depending on the degree of cross-loadings allowed. The complexity can either be modeled at the level of the loadings of individual items or scales, or it can be modeled at the level of the factor correlations. This has major theoretical implications, both for the FFM, which is often presumed to be composed of orthogonal factors, and because there are those who have posited theories based on the observed patterns of factor correlations (e.g., [DeYoung, 2006, 2013; Digman, 1997](#)). However, by reverting to EFA-derived or ESEM-derived factors it becomes difficult, impossible in fact, to adjudicate quantitatively between orthogonal and oblique rotations.

Therefore, investigators should be aware of the implications of choosing a rotation if employing ESEM, just as was necessary in EFA. In general, researchers are faced with three options, orthogonal, oblique, and target rotations. With few exceptions (e.g., exploratory bifactor rotation; [Jennrich & Bentler, 2011](#)), the orthogonal and oblique rotations that are generally available are going to be calibrated, in various ways, to maximize simple structure. Given this fact, an orthogonal rotation can be imposed, making the assumption that factors are uncorrelated, but there is no quantitative justification to prefer this solution to one that allows for factor correlations. More desirable, [Fabrigar and colleagues \(1999\)](#) argue, is to employ oblique rotations given that if simple structure is maximized by a solution with

uncorrelated factors, this will emerge in an oblique rotation. Alternatively, researchers may employ target rotations. Mentioned only briefly above, this allows researchers to rotate ESEM (or EFA) factors to a specific pattern, determined either by prior research or by a theoretical structure. The statistical package will then try to “hit” the target values, and will return a model with values as close as possible to those set as the targets. This can be useful when a specific scale is intended as the primary marker for a domain (i.e., a high target loading is specified) and other scales are intended to be orthogonal (i.e., they would be targeted for a 0.0 loading), and those presumed to have complex structure can be left free to load. Note that regardless of rotation strategy, ESEM (or maximum likelihood EFA) models will all evidence equivalent fit, and therefore the onus remains on the researcher to select and defend a particular solution.

Our understanding of the structure of personality attributes has been deeply influenced by factor analysis in its various forms. Early work relied on EFA, which as a novel method was poorly understood and resulted in solutions that fared poorly on replication. As EFA methods improved, so too did the robustness of personality structure, ultimately arriving at the FFM by the end of the 1980s to early 1990s. Presuming a reasonably consensual final model, a great deal of scientific effort shifted toward validation and examining the implications of the model. At the same time, the FFM was subjected to CFA that seemed to threaten its foundations. However, initial concerns based on rigid applications of CFA gave way to a more nuanced understanding of the issues involved (e.g., complexity of items and scales) and a recognition that the goals of developing and testing a broadband personality structure may be at odds with the highly sensitive nature of CFA. The recent addition of ESEM provides the necessary compromise to broker reconciliation between the practicalities of working with personality data and the desire to use several of the sophisticated features and control of a confirmatory analytic framework. In many respects it would seem that much of what factor analysis can tell us about personality has been exhausted. Nothing could be further from the truth. On the contrary, highly sophisticated factor analytic investigations continue to be used to address complex questions at the cutting edge of personality science. In the next section several of these areas with intensely active literatures will be considered.

Future Challenges for Factor Analysis in Personality Research and the FFM

By the 1990s the FFM had spurred considerable work on personality traits as predictors, outcomes, developmental constructs, and more. But the story does not end there, and important structural considerations remain even today that go beyond the FFM per se, and include the FFM in the context of a hierarchy of traits and the utility of enlisting the FFM to serve as a broader fundamental psychological structure.

Hierarchical Structure of Personality Traits

Although it should be clear at this point that the FFM represents a robust solution for personality structure, it mostly reflects only one level of abstraction in a larger structural organization of personality that goes both up, toward more general or “meta-trait,” and down, to ever more fine-grained articulations of personality attributes. Since their inception, factor analytic studies of personality have assumed a hierarchical model, with the assumption being that individual behaviors reflect the expression of attributes captured by specific descriptors, specific descriptors combine to form narrow traits, which ultimately coalesce into the broad domains [see, e.g., [Guilford \(1975\)](#) or [Costa & McCrae \(1995\)](#) for a detailed discussion]. For a good example of how this has been operationalized in a contemporary measure, consider the NEO PI-R ([Costa & McCrae, 1992](#)): each domain is made up of six facets, which are each made up of eight items. Thus, it could be argued that the NEO PI-R has (at least) three levels of measurement by design.

Going up before going down, it is worth returning to the issue of the factor intercorrelations observed among scales measuring the FFM domains. It was noted earlier that the theoretically orthogonal domains manifested nonignorable, and at times quite sizeable, correlations in real world data. The initial quantitative work on this issue was conducted by [Digman \(1997\)](#) who examined the higher-order structure of the five factors from 14 different studies, finding a replicable structure that had one factor marked by neuroticism (or rather its inverse emotional stability), agreeableness, and conscientiousness, and the other marked by extraversion and openness. Importantly, these structures were tested with CFA models that were generally well-fitting. Digman labeled these factors using neutral terms,

alpha and beta, respectively, although he hypothesized links to several grand psychological theories. Since then a number of researchers have explored these two higher-order domains in diverse datasets (e.g., [Anusic, Schimmack, Pinkus, & Lockwood, 2009](#)). And although highly replicable, in specific datasets they may not emerge or may evidence significant unexpected cross-loadings. These two domains have also motivated theoretical innovation; DeYoung ([2006, 2013](#)) has suggested the term “stability” for alpha and has hypothesized that it reflects central serotonergic functioning, whereas he suggested the term “plasticity” for beta, hypothesizing that it reflects dopaminergic functioning (see also the chapter by [Allen and DeYoung](#)).

At this point, these two domains appear to be well established from a factor analytic standpoint, and most relevant research moving forward will likely entail further investigation of the external correlates and predictive power of these domains (e.g., it may be that enhanced longitudinal prognostic capacity is afforded by the broader domains relative to the five factors; are the domains indeed reflective of functioning in the neurotransmitter systems?). However, one aspect of this work that deserves greater factor analytic attention is the role of the attenuation in correlations observed when cross-loadings are modeled directly at the lower level of measurement. Significant factor correlations remain when modeling an oblique structure with cross-loadings, but they decrease in magnitude significantly ([Booth & Hughes, 2014](#); [Marsh et al., 2010](#)). Testing whether, and if so to what degree, the two higher-order factors survive in a fully hierarchical model using second-order CFAs or ESEM^s would be an important confirmation of the robustness of these domains.

The fact that even alpha/stability and beta/plasticity correlate have led some to hypothesize a “general factor of personality” (GFP), analogizing to the “g” of cognitive abilities ([Rushton & Irwing, 2008](#)). This proposition has resulted in an incredible amount of research within the past several years, often with acrimonious commentary and critiques. Although it is difficult to guess the motivation behind a given researcher’s decision to conduct a study and/or write a paper with any certainty, it is hard to ignore the fact that Rushton’s writing drew links from the GFP to distasteful explanatory theories of racial inequity in ways that may have motivated criticism ([Rushton, Bons, & Hur, 2008](#)). Regardless of the rationale, most of the published critiques have taken supporters of the GFP to task on factor-

analytic grounds. For instance, from a very basic perspective, [Hopwood, Wright, and Donnellan \(2011\)](#), using a variety of factor analytic techniques, showed that the GFP from different measures could hardly be considered isomorphic, if even distally related. [Pettersson and Turkheimer \(2010\)](#) demonstrated that the GFP, if representing anything substantive, likely reflected evaluative bias. Finally, [Revelle and Wilt \(2013\)](#) showed that to the extent that the GFP exists, it is of modest statistical prominence, and likely does not warrant considerable attention. Others (e.g., [Donnellan, Hopwood, & Wright, 2012](#)), noting problems in the CFA solutions reported (e.g., mismatching degrees of freedom between text and diagrams) in some research supporting the GFP, have also shown that solutions may not replicate across datasets. Ultimately, given the strength of the criticism, the GFP has a difficult road ahead should the proponents seek to establish its permanence in the hierarchy of personality traits.

Starting with five variables not much room remains to build upward, but there is probably unlimited space to build downward. Undoubtedly the best-known lower-order set of scales is the NEO PI-R's 30 facets, which were designed to meet several conceptual and statistical criteria. These included suitable factor-analytic features, but also appropriate breadth of measurement, and sufficient prior attention in the research literature. Other promising solutions include the Big-Five Aspects of [DeYoung, Quilty, and Peterson \(2007\)](#), which reflect 10 intermediary constructs, two per domain of the FFM, that sit between the five factors and the facets. The challenge with building downward is identifying sets of scales that "hit" at the same level of abstraction ([Guilford, 1975](#)).

Ultimately it may be possible, given sufficient data and samples, to articulate a broader hierarchy of personality and several levels of abstraction, with the level of abstraction that is most conceptually or predictively useful depending on the purpose for which it is needed. Even so, it is clear that the FFM will retain a privileged position within any hierarchy. In the service of this aim, a technique for establishing personality (and other) hierarchies that is based on factor analysis, although it is not strictly factor analytic, bears mention. In what [Goldberg \(2006\)](#) has affectionately yet irreverently termed the "Bass-Ackwards" method, factor solutions of increasing complexity are estimated (e.g., one-factor, two-factor, three-factor), the factor scores are saved, and then are correlated to estimate the "unfolding" of a trait hierarchy. This simple but powerful technique has been put to good use examining the

hierarchical structure of various measures, and has shown what [Goldberg \(1981\)](#) argued for conceptually, that most of the enumerated trait models (i.e., the Big-Three, Big-Four, Big-Five) can be handled by considering them as instantiations of varying levels of abstraction. For instance, [Markon Krueger, and Watson \(2005\)](#), examining the joint structure of adaptive and maladaptive personality measures, noted that at the apex sat alpha and beta, at a level down alpha split into neuroticism and disinhibition, next disinhibition split into agreeableness and conscientiousness (or more accurately their inverses), and finally, at the fifth level, beta split into extraversion and openness.

Convergence between Normal and Abnormal Personality Structure

Around the same time that personality science was beginning to gain traction with a consensual structural model for personality attributes in the FFM, the [American Psychiatric Association \(1980\)](#) made a major revision to its diagnostic manual and system (i.e., the *Diagnostic and Statistical Manual of Mental Disorders*, or *DSM*), and codified personality disorders (PDs) into 11 discrete, categorical diagnoses (this has since been reduced to 10). Almost immediately, researchers and clinicians began complaining about its lack of clinical utility and mismatch to the phenomena it was putatively describing ([Widiger & Kelso, 1983](#)). Many stringent critiques of this system have been published over the years (see e.g., [Krueger & Eaton, 2010](#); [Widiger & Clark, 2000](#); [Widiger & Trull, 2007](#)), and therefore a detailed description of the system's many limitations does not bear enumeration here (see, as well, the chapter by [Widiger, Gore, Crego, Rojas, & Oltmanns](#)). Suffice it to say, however, that the major critiques are structural—there does not appear to be 10 cleanly separable disorders, nor has any credible and replicated research supported the categorical distinction of disordered and not disordered. This is evidenced by the fact that the personality disorder (PD) diagnoses covary within individuals at a much higher degree than would be expected by chance, and indeed the most commonly used diagnosis in practice has been one of “mixed” or “PD Not Otherwise Specified” (i.e., PD is present, but does not match any of the categories and instead reflects a blend of features; [Verheul & Widiger, 2004](#)). Without belaboring the point, a poorly articulated structural model impedes accurate clinical diagnosis, communication, and treatment, while also frustrating

research efforts attempting to identify etiological and maintenance mechanisms, and develop efficient treatments.

Although the epistemological differences between psychiatry and personality science are traditionally large, it is difficult to argue that a system developed to map the structure and major units of personality pathology should bear no resemblance to the empirical structure derived for basic personality. As far back as the 1950s, [Leary \(1957\)](#) argued convincingly that the same system needed to be used in the description of both to achieve harmonized scientific and clinical endeavors. As the FFM gained prominence throughout the 1980s, a natural next question was whether, and if so how, the five domains of basic personality interfaced with the 10 categorical diagnoses of the *DSM* PDs ([Widiger & Frances, 1985](#)). Considerable work has examined their interface, enough to support two relatively recent meta-analyses ([Samuel & Widiger, 2008a](#); [Saulsman & Page, 2004](#)). However, consistent with the theme of this chapter, the focus in this chapter will be on the use of factor analysis for answering this question.

[Wiggins and Pincus \(1989\)](#) were the first to use EFA to study how the two systems interdigitate.⁶ They analyzed student analogue responses to the NEO PI domains, the Revised Interpersonal Adjective Scales—Big Five (IASR-B5; [Trapnell & Wiggins, 1990](#)), the Minnesota Multiphasic Personality Inventory (MMPI) PD scales of [Morey, Waugh, and Blashfield \(1985\)](#), and the Personality Adjective Check List (PACL) PD scales ([Strack, 1987](#)). The pattern of loadings on the resulting five factor structure was easily interpretable and conceptually clear. The personality dimensions of NEO Extraversion and IASR-B5 Dominance, and the PD dimensions of MMPI Histrionic, Narcissistic, and PACL Antisocial marked the first factor positively and MMPI and PACL Schizoid and Avoidant scales marked the factor negatively, reflecting what appeared to be a bipolar dimension ranging from intrusiveness/attention-seeking to detachment/withdrawal. The second factor was most strongly marked by NEO and IASR-B5 Neuroticism, and was additionally positively marked by MMPI Borderline, Dependent, and Avoidant, and PACL Passive-Aggressive and Avoidant, with smaller negative loadings from MMPI and PACL Narcissistic and PACL Antisocial scales, thereby reflecting a modestly bipolar dimension ranging from negative affectivity and distress to a presumed problematic lack of concern for such. Factor three represented a dimension that ranged from overaffiliativeness through antagonism, with positive loadings from NEO

Agreeableness, IASR-B5 Affiliation, and PACL Dependent, and negative loadings from PACL Narcissistic and Antisocial and MMPI Paranoid. The fourth factor reflected a dimension ranging from compulsivity to impulsivity/indolence, with strong positive loadings from NEO PI and IASR-B5 Conscientiousness and PACL and MMPI Compulsive, and negative loadings from MMPI Antisocial and Passive-Aggressive. Finally, NEO PI and IASR-B5 Openness and MMPI Schizotypal marked the fifth factor.

In many ways this study, although not without limitations, reflected the seminal empirical demonstration that the FFM and pathological personality constructs could be organized within the same structural model. Of note is that almost all of the PD scales had strong loadings on one of the factors, and these were easily interpretable. Also noteworthy is the fact that some scales (e.g., Narcissistic, Antisocial, and Dependent) differed in their loading across instruments. For instance, MMPI Dependent was a strong marker of negative affectivity, whereas the PACL scale of the same name marked the overly nurturant versus antagonism domain. This type of variability in the content of scales with the same name causes problems when used as predictors or criteria in individual studies (e.g., [Samuel & Widiger, 2008b](#)), but can be resolved with factor analytic studies, assuming that sufficient markers of the diverse domains are being sampled. Finally, the emergence of the fifth factor that combined Openness and Schizotypy presaged what has ultimately become a contentious topic in this area of research, which will be addressed again later in this chapter.

[Wiggins and Pincus' \(1989\)](#) joint EFA of PD scales and FFM scales raises the question of what the stand-alone structure of PD would be, unbuttressed by FFM scales. Although many individual studies have examined this over the years (see, e.g., [Wright & Zimmermann, 2015](#), for a review), [O'Connor \(2005\)](#) used EFA techniques with target rotations to ascertain the consensus structure of the 10 *DSM* PD constructs pooling across many studies (see also the chapter by [O'Connor](#)). He concluded that a four-factor structure was the best fit, with clear resemblance to four of the FFM domains: neuroticism (e.g., borderline, avoidant, dependent), antagonism (e.g., histrionic, narcissistic, antisocial), extraversion/introversion (e.g., schizoid, avoidant, histrionic), and conscientiousness (obsessive-compulsive). Thus, even without the anchors of FFM the conceptual overlap was clear. Missing, of course, was a domain reminiscent of the fifth factor, openness. Results

such as these led some relatively early to suggest that a four-factor, but not five factor model would be a reasonable compromise between the FFM and the empirical structure of PD ([Widiger, 1998](#)).

Despite this seemingly strong evidence for a model of PD that resembles the FFM, at least in large part, there has been rigid resistance by many to replacing the *DSM*'s discrete categorical model. One of the traditionally cited reasons was that there was a lack of agreement on the structure of personality. However, it is difficult to consider this as anything more than a contrived criticism at this point, and each of the major alternative models is more alike than dissimilar—especially at the primary domain level of analysis (e.g., [Markon et al., 2005](#); [Widiger & Simonsen, 2005](#)). [Widiger and Simonsen \(2005\)](#), in much the same way [Goldberg \(1981\)](#) did with normal personality, reviewed 18 different models of normal and maladaptive personality and concluded that although there are differences in the precise make-up of the lower-order scales, all models either contain or can be conceptually accommodated by four broad domains: extraversion versus introversion/detachment, agreeableness versus antagonism, emotional stability versus neuroticism/emotional dysregulation, and constraint/conscientiousness versus disinhibition (they also identified a fifth domain, unconventionality versus closedness to experience, but excluded it from the primary proposal because it was not included within some prominent models). The conceptual similarities articulated by [Widiger and Simonsen \(2005\)](#) have been born out in numerous empirical factor analytic studies that have examined these models alone (e.g., [Calabrese, Rudick, Simms, & Clark, 2012](#); [Kushner, Quilty, Tackett, & Bagby, 2011](#)) or in combination with other measures (e.g., [Clark, Livesley, Schroeder, & Irish, 1996](#); [Markon et al., 2005](#)).

Many researchers have developed questionnaires/inventories that were intended to conform (more or less) to the *DSM*'s structure [e.g., Personality Diagnostic Questionnaire-4 (PDQ-4), [Hyler, 1994](#), and Millon Clinical Multiaxial Inventory (MCMI-III), [Millon, Davis, & Millon, 1997](#)]. However, others have adopted a different approach, pivoting away from the *DSM* constructs and instead developing measures that reflect the putative constituent or transdiagnostic features of maladaptive/pathological personality functioning. Examples of this approach include Clark's Schedule for Non-Adaptive and Adaptive Personality (SNAP; [Clark, 1993](#)), which was developed around a theoretically triarchical temperament structure, and

Livesley's Dimensional Assessment of Personality Pathology (DAPP; [Livesley & Jackson, 2009](#); [Livesley, Jang, & Vernon, 1998](#)), which was developed to match the four-factor structure reviewed above ([Livesley, Jackson, & Schroeder, 1989](#)). Factor analysis of each of these measures supports their intended structure, or, in the case of the SNAP, an alternative four-factor structure is defensible (e.g., [Calabrese et al., 2012](#); [Pettersson et al., 2014](#)). It is important to understand, however, that both the SNAP and the DAPP each includes only one thought-disordered scale out of a total of 15 and 18 scales, respectively. This makes it very unlikely that a separate domain will emerge that captures psychoticism/oddity/peculiarity in an EFA of these measures. Ongoing efforts to develop measures that more explicitly are matched to the FFM are underway or close to their conclusion. In one such effort, Widiger and his colleagues ([Widiger, Lynam, Miller, & Oltmanns, 2012](#)) have developed individual measures for each of the *DSM* PD constructs, but using FFM-based facet scales. However, this effort has thus far emphasized a conceptual mapping of items to lower-order constructs, and these have yet to be subjected to factor analytic work across the different measures (see also the chapter by [Widiger and colleagues](#)). In another effort, [Simms and colleagues \(2011\)](#) have been developing a computerized adaptive test of PD (CAT-PD) that aimed to provide comprehensive coverage of PD features, while also ensuring adequate coverage of a pathological FFM model (see also the chapter by [Simms, Williams, and Simms](#)). Although the measure is not yet finalized, early EFAs suggest that the CAT-PD scales conform to expected structure when analyzed in conjunction with normal range and pathological traits ([Wright & Simms, 2014](#)).

Leading up to the recent revision of the *DSM* (i.e., *DSM-5*) it appeared as though there might be a shift from the categorical model to a model based on dimensional features of PD. Indeed, this is what the *DSM-5* Personality and Personality Disorder Work Group ultimately recommended. The model they suggested was based, in part, on five broad domains of individual differences in personality pathology, based on 25 lower-order facets. No doubt the five broad domains might have been expected a priori, however, these were established based on a bottom-up process, guided by EFA.⁷ In brief, the Work Group members enumerated the features they deemed necessary for the comprehensive mapping of the PD phenotype, which resulted, after deliberations, in 37 primary features. These were then

instantiated in self-report scales and administered to two large samples, one matched to population demographics and one reporting previous mental health treatment, respectively, and then subjected to a variety of factor-analytic techniques (Krueger, Derringer, Markon, Watson, & Skodol, 2012). As a result of these analyses, the initial 37 scales were reduced to 25 scales that loaded on five factors labeled negative affectivity, detachment, antagonism, disinhibition, and psychotism. The 25 scales and five domains were furthered as part of the *DSM-5* PD model, and also resulted in a final instrument, the Personality Inventory for the *DSM-5* (PID-5; Krueger et al., 2012). Since then, support for the structure has been rapidly accruing via replication in independent samples (e.g., De Fruyt et al., 2013; Wright et al., 2012) and via independent raters (e.g., Markon, Quilty, Bagby, & Krueger, 2013; Morey, Krueger, & Skodol, 2013).

Furthermore, the five domains of the *DSM-5* model would appear to offer clear conceptual matches to the FFM. Several studies now show that when the PID-5 domains are subjected to conjoint analyses with normative range scales the joint structure emerges as might be predicted. De Fruyt et al. (2013) and Thomas et al. (2013) both used EFA to show that the patterns of loadings aligned in factors that reflected a coherent joint structure. Furthermore, Gore and Widiger (2013) and Wright and Simms (2014) used ESEM to conduct exploratory analyses while also accounting for method variance associated with each of several measures. Thus, although the *DSM-5* model was not developed to match the FFM structure *a priori*, what has ultimately resulted is a model that provides a clear bridge for including the FFM in the diagnostic nosology. A further potential of this outcome is discussed below. However, although these results are encouraging, the proposed *DSM-5* model for PD was not adopted, and its future remains uncertain at this juncture. One possibility is that research of the type that is emerging now can be used to revise and improve the model for inclusion in a subsequent revision.

In spite of what appear to be clear convergences related to normative and maladaptive structures, several issues remain. Krueger and colleagues (2011) recently summarized these as involving *structure*, *bipolarity*, *hierarchy*, and *range*. Although there are some distinctions to be made among these four issues, they are all variations on structural considerations and are amenable to study by factor analytic techniques. The first two of these will be discussed.⁸

Structure, in the context that Krueger and colleagues (2011) meant it, refers to the mapping of specific content onto the primary domains (i.e., likely the FFM), and by extension the best interpretation of each domain. The reason this remains somewhat of a challenge is that a comprehensive mapping of clinically relevant personality domains necessarily invokes new content because basic trait models generally do not provide adequate coverage of specific areas of impairment (Trull, 2005). Furthermore, the relationship between pathological facets and normal traits can be complex. For example, when items of normal range trait measures are modified to reflect maladaptive functioning, the pattern of covariation among domains is altered (Haigler & Widiger, 2001). It appears that as extremity or maladaptivity is increased, content may have a tendency to be altered as well. This is particularly evident in the specific composition of scales related to disinhibition, constraint, and antagonism (Krueger et al., 2011). On the one hand, disinhibition and constraint are theoretically opposite maladaptive poles of the same dimension (i.e., conscientiousness; e.g., Samuel, 2011; Widiger, Livesley, & Clark, 2009; Widiger & Mullins-Sweatt, 2009). However, in different structural analyses of traits, disinhibition and constraint sometimes emerge as opposing poles (e.g., Markon et al., 2005; Watson, Clark, & Chmielewski, 2008) and sometimes as separate domains (e.g., De Clercq, De Fruyt, Van Leeuwen, & Mervielde, 2006; Morey, Krueger, & Skodol, 2013). In addition, when these domains do separate, disinhibition scales often join antagonism scales to form a dimension that more closely resembles the externalizing spectrum (e.g., Krueger, Markon, Patrick, Benning, & Kramer, 2007; Morey et al., 2013). Undoubtedly, measurement issues (i.e., the content of the specific scales; e.g., Samuel & Widiger, 2010) are involved in addition to substantive structural questions, but further research to clarify the joint structure of normal and abnormal traits is likely warranted.

As previously alluded, an ongoing structural issue involves the fifth personality domain. In normal range trait models there is broad support for the domain of openness to experience/intellect (Goldberg, 1993), whereas in maladaptive models, a dimension related to oddity, peculiarity, aberrant thinking, or psychotism has been suggested to capture content related to schizotypy (Harkness & McNulty, 1994; Harkness, Finn, McNulty, & Shields, 2012; Tackett, Silberschmidt, Krueger, & Sponheim, 2008; Watson et al., 2008). Evidence is somewhat mixed on whether these can be

conceptually and empirically integrated (e.g., Piedmont, Sherman, Sherman, Dy-Liacco, & Williams, 2009; Watson et al., 2008). Several EFA studies find clear support for the convergence of openness and schizotypy (e.g., De Fruyt et al., 2013; Gore & Widiger, 2013; Markon et al., 2005; Thomas et al., 2013; Wiggins & Pincus, 1989) whereas in others the picture is murkier (e.g., Watson et al., 2008; Wright & Simms, 2014). Returning to basic factor analytic principles may help clarify some of the discrepant results. For instance, Watson et al. (2008) reported on three different studies, each of which they interpreted as suggesting that schizotypy/oddity reflected a domain outside of the FFM and did not correspond to openness. However, although they were thorough in many respects (e.g., several samples and studies, different measures across studies, extraction and comparison of several solutions), in other respects their analytic approach raises questions about whether their conclusions can really be considered final. Most importantly, in each of their analyses it could be argued that they oversaturated their models with scales related to schizotypy/oddity, which may have served to virtually guarantee that a separate factor would emerge for schizotypy/oddity. Finally, in studies 2 and 3, scales related to schizotypy/oddity were the only pathological scales in the analyses, raising the question of method artifact. ESEM could fruitfully be applied here to clarify these results.

Turning to the issue of bipolarity, certain aspects of pathological personality functioning are theorized to be extreme poles of the same dimension (Samuel, 2011; Widiger, Livesley, & Clark, 2009; Widiger & Mullins-Sweatt, 2009). Although there is evidence to suggest that many domains operate in this way (e.g., extraversion/detachment; Markon et al., 2005; Watson et al., 2008), some domains, disinhibition/constraint in particular, are more variable across studies. This can be observed in certain external correlates, in which both poles manifest positive correlations (e.g., with obsessive-compulsive disorder, Kotov, Gamez, Schmidt, & Watson, 2010; Wu, Clark, & Watson, 2006). Other domains, such as antagonism/agreeableness, have specific content that is hypothesized to fall at one end of the dimension, but instead shift domains (e.g., dependency and attachment anxiety frequently shift to negative effectivity; Markon et al., 2005; Wiggins & Pincus, 1989). The question of unipolarity versus bipolarity remains an understudied issue in large part because most personality trait inventories measure, or are keyed in the direction of, a

single pole of the primary trait domains. For instance, it is common for normal range inventories to provide scales that tap agreeableness but not antagonism. Yet normal range and pathological trait inventories tend to be complementary in this regard, and therefore when studied together more of the poles receive measurement coverage.

Relatedly, recent work by Pettersson, Turkheimer, and colleagues (2010, 2012, 2014) has revived the notion of “evaluation” (Edwards, 1957; Peabody, 1967) in personality questionnaires and their work suggests that this may be a compelling resolution to some of the thorny issues considered here. Briefly, evaluation is defined as the tendency to respond in the affirmative to positive attributes, irrespective of content, and to indiscriminantly deny negative attributes (or vice versa were the scale to be keyed toward negative evaluation). In the study most relevant to this discussion, Pettersson and colleagues (2014) had participants code items reflecting the *DSM* PD features and their opposites for evaluativeness, transformed these into factor loadings, then compared them with the loadings of the items on the first principle component extracted from the same items collected from participants. The congruence coefficient between the two was 1.0, demonstrating perfect agreement between the ratings of evaluation and the loadings on the first principle component. The authors next coded the SNAP items for degree of evaluation, transformed these ratings to factor loadings for a target rotation, and rotated an EFA of the SNAP items such that there was an evaluation factor and three unrelated content factors. The resultant content factors demonstrated increased bipolarity (i.e., pathological content at both poles of the dimension) relative to a solution that does not account for item evaluativeness. Although thus far only applied to a limited set of scales and measures, statistically isolating evaluation in order to focus on the structure of pure content is compelling and may resolve some longstanding concerns that are otherwise difficult to resolve factor analytically.

At the same time, isolating evaluation is not a simple solution and faces several challenges, as any method does. For one, as with all EFAs combined with rotation methods, the resultant factors must be interpreted, and although some investigators may view the loadings on a first orthogonal factor as evaluation, others may view it as reflecting personality pathology’s core impairments (e.g., Hopwood, Malone, et al., 2011; Sharp et al., 2015). The issue here is that the first orthogonal factor often contains impairments of

seemingly opposing content (e.g., socially inhibited *and* needs admiration). Impairments in functioning across domains accord well with many theories of personality pathology, but the evaluative perspective raises reasonable questions on commonsense grounds. Recall that the interpretation of a dimension such as this cannot be adjudicated within the factor analytic framework, and therefore additional data must be gathered. Of particular importance may be temporally sequenced data. This is because endorsing impairments of opposite content may be justified if individuals do in fact demonstrate both, although presumably not both at the same time (e.g., Wright, 2014). A modest amount of data exists that suggests that personality pathology, at least of some types, predicts shifts in content of behavior over time (Wright, 2014; Wright, Scott, Stepp, Hallquist, & Pilkonis, 2015; Wright, Hallquist, Beeney, & Pilkonis, 2013), although more work in this area is needed. Additionally, as Pettersson et al. (2014) note, their analyses have been limited to self-report scales, and it is possible that evaluation would be attenuated to a large degree with interviewer or other-report data. Hopefully more work involving repeated sampling, different raters, and the prediction of external criteria will emerge over the coming years.

The Next Challenge: A Metastructural Model of Personality and Psychopathology

Investigating the overlap between the normative trait domains of the FFM and *DSM* personality disorder features, with a view toward achieving structural integration, is a natural goal. However, it may be too narrow. This is because the relationship between the FFM traits and the personality disorders is not privileged, and in fact the FFM traits show robust relationships with most mental disorders (Andersen & Bienvenu, 2011; Kotov et al., 2010). It may surprise readers to know that the strengths of association between personality traits and clinical syndromes frequently surpass those between traits and personality disorders. This may be due to the more clearly defined and less heterogeneous nature of clinical syndromes relative to PDs, the low reliability of PD assessments, or some combination of both. Regardless of the relative strength of associations, the *DSM*'s clinical syndromes also appear to be moderately to strongly related to personality traits from the FFM. Recognition of this fact immediately raises the question of whether the structure of personality and psychopathology

writ large could be incorporated within a coherent “meta-structural” model (see also the chapter by [Bagby](#)).

In recent years there has been a steadily growing literature on the quantitative modeling of the structure of mental disorders. Based on the observation that psychiatric comorbidity (i.e., diagnostic covariation) is extensive in the general population, far outpacing chance cooccurrence ([Kessler et al., 1994, 2005](#)), and polydiagnosis is the rule rather than the exception ([Zimmerman & Mattia, 1999](#)), there has been an increased interest in identifying the fundamental domains of psychopathology, in much the same way personality theorists sought to delineate the fundamental units of personality ([Krueger & Markon, 2006](#)). Mirroring the structural work in personality, efforts to quantitatively derive an empirical structure of psychopathology have relied on factor analysis and related techniques. Although this approach has been profitably applied to both child ([Achenbach, 1966; Lahey et al., 2008](#)) and adult ([Kotov et al., 2011; Krueger, 1999; Krueger & Markon, 2006](#)) disorders, the current review is confined to structural models of adult psychopathology.

Early investigations focused primarily on “the common mental disorders,” which include syndromes of high population prevalence that are readily ascertained in epidemiological samples, such as the unipolar mood disorders, anxiety disorders, antisocial behavior, and substance abuse. Factor analyses, usually CFA, applied to diagnoses and symptoms of the common mental disorders resulted in what is now a well-replicated two-factor structure of internalizing (e.g., unipolar mood disorders, anxiety disorders) and externalizing (e.g., substance use, antisocial behavior) spectra that are robust across age, sex, ethnicity, culture, informant type, and *DSM* axes ([Eaton et al., 2012; Eaton, Krueger, & Oltmanns, 2011; Forbush & Watson, 2013; Kramer, Krueger, & Hicks, 2008; Krueger, Capsi, Moffitt, & Silva, 1998; Krueger, Chentsova-Dutton, Markon, Goldberg, & Ormel, 2003; Lahey et al., 2008; Slade & Watson, 2006](#)). As was discussed in the context of the factor analytic studies of personality attributes, the particular admixture of variables analyzed constrains the resulting structure, and early studies were understandably conservative in their focus on common mental disorders. This approach was necessitated by the nature of many of the early samples, which were often epidemiological, and were coded for diagnostic categories as opposed to more fine-grained symptoms, limiting the amount of variability for some of the rarer disorders (e.g., psychosis, mania).

Studies have since sought out clinical samples or examined individual symptoms in epidemiological samples to investigate an expanded structure. There is now accumulating evidence that a *thought disorder/psychosis* (e.g., psychotic disorders, schizotypal personality disorder) spectrum is reasonably robust across samples and criterion sets (Kotov et al., 2010; Markon, 2010; Wolf et al., 1988; Wright, Krueger, et al., 2013). To provide more detail in the various ways in which factor analytic techniques are being employed in this domain, one recent study is highlighted. Wright, Krueger, and colleagues (2013) used EFA on symptom level data from 8,841 individuals included in the 2007 Australian National Survey of Mental Health and Well-Being, resulting in a six-factor model, with dimensions reflecting distress, fear, obsessive-compulsive features, alcohol abuse, drug abuse, and psychosis. Then, using CFA, models reflecting a three-factor structure (internalizing, externalizing, and psychosis) were compared to two different two-factor models that allowed the symptoms of psychosis to load on internalizing or externalizing domains, respectively. The three-factor model provided markedly better fit, supporting the three distinct but correlated domains of internalizing, externalizing, and psychosis.

However, it is clear that spectra of internalizing, externalizing, and psychosis cannot comprehensively account for the diverse array of pathologies of behavior and mental functioning observed in the population. As such, several ambitious studies have sought to expand upon this basic triarchic structure by incorporating additional diagnoses, most notably the PDs, and have begun to uncover additional spectra. To date only four published studies have explored the structure of psychopathology using a broad suite of clinical syndromes and personality disorders (Blanco et al., 2013; Kotov et al., 2011; Markon, 2010; Røysamb et al., 2011). Although each resultant model is necessarily unique given differences in the precise admixture of disorders (e.g., some do not include indicators of psychosis), sampling strategy (e.g., clinical versus epidemiological), and other features (e.g., disorder-level versus symptom-level analyses), two additional domains appear reasonably replicable across studies. First, Markon (2010) and Røysamb and colleagues (2011) each identified a new spectrum they respectively termed pathological or anhedonic introversion in EFA studies. In both cases, avoidant and dependent PDs were strong markers of the factor, although Røysamb et al. (2011) also found that schizoid and depressive PDs loaded strongly on the factor, which accounts for the slight

difference in conceptualization. [Blanco and colleagues \(2013\)](#) also found evidence for a factor for which the strongest loadings came from avoidant and dependent PDs and social phobia.

Second, in three studies ([Blanco et al., 2013](#); [Kotov et al., 2011](#); [Røysamb et al., 2011](#)), which varied in their use of exploratory and confirmatory techniques, a domain related to antagonism, as labeled by Kotov and colleagues, has emerged. Again, slight differences have arisen in the makeup of this domain across studies, although narcissistic and histrionic PDs consistently exhibit the strongest loadings. Additional markers for this domain include obsessive-compulsive, borderline, paranoid, and (to a lesser extent) antisocial PDs. What these disorders share to varying degrees is an antagonistic interpersonal style that puts afflicted individuals at odds with others. Notably, these domains of introversion and antagonism, which emerge with the addition of PDs, each deals with maladaptive social/interpersonal functioning, consistent with the view that the PDs, at their core, reflect the interpersonal disorders ([Benjamin, 1996](#); [Hill, Pilkonis, Bear, 2010](#); [Hopwood, Wright, Ansell, & Pincus, 2013](#); [Meyer & Pilkonis, 2005](#); [Pincus, 2005](#); [Wright et al., 2012](#)). Therefore, based on this initial suite of studies that have included PDs in structural models of psychopathology, the domains of introversion and antagonism appear to be good candidates to include alongside internalizing, externalizing, and thought disorder as broad, replicable domains of psychopathology.

Taken together, these domains bear a remarkable conceptual resemblance to the FFM or maladaptive variants thereof (e.g., the pathological personality trait domains included in *DSM-5* Section III system of PDs as reviewed earlier). The five domains outlined in the structural models of psychopathology are easy to conceptually map onto the FFM: internalizing—neuroticism; externalizing—disinhibition (or impulsivity/low conscientiousness); psychosis/thought disorder—openness to experience/unconventionality; antagonism/low agreeableness; pathological introversion/low extraversion. However, although intuitively compelling, direct empirical evidence for this structural coherence is only just emerging. In a recent study, [Wright and Simms \(2015\)](#) showed that the *DSM-5* PD traits, clinical syndrome symptoms, and traditional DSM PD criteria, when factored using ESEM to account for measurement effects, supported the hypothesized structure. Nevertheless, future studies are needed that replicate this work and combine analyses of personality traits (adaptive and

maladaptive) with *DSM*-defined symptoms and disorders. Were this shared structure to be replicated, it would go a long way to providing an empirically supported basis for the conceptualization of psychopathology, and provide a much needed bridge between normality and psychiatric dysfunction.

Network Modeling: A Conceptual Challenge?

Recently the factor analytic basis of not only the FFM, but the structure of personality in general (including psychopathology), has been questioned (Cramer et al., 2010, 2012). The authors of these critiques have argued that factor analytic techniques are inappropriate for studying the structure of personality (and psychopathology) because they make a fundamentally incorrect assumption—namely, that there are unobserved (i.e., latent) variables that simultaneously “cause” observed features or behaviors. Rather, Cramer and her colleagues suggest that individual behaviors, features, attributes, symptoms, etc. are directly causal, and are related to each other in complex “networks.” Accordingly, they have proposed network models as alternatives to factor analytic techniques to understand the structure of personality. To illustrate using examples of theirs, they might argue that the items “like to go to parties” and “like to be around people” are not both markers of extraversion; rather, people “like to go to parties” *because* they “like to be around people.” Or, for example, the diagnostic criteria “fatigue” and “difficulty sleeping” for depression do not both arise because of an underlying depression, but rather because a person who has difficulty sleeping will then become fatigued. Extrapolating beyond these simple examples, the behaviors that constitute what are termed personality and psychopathology are not reflective of underlying entities, rather they *are* personality and psychopathology, and it is in their complex associations that personality arises as an emergent property.

On its surface, the suggestion that the field should move beyond descriptive models of the structure of personality to understanding the microcausal and mutually influencing inputs to a complex system is highly appealing. However, there are grave problems with the way the network modeling approach has been put forward that should foreclose any potential enthusiasm at this juncture. Indeed, for each of the articles cited above there has been sharp criticism leveled at the network approach (see commentaries associated with Cramer et al., 2010, 2012). There are currently three major problems with the network approach. First, and most relevant here, the

authors make a straw man out of factor analysis and latent variable techniques. As described earlier in the methodological review, one way of thinking of factor analysis is as a causal framework, with the underlying factor directly causing the observed variables (see [Figure 11.1](#)). Also, a frequent, but unnecessary, assumption of factor models is one of conditional independence. Yet, also noted, factors do not necessitate such strict causal interpretations, and can be understood at a more practical and descriptive level (i.e., the shared variance among a group of items). Cramer and colleagues discuss factor models as if the only way to view them is in the strictest causal frameworks, and that these are inviolable and inflexible assumptions or perspectives. By doing so they make assumptions few personality theorists or applied factor analysts would make, creating a problem where there is none. Others have made this observation as well ([Belzung et al., 2010](#)).

Second, as currently implemented, network models offer little more than graphic representations of covariance/correlation matrices (see also [Asendorpf, 2012](#); [Molenaar, 2010](#)). In other words, the diagram that is the network model, although visually very captivating, is defined by and directly depicts the associations among individual items. Arguably these relationships are easier to appreciate when visually depicted, but can quickly become overwhelming, as is the case when the 240 items of the NEO PI-R are graphed in a network. A corollary of this fact is that network models offer no reduction in the complexity of the data, and as such do not reflect models in the sense of a more parsimonious and general description of a psychological phenomenon.

Third, the descriptions of causal associations that are hypothesized to make up personality and psychopathology constructs from the network perspective necessarily imply temporal relationships that play out over a multitude of (currently unknown) time scales. Yet the major demonstrations of the network perspective employ cross-sectional data that could not possibly test the type of causal associations that are hypothesized. Thus, there is a fundamental disconnect between what the perspective promises and what it currently offers.

Although the current state of network models detracts little from the latent variable perspective (including factor analysis), and offers very little in replacement, it may be that with continued advances this perspective could contribute greatly to personality science. For it to be successful, it will

require a greater clarity of conceptualization, better match between theory and data, and advances in methodology to accommodate true models of interindividual differences in intraindividual causal processes.

Conclusions

The early history of the FFM, in many respects, followed the history of factor analysis. As factor analysis advanced, so too did the field's understanding of the structure of personality. From the factor analytic perspective, the evidence for the five domains of extraversion, agreeableness, conscientiousness, neuroticism, and openness/intellect is quite strong. Although questions have been raised about the structural validity of the FFM, especially as instantiated in specific instruments, these can mostly be quieted by a careful consideration of whether the methods match the purposes of the investigation. Currently, it is scientifically more interesting and likely to lead to greater psychological insight, to consider in what ways the FFM may serve as an organizing framework for understanding diverse areas of human functioning that extend beyond basic personality, than to agonize over whether the FFM meets precise cutoffs for confirmatory model fit. This chapter emphasized the clear convergences between the structure of the FFM and the structure of personality pathology, and possibly even psychopathology more generally. A full and practically useful coordination of these systems though will require considerably more work, much of it factor analytic. The current review was necessarily selective, prioritizing breadth of content as opposed to depth, which has unfortunately left out the work of many brilliant and pioneering researchers. Several new techniques that also hold promise for future structural work in personality were not able to be covered (i.e., Bayesian CFA, multigroup EFA) without published examples in the literature as of yet. In spite of this, hopefully this review will stimulate others to take up these next waves of a long history of factor analytic investigations into the structure of personality.

Notes

1. For more detailed reviews of the historical evidence for the FFM, the reader is directed to [Digman \(1996\)](#) or [Goldberg \(1993\)](#). At this point in the history of the FFM it would be impossible to cover all relevant studies and applications. As a result, many important contributions had to be neglected. Therefore this review is necessarily selective, and this is further compounded by my choice to focus on specific studies that provide illustrative examples as opposed to more cursory

reviews of many studies. I offer my apologies to the authors of those many excellent studies that were not included.

2. Alternatively, a more pragmatic interpretation can be made that a factor merely represents the shared content from a set of indicator variables, such that when indicators covary strongly a factor can serve to parsimoniously summarize their associations. Thus the interpretation of a factor can range from the descriptive to the causal.
3. Most modern statistical packages that offer CFA as a technique (e.g., LISREL, Mplus) have a number of default settings that prespecify many parameters in any given model (e.g., error covariances are fixed at 0.0). Whether the investigator relies on these conveniences or manually codes each parameter does not change the fact that a decision is being made on whether to fix or free each parameter.
4. To the knowledgeable reader several important names may be conspicuously absent from this historical narrative—names such as Eysenck and Tellegen. This is because they generally ascribed to a theoretical model of temperament/personality domains that was divided into three domains: Neuroticism/Negative Emotionality, Extraversion/Positive Emotionality, and Psychoticism/Constraint. Although undoubtedly too simplistic of a characterization of these author's important work, they developed measures that were intended to fit this trinity structure, and the measures mostly did (e.g., [Tellegen & Waller, 2008](#)). As will be discussed below, these formulations are not necessarily at odds with the FFM, and it is reasonably possibly to coordinate both models hierarchically.
5. Note that when using sum scores of FFM domains or facets in applied research, this is, in effect, treating each item as if it has zero cross-loadings (and a 1.0 loading on the target scale). Thus the factor correlations observed in practice often mirror those observed in a CFA framework.
6. Technically they used principle components analysis, which is related to, but not the same as factor analysis. In the service of brevity, however, I will treat this work and others like it (e.g., [O'Connor, 2005](#)) as having conducted an EFA.
7. The rationale for many of the decisions made by the Work Group was political as opposed to scientific, and therefore was frequently driven by expediency to satisfy competing interests. A discussion of these issues goes beyond the current chapter, although the interested reader is directed to retrospectives by [Krueger \(2013\)](#), [Skodol et al. \(2013\)](#), and [Widiger \(2013\)](#).
8. I limit my review to structure and bipolarity here, having addressed hierarchy above, and because range, although important, generally requires the application of item response theory techniques, which are not currently applicable to fully dimensional scales. Nevertheless, a number of recent studies have started to examine range in personality scales, and I direct the reader to Walton and colleagues (2008), [Samuel and colleagues \(2010\)](#), and [Stepp and colleagues \(2012\)](#).

Sarah S. W. De Pauw

Abstract

This chapter discusses the blossoming research on childhood personality, addressing salient questions on its measurement, its foundational structure, and its convergence with child temperament. First, the discovery and contemporary measurement of FFM-antecedents in young age is reviewed, highlighting promises as well as pitfalls of the various approaches available today. Second, divergences between child and adult taxonomies are delineated, as accumulating research suggests that the structure of child personality is not identical to the established FFM-structure in adults. Finally, the issue of temperament-personality convergence is considered. Whereas influential narrative reviews proposed that temperament and personality appear to be “more alike than different,” empirical research suggests that a simple hierarchical mapping fails to capture the complexity of these relationships. We invite students of behavioral individuality in childhood and adolescence to take into account the salient differences between the various personality approaches, child and adult personality taxonomies, and child temperament and personality “vocabularies.”

Key Words: personality, temperament, childhood, adolescence, development, assessment, taxonomy

It is almost impossible to overestimate the impact the Five Factor Model (FFM) has had on the study of adult personality in the past four decades. The pursuit to unravel the basic architecture of adult traits has provided the personality field with structure and clarity, which has greatly accelerated the discipline’s progress. Most trait researchers now agree that personality is hierarchically structured, with higher-order domains subsuming narrower traits. Most scholars also agree that the FFM (or the Big Five) constitutes a unique, comprehensive level of this personality hierarchy (John, Naumann, & Soto, 2008; Markon, Krueger, & Watson, 2005).

One major strength of the FFM is its attested comprehensiveness to describe adaptive individual differences in adults. To date, a considerable number of studies have documented the impressive power of the FFM to link many competing adult personality systems under its “five factor umbrella” (Halverson et al., 2003; John et al., 2008; McCrae & Costa, 1996). This well-documented convergence between the FFM and alternative personality models has significantly contributed to the establishment of the FFM as a unifying framework that allows organization and integration of the wide ocean of adult trait descriptors into one single reference structure. This integrative character of the FFM has also provided an excellent framework for generating new hypotheses and exciting research on how adult personality impacts a wide array of life outcomes (e.g., Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007).

These major advances in the domain of adult personality have sparked a growing interest in uncovering FFM antecedents in younger age groups. There is now-particularly among personality psychologists- a wide acceptance of the notion that the FFM can be used as a valid framework to describe behavioral individuality in adolescents and even in children, at least from the preschool years on (John, Caspi, Robins, Moffitt, & Stouthamer-Loeber, 1994; Mervielde, De Clercq, De Fruyt, & Van Leeuwen, 2005; Shiner & Caspi, 2003; Shiner & DeYoung, 2013; Soto & John, 2014; Soto, John, Gosling, & Potter, 2008; Tackett, Kushner, De Fruyt, & Mervielde, 2013). However, unlike in adulthood, in which the FFM reigns as the “sovereign framework” for trait assessment in both research and practice, the study of childhood personality still remains “a work in progress” with important lingering questions on the *measurement, structure, and conceptualization*, of youngsters’ behavioral traits.

First, questions remain on how to *measure* FFM personality in youth. Notwithstanding that one of the most seminal papers on the “Little Five,” describing FFM antecedents in adolescent boys (John et al., 1994), has already celebrated its twentieth birthday, researchers and practitioners still have a need for clear recommendations on which *measures* to use to assess a child’s personality (Tackett et al., 2013). In the first section of this chapter, we critically review the discovery history of FFM antecedents in childhood. Along

the way, the most important contemporary personality instruments for youth are highlighted, focusing on their strengths and limitations, and their convergence with the adult FFM framework.

Second, throughout this review, we discuss accumulating evidence that the *structure* underlying child personality is less equivalent to adult personality than was originally expected on the basis of the FFM. Recent empirical and conceptual analyses no longer radically assert that five dimensions are enough to capture youth's traits. Studies increasingly identify Activity as a major sixth dimension to consider (De Pauw, Mervielde, & Van Leeuwen, 2009; Shiner & DeYoung, 2013; Soto & John, 2014). Gradually, other divergences between child and adult personality taxonomies become visible and these are highlighted in the second part of this chapter. In addition, we formulate some thoughts on salient themes that need further consideration to advance the budding child personality discipline.

Finally, essential questions remain about the *conceptual convergence* between childhood *personality* and *temperament*, which is the historical "sovereign framework" for trait description in children and adolescents. In the past decade, some influential, yet primarily personality-inspired, scholars have made a compelling case that temperament and personality systems describing children's and adolescents' traits can be considered to be "more alike than different," at least from the preschool years on (Caspi, Roberts, & Shiner, 2005; Caspi & Shiner, 2006, 2008; De Pauw & Mervielde, 2010; Mervielde et al., 2005; Shiner, 1998; Shiner & Caspi, 2003; Shiner & DeYoung, 2013). Moreover, these authors have proposed—mainly based on narrative analyses—that the FFM provides a comprehensive framework to capture the conceptual dimensions underlying both personality and temperament traits. The third part of this chapter discusses the growing evidence on temperament–personality convergence and focuses on what we can learn from the temperament perspective. Finally, we propose a detailed and nuanced taxonomy describing how the wide range of temperament and personality traits that are currently assessed in youngsters can be integrated.

While discussing the blossoming child personality field, we will point out some vital issues that need further empirical or conceptual consideration. It is our hope that these issues will inspire fruitful dialogues between scholars from different disciplines, including personality psychology and developmental psychology. Ideally, these discussions should go beyond disputes about which framework (i.e., personality or temperament) will prove superior to conceptualize childhood traits. What both disciplines (i.e., personality psychology and developmental psychology) need, is a more universal and cross-disciplinary approach to individual differences among youth (Caspi & Shiner, 2006; De Pauw & Mervielde, 2010). A consensus on a more comprehensive conceptual trait system would help to better clarify the wide heterogeneity in pathways that children and adolescents follow throughout their development. Ideally, such a trait system should be tied closely to individual differences in adults in order to facilitate theories relating individual trait differences to development across the entire lifespan. As will become evident throughout this chapter, a flexible adaptation of the FFM is a good candidate to provide the conceptual underpinnings of such a comprehensive taxonomy for childhood traits.

Discovery and Measurement of Child Personality

How Shall We Speak of Personality Differences in Children and Adolescents?

Child temperament yes, but personality? Historically, the conceptualization and measurement of individual differences among infants, toddlers, preschool children, and school-age children are based on *temperament* models. Temperament has been traditionally distinguished from *personality* because it refers to individual differences that appear from birth onward, remain relatively stable across the lifespan, and presumably have a strong genetic or neurobiological basis (Goldsmith et al., 1987; Mervielde et al., 2005). In addition, temperament has been conceived as the "attentional, activational, and attentional core" of personality around which personality develops under the influence of the environment (Rothbart & Bates, 1998, 2006). According to this view, *personality* is wider in scope than temperament and refers to consistent patterns of thoughts, feelings, and actions, including skills, values, defenses, beliefs, morals, and social cognitions (Rothbart & Bates, 1998, 2006).

Based on this perspective, the study of individual differences among children and adolescents has been—for many years—the uniquely reserved territory of developmental psychologists, who conceptualized trait differences in terms of *temperament* since the early 1960s (Rothbart, 2012; Thomas, Chess, Birch, Hertzig, & Korn, 1963). In contrast, personality psychologists primarily devoted their attention to the structure and

measurement of individual differences in adulthood. For several decades, the literatures on temperament and personality were separate worlds. Researchers created divergent systems based on widely varying constructs and dimensions, seeking little opportunities for cross-fertilization.

This trend changed, however, in the late 1980s to early 1990s. In this period, described as the “electrifying” early years of FFM research (Goldberg, 1993), studies on adult personality impressively documented how the “Big Five” dimensions emerged across a wide variety of ages, languages, and cultures (John et al., 2008). These great successes in the adult literature inspired multiple research groups from all over the world to inquire about the applicability of the FFM in younger age groups, such as adolescents or even children. At the time, examining the FFM in children was considered an audacious endeavor. By launching this quest for FFM antecedents in developmental research, historical borders between the temperament and personality territories were trespassed and the traditional interpretations of both established constructs began to erode.

The discovery of “the Little Five” in adolescents and children. The pioneering efforts of the multiple research groups independently searching for FFM personality antecedents can be considered as very successful. There is now rich and ample evidence that five factor-like dimensions can indeed be retrieved in adolescents and even in children. In Tables 12.1 and 12.2, we provide an overview of the most important actors in research on the “discovery of FFM antecedents”—historically referred to as the “Little Five” (John et al., 1994)—in younger age groups. Both tables show that the research groups searching for the “Little Five” derived their conclusions based on a wide variety of informants, strategies, and methods of assessment (Goldberg, 2001a; John et al., 1994; Mervielde & De Fruyt, 1999; Shiner & Caspi, 2003). Regarding *informants*, five factor-like dimensions have now been found across ratings provided by parents and teachers (Table 12.1) as well as across peer-reports and self-reports (Table 12.2). Regarding *strategies*, five factor-like dimensions emerged in studies using questionnaires, adjective lists, and rating scales, as well as in studies using peer nomination procedures and studies using generic and natural language descriptions of children and their parents. Regarding *methods of assessment*, five factor-like dimensions have emerged in studies using Q-sorts, trait adjective lists, behavioral statements, bipolar scales, and even combinations of rating scales and child interviews. Many of these studies documented that the “Little Five” retrieved in childhood or adolescence are theoretically—and in some cases, even empirically (e.g., De Fruyt, Mervielde, Hoekstra, & Rolland, 2000)—related to the Big Five dimensions established in adults. Moreover, many of these studies have provided compelling evidence that Little Five dimensions, retrieved in youth, are associated (both cross-sectionally and longitudinally) with a wide range of theoretically meaningful external correlates (e.g., De Pauw et al., 2009; Graziano, Jensen-Campbell, & Finch, 1997; John et al., 1994; Markey, Markey, Tinsley, & Erickson, 2002).

How Shall We Measure Personality in Children and Adolescents?

The summary above gives an affirmative answer to the central question of whether the FFM can be used for the description of individual differences among adolescents, and even children. Yet, in this chapter, we aim to illuminate a number of unresolved issues in current FFM approaches to childhood personality. One important issue is that--unlike in adulthood--where there is a wide array of well-validated FFM instruments available (in all sorts and lengths), a comparably clear set of instruments for child assessment is still missing. There are not many well-validated FFM instruments for use in applied settings. Moreover, there is relatively little critical discussion on which instrument should be preferred for which purposes (Tackett et al., 2013). As a consequence, the search for a psychometrically sound (and preferably short) FFM instrument remains a major obstacle for researchers and clinicians interested in addressing children’s personalities in their studies or practices today.

Table 12.1 Prominent FFM Instruments for Child and Adolescent Personality Assessment, Relying on Caregiver Informants

Strategy	Key Reference for Application in Youth	Number of Items	Age of Target	Informant	Method of Assessment	Facets	Dimensions
<i>I.a. Top-down adult-oriented inventories not modified</i>							
Bipolar markers (Goldberg, 1992)	Mervielde et al. (1995)	25	4–12	Teacher	Bipolar markers	—	N, E, I, A, C
Bipolar markers (Goldberg, 1992)	Graziano et al. (1997)	50	10–14	Teacher	Bipolar markers	—	N, E, I, A, C
Unipolar markers (Goldberg, 1992)	Gerris et al. (1998)	30	12+	Parents	Adjectives	—	N, E, Resourcefulness, A, C
NEO Five Factor Inventory (Costa & McCrae, 1992)	Parker and Stumpf (1998) Markey et al. (2002)	60	11–14 10–13	Parent Parent	Questionnaire	—	N, E, O, A, C
NEO-Personality Inventory-R (Costa & McCrae, 1992)	Martin and Friedman (2000)	240	9–15	Parent	Questionnaire	30	N, E, O, A, C
<i>I.b. Top-down adult inventories explicitly modified to fit youth</i>							
Experimental Big Five trait markers	Ehrler et al. (1999)		9–18	Teachers	Ratings	—	N, E, O, A, C
Big Five Questionnaire—Children	Barbaranelli et al. (2003)	65	3–14	Parent, teacher	Questionnaire	—	Emotional Instability, Intellect/ Openness, Energy/E, A, C
Big Five Inventory Marker scales	John et al. (2008)	20	3–20	Parents	Questionnaire	—	N, E, O, ^a A, C
M5-PS	Grist et al. (2012)	90	3–5	Teacher	Questionnaire	—	N, E, O, ^a A, C
<i>II.a. Generic descriptions of child development</i>							
Digman teachers' general ratings	Goldberg (2001a)	39	6–12	Teacher	Adjectives	(11)	Emotional Stability, E, I, Friendliness, C
Project Competence personality indices (general interview, rating scales, Devereaux inventory)	Shiner and Masten (2012)	>115	10	Multi-informant composite (parent, teacher, child)	Multi-report (interviews, questionnaires)	—	N, E, O, A, C
<i>II.b. Regrouping of items of other theoretical models</i>							
Common Language Version of the California Child Q-sort (Caspi et al., 1992)	John et al. (1994)	48	3–15	Parent	Q-sort FFM scales	—	N, E, O, A, C
John et al. (1994)		100	3–15	Parent	Q-sort	—	Anxious Distress, Sociability, O, A, C, Irritability, Activity
Van Lieshout and Haselager (1994)		100	3–17	Parent, teacher	Q-sort	—	Emotional Stability, E, O, ^a A, C, Activity, Dependency
Soto and John (2014)		100	3–20	Parent	Questionnaire	—	N, E, O, ^a A, C, Activity
School Behavior Checklist (Zaal, 1978)	Resing et al. (1999)	52	4–12	Teacher	Questionnaire	—	Emotional Stability, E, A, Attitude toward School Work
Multidimensional Personality Ratings (Tellegen & Waller, 2008)	Tackett et al. (2008)	34	11	Parent	Questionnaire	—	Negative Emotionality, Positive Emotionality, Absorption/ Openness, A, Constraint
<i>III. Bottom-up based on free descriptions lexical research</i>							
Inventory of Childhood Individual Differences	Halverson et al. (2003) Deal et al.	108	2–15	Parent, teacher	Questionnaire	15	N, E, I, A/Manageability, C

Inventory of Childhood Individual Differences, short version	al. (2007) Deal et al. (2007)	50	2–15	Parent, teacher	Questionnaire	-	N, E, I, A/Manageability, C
Hierarchical Personality Inventory for Children	Mervielde et al. (2009)	144	6–15	Parent, teacher	Questionnaire	18	Emotional Stability, E, Imagination, Benevolence, C

Note. We abbreviated the FFM domain names if the original reports explicitly use the Big Five (NEIAC) or FFM (NEOAC) nomenclature. N, Neuroticism; E, Extraversion; O, Openness-to-experience; I, Intellect; A, Agreeableness; C, Conscientiousness.

^a Weaker psychometric properties are reported for this dimension.

Table 12.2 Prominent FFM Instruments for Child and Adolescent Personality Assessment, Relying on Youth As Informant

Strategy	Key Reference for Application in Youth	Number of Items	Age of Target	Informant	Method of Assessment	Facets	Dimensions
<i>I.a. Top-down adult-oriented inventories not modified</i>							
Bipolar markers (Goldberg, 1992)	Graziano et al. (1997)	50	10–14	Self	Bipolar markers	–	N, E, I, A, C
Bipolar markers (Goldberg, 1992)	Gerris et al. (1998)	30	12+	Self	Unipolar markers	–	N, E, I, A, C
Selected set of bipolar markers	Scholte et al. (1997)	25	13–15	Self	Questionnaire	–	Emotional Stability, E, O/I, A, C
Selected set of unipolar markers	Scholte et al. (1997)	20	13–15	Peers	Peer nominations	–	Aggression–Inattentiveness, Achievement–Withdrawal, Self-confidence, Sociability, Emotionality–Nervousness
Selected set of bipolar markers	Mervielde and De Fruyt (2000)	25	8–12	Peers	Peer nominations	–	Emotional Stability–Extraversion, Agreeableness, Intellect–Conscientiousness
NEO-Personality Inventory-R (Costa & McCrae, 1989)	De Fruyt et al. (2000)	240	12–17	self	Questionnaire	30	N, E, O, A, C
NEO-Five Factor Inventory (Costa & McCrae, 1989)	Markey et al. (2002)	60	10–13	Self	Questionnaire	–	N, E, O, A, C
NEO-Personality Inventory-3 (McCrae et al., 2005)	McCrae et al. (2005)	240	12+	Self	Questionnaire	30	N, E, O, A, C
Big Five Inventory (John & Srivastava, 1999)	Soto et al. (2008)	40	10+	Self	Questionnaire	–	N, E, I, A, C
Five Factor Personality Inventory (Hendriks, 1997)	Hendriks et al. (2008)	100	12+	Self	Questionnaire	–	Emotional Stability, E, Autonomy ^a , A, C
<i>I.b. Top-down adult inventories explicitly modified to fit youth</i>							
Adolescent Personality Style Inventory	Lounsbury et al. (2003)	55	11–18	Self	Questionnaire	–	Emotional Stability, E, O, A, C
Five Factor Personality Inventory–Children	McGhee et al. (2007)	75	9–18	Self	Questionnaire	30	Emotional Regulation, E, O, A, C
Big Five Questionnaire–Children	Barbaranelli et al. (2003)	65	8–13	Self	Questionnaire	–	Emotional Instability, Energy/E, I/O, A, C
<i>II. Generic descriptions of child development</i>							
Common-Language version of the California Child Q-sort (Caspi Haselager (1994) et al., 1992)	van Lieshout and Caspi Haselager (1994)	100	11–14	Self, peers	Q-sort	–	Emotional Stability, E, Activity, A, C (no O)
Adjective Check List (Gough & Heilbrun, 1983)	Parker and Stumpf (1998)	103	13–15	Self	Adjectives	–	N ^a , E ^a , O ^a , A, C
Berkeley Puppet Interview	Measelle et al. (2005)	60	6–7	Self	Puppet interview	–	N, E, O, A, C
<i>III. Bottom-up</i>							
Inventory of individual differences	Halverson et al. (2003) Deal et al. (2007)	108, 40	12–17	Self	Questionnaire	15	N, E, O, A, C
Inventory of individual differences–short	Deal et al. (2007)	40	12–17	Self	Questionnaire	–	N, E, O, A, C
Hierarchical Personality Inventory for Children	Mervielde et al. (2009) De Fruyt et al. (2000)	144	12–17	Self	Questionnaire	18	Emotional Stability, E, Imagination, Benevolence, C

Note. We abbreviated the FFM domain names if the original reports explicitly use the Big Five (NEIAC) or FFM (NEOAC) nomenclature. N, Neuroticism; E, Extraversion; O, Openness-to-Experience; I, Intellect; A, Agreeableness; C, Conscientiousness.

^a Weaker psychometric properties are reported for this dimension.

Three approaches to delineate FFM antecedents in children and adolescents. In considering the history of research on child personality (and childhood traits in general), it is crucial to distinguish research that relies upon *theory-driven* construction methods from research that does not depart from such a priori theoretical assumptions. Obviously, research using *bottom-up strategies* to delineate the structure of childhood traits has the potential to provide stronger and less biased support for the notion that the FFM supplies a valid framework for describing childhood traits. In the search for the “Little Five” in nonadult

groups, three approaches have been used, all of which vary in their adoption of a top-down or bottom-up rationale. Each of these approaches has successfully retrieved FFM-like dimensions in caregiver reports (see Table 12.1) and, to a lesser degree, in self-ratings and peer-ratings of children (see Table 12.2).

Top-down: Downward adapting adult-oriented measures. The first strategy is clearly top-down, departing from the a priori assumption that the FFM will provide valid trait descriptions in nonadult age groups. This approach sees no problems in stretching the FFM model and its adult-based measures by applying it to younger groups. When interpreting results of this type of research, it must be kept in mind that results are strongly driven by the a priori hypothesis that the FFM structure is replicable in nonadults. As such, there is a risk of confirmation bias and a potential lack of opportunities for falsification of the hypothesis. On the other hand, this approach has the major advantage that it makes it possible to use the same scales across different age periods. This is a great asset for scholars wanting to make comparisons across developmental age groups (McCrae, Costa, & Martin, 2005).

Roughly, this top-down methodology has two versions. In the first version, FFM instruments developed for adults are administered without major modifications to younger age groups. In the second version, instruments that have a clear link to FFM instruments developed for adults are modified extensively to warrant that the item content suits the behavioral repertoire of younger groups.

The oldest examples of the first version of top-down research (i.e., using adult measures in nonadult groups without major modifications) are based upon FFM adjective markers, stemming from the psycholexical research tradition in adults (Goldberg, 1990). These *adjective lists* have now been widely applied as rating forms for teachers and parents to describe children even as young as age 4. Factor analyses on these commonly short lists (e.g., 25 to 50 adjectives) generally support a five-dimensional structure underlying caregiver reports in childhood and young adolescence, closely resembling the Big Five structure in adults (Branje, Van Aken, Van Lieshout, & Mathijssen, 2003; Graziano et al., 1997; Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2009; Mervielde, Buyst, & De Fruyt, 1995; Vermulst & Gerris, 2005). In teacher ratings of 4- and 5-year-old children, however, research has had difficulties in retrieving separate Intellect and Conscientiousness dimensions (Mervielde et al., 1995).

Because adjective lists are less complex and time-consuming than full questionnaire statements, they have also been a preferred medium in studies exploring how (pre)adolescents perceive their own and (their peers') personalities (Klimstra et al., 2009; Mervielde & De Fruyt, 2000; Scholte, Van Aken, & van Lieshout, 1997). Such research has replicated clear FFM structures underlying self-ratings in adolescents from 12 years and older (Klimstra et al., 2009; Scholte et al., 1997). The structure of young adolescents' personality ratings of their peers on Big Five adjective lists in peer nomination designs, however, appears less differentiated (e.g., Mervielde & De Fruyt, 2000; Scholte et al., 1997). In a study critically examining peer nomination procedures, Mervielde and De Fruyt (2000) retrieved a three-factor structure in children's peer nomination scores on bipolar personality adjectives: The first factor included a combination of Extraversion and Emotional Stability, the second factor represented a combination of Conscientiousness and Intellect, and the third factor clearly represented Agreeableness. This lower differentiation in children's perceived personality evaluations might reflect more limited cognitive capacities in judging others, but could also denote methodological problems associated with the selected nomination scales or peer nomination procedure (Mervielde & De Fruyt, 2000).

Next to adjective lists, it is now fairly common to administer *adult questionnaires* without major item-phrasing modifications to nonadult groups. This approach is particularly popular in obtaining self-ratings in older adolescents, but is also sporadically used to obtain caregiver reports of youngsters' personality (see, e.g., Markey et al., 2002; Martin & Friedman, 2000; Parker & Stumpf, 1998). In the past 15 years, several studies have successfully demonstrated that (pre)adolescents are capable of providing reliable and valid judgments of their own personality on common adult-oriented FFM measures. Replications of the FFM structure in older children and adolescents are now available for self-report versions of the NEO inventories (De Fruyt et al., 2009; McCrae et al., 2002; Parker & Stumpf, 1998), the Big Five Inventory (BFI; Denissen, Geenen, Van Aken, Gosling, & Potter, 2008; Soto et al., 2011), and the Five Factor Personality Inventory (FFPI; Hendriks, Kuyper, Offringa, & Van der Werf, 2008; Szirmaiak, 2005), among others. Taking into account the critique that some of the NEO Personality Inventory-Revised (NEO PI-R) items are too difficult for use in adolescents as well as in adults with lower educational levels, 38 of 240 original NEO PI-R items have recently been reformulated in the NEO's third revision. In the past years, this NEO-PI-3 and its shorter

counterpart, NEO-FFI-3, have extensively been validated as a self-report instrument in adolescence, across multiple cultures and languages (e.g., [De Fruyt et al., 2009](#)). The original U.S. manual officially proposes the NEO-set of questionnaires for acquiring personality self-ratings in adolescents aged 12 years and beyond. Norms are also available, but only for a broad reference group, aged 12 to 20 years. Other NEO manuals such as the Dutch version ([Hoekstra & De Fruyt, 2014](#)) set the age limit more conservatively to 16 years. Shorter FFM instruments such as the BFI (44 items) and FFPI (100 items) have now been validated for self-report in even younger age groups. Studies have shown that the presupposed FFM structures can be replicated in self-reports as early as age 10 years, even though internal consistencies and differentiation among FFM domains tend to improve with age across late childhood and adolescence ([Hendriks et al., 2008](#); [Soto et al., 2008, 2011](#)).

A second, alternative version of the top-down approach is to adapt existing adult-oriented FFM measures, explicitly modifying item phrasing and rating instructions to make them more suitable for child or adolescent assessment. This approach draws content for the prespecified FFM dimensions from two major sources. First, adult FFM item pools [such as the trait adjectives of [Goldberg \(1999\)](#), the International Personality Item Pool of [Goldberg \(2001b\)](#), or the NEO items of [Costa and McCrae \(1989\)](#)] are screened for personality descriptions that are thought to also apply to children's behavioral repertoire. Second, these prestructured FFM dimensions are further supplemented by newly written child- or adolescent-oriented items (for instance, suggested by a panel of developmental experts such as classroom teachers) to attain a more age-appropriate coverage of the FFM domains. Notable examples of this approach are the Adolescent Personality Style Inventory which was developed specifically for adolescent self-report ([Lounsbury et al., 2003](#)), the Five Factor Personality Inventory for Children and its experimental precursor versions ([Ehrler, Evans, & McGhee, 1999](#); [McGhee, Ehrler, & Buckhalt, 2007](#)), and the Big Five Inventory for Children, which is one of the few questionnaires available today that is simultaneously validated across self-, parent-, and teacher-ratings ([Barbaranelli, Caprara, Rabasca, & Pastorelli, 2003](#)).

Whereas the nonadapted adult measures usually target adolescence and rely on self-ratings, these downward extensions generally focus on middle childhood (age 9 years and beyond) and rely on caregiver reports as well as self-reports. Recently, researchers adopted a similar approach to construct a caregiver instrument to address FFM personality in preschool age ([Grist, Socha, & McCord, 2012](#)). The M5-PS-inventories (a 90-item and 35-item version) were developed on the basis of a long list of traits that the authors derived from [Goldberg's International Personality Item Pool \(2001b\)](#) as they considered these traits to be relevant for preschoolers. In a second step, these items were rewritten to fit preschoolers, using expert panels of kindergarten teachers to validate or supplement these descriptions. Studies with the M5-PS replicated four of the FFM factors in teacher ratings of preschoolers. Only the Openness scale performed poorly in terms of internal consistency and convergent validity ([Grist et al., 2012](#)).

TOP-DOWN AND/OR BOTTOM-UP: DERIVING FFM PROXIES FROM EXISTING ASSESSMENT MEASURES

The second strategy derives FFM marker scales from existing instruments that specifically target child development (rather than adult development) but were originally developed outside the FFM sphere of influence. This strategy also comes in two versions. A first version is based upon a-theoretical lists of generic descriptions of youth's development. A second version derives FFM scores from measures that were originally operationalizing other theoretical models. To date, research has made a strong case that the dimensions underpinning these rich, child-focused item pools show striking similarities to the FFM domains in adults, based upon analyses inspired by both the top-down and bottom-up rationale.

The best known and most influential example of the use of a-theoretical generic lists of child development can be found in the work of John Digman. Digman was among the first to address the complexity of childhood personality while searching for the basic structure underlying personality in middle childhood. From 1959 to 1967, Digman asked 88 teachers to make judgments of personality attributes of 2,572 pupils aged 7 to 13 years. He did so in a series of six data collections in Hawaii. These lists were composed of 36 to 63 personality attributes, phrased as a single word or short phrase (e.g., Energetic: active; full of pep; vigorous; movements are quick, darting). In some samples, these attributes were accompanied by a definition developed beforehand from focus groups in which teachers were asked to provide typical examples of classroom behaviors relating to that concept. In Digman's first analyses of these data (in an era

in which computerized data-analytical applications were still in their infancy), he suggested that seven or eight factors would underlie these child personality attribute ratings. Later, [Digman and Takemoto-Chock \(1981\)](#), [Digman and Inouye \(1986\)](#), and [Digman and Shmelyov \(1996\)](#) carried out other studies based on similar lists of teacher ratings. They finally reported five recurring factors, across multiple cultures, that showed remarkable similarity to the Big Five dimensions retrieved in adulthood.

In 2001, Lew Goldberg thoroughly reanalyzed the original Hawaiian datasets of Digman, which are so unique because these trait descriptors were chosen long before the FFM became the “sovereign” personality framework in adults. Using bottom-up-inspired data-analyses (principal components analysis and exploratory factor analysis), [Goldberg \(2001a\)](#) concluded that in all six Hawaiian samples, a clear and robust five factor structure emerged, and, that no other domains than the Big Five factors surfaced from these different datasets. This research provides compelling evidence for the validity of the Big Five model for teacher-based personality assessment in middle childhood.

Other scholars have also used the FFM as a taxonomic framework to organize generic descriptions collected long before the FFM became the dominant personality paradigm, enabling the study of child personality in and across archival datasets. For example, Shiner (2000) derived child personality markers similar to four of the FFM dimensions (not Neuroticism) using multi-informant and multi-method descriptions of children’s competences in various developmental task domains that were collected in the Project Competence longitudinal study ([Masten & Tellegen, 2012](#)). These four traits, labeled Agreeableness, Mastery Motivation (akin to Openness/Intellect), Academic Conscientiousness, and Surgent Engagement (akin to Extraversion), were highlighted as important contributors to resilience and adjustment across time. Recently, [Shiner and Masten \(2012\)](#) reorganized the item groupings of these original child personality scales to attain even more clearly aligned, reliable, and valid FFM scales. These top-down modifications produced purer Extraversion and Openness proxies, in addition to the already established scales for Agreeableness and Conscientiousness. [Shiner and Masten \(2012\)](#) were also able to construct a proxy scale for child Neuroticism by selecting items from a generic behavior questionnaire rated by the parents. This reanalysis for all five FFM domains revealed that individuals who were rated around 10 years of age with more favorable traits on four of the FFM domains (except Extraversion) had the most favorable developmental outcomes in both emerging (around 20 years) and young adulthood (around 30 years of age).

Research based upon this second approach (deriving FFM-proxies from existing, a-theoretical developmental questionnaires) has strongly supported the validity of the FFM as a model to describe individual differences in children. In addition, this approach has had tremendous value in establishing the relevance of child personality, its longitudinal consistency, and its impact on important life domains, even though the original measurements were not operationalizing FFM-based child personality. Long-term longitudinal studies based on this approach have uncovered the vital importance of child personality for physiological dysfunction, health, or mortality risk (e.g., [Hampson & Goldberg, 2006](#); [Kern, Hampson, Goldberg, & Friedman, 2014](#)) and for psychosocial (mal)adjustment and resilience ([Masten & Tellegen, 2012](#); [Shiner & Masten, 2012](#)), even across long stretches of time.

This second approach also includes the regrouping of items based upon alternative theoretical models. The California Child Q-set ([CCQ; Block & Block, 1980](#)) and its Common Language adaptation ([Caspi et al., 1992](#)) is the most notorious example of this strategy and can be considered as the most popular instrument in the history of child personality assessment. In contrast to the a-theoretical lists that offer a more broad perspective on child development, the (Common) CCQ sort was developed within the clear theoretical model postulated by [Jack Block and Jeanne Block \(1980\)](#). This model distinguishes two major dimensions. The first dimension, ego-control, refers to a child’s tendency to contain rather than to express emotional and motivational impulses. The second dimension, ego-resiliency, refers to a child’s tendency to respond flexibly rather than rigidly to changing situational demands or particularly stressful situations. The CCQ is composed of 100 behavioral statements (to be sorted in a fixed Q-sort distribution) that target the description of personality, cognitive, and social attributes of children in this ego-control/ego-resiliency framework.

[John et al. \(1994\)](#) were the first to evaluate whether the FFM domains and/or additional factors could be replicated in the structure of Common CCQ ratings. They analyzed data from the Pittsburgh Youth Longitudinal Study, focusing on early adolescent boys (12 years) and using maternal ratings. They investigated this issue from both a top-down and bottom-up approach. First, a lucid top-down strategy was

used: The authors aimed to construct rationally developed FFM scales for use with children and adolescents. To this end, they had two coryphaei of FFM research in adults (Oliver John and Robert McCrae) independently select those CCQ items that they judged to be clearly related to the FFM in adults. These five FFM scales were composed of 48 CCQ items and showed good to excellent validity (even though Openness-to-Experience had the smallest number of items and showed the lowest reliability).

All FFM scales were found to be associated meaningfully with a wide array of external criteria. This study was introduced as “discovering the Little Five” in young adolescents while providing a first validation of its nomological network. To date, these top-down-derived FFM CCQ scales have been widely adopted. Research based on these scales has strongly contributed to the growing evidence that childhood personality is a major predictor of cognitive, academic, behavioral, as well as mental health outcomes, both concurrently (e.g., [John et al., 1994](#); [Van Lieshout & Haselager, 1994](#)) and longitudinally (e.g., [Abe, 2005](#); [Abe & Izard, 1999](#); [Asendorpf & Van Aken, 2003](#); [Gjerde & Cardilla, 2009](#); [Lamb, Chuang, Wessels, Broberg, & Hwang, 2002](#)).

Interestingly, [John et al. \(1994\)](#) also adopted a bottom-up perspective to address the broader issue of adolescent personality structure by performing principal component analyses on the entire 100 CCQ item set. Notably, they recovered a variant of their proposed Big Five, but they also identified two additional factors. Three factors were found that differed little from the top-down proposed FFM scales: Agreeableness, Conscientiousness, and Openness-to-Experience. Interestingly, the two other FFM domains were defined more narrowly, and were labeled Sociability (instead of Extraversion) and Anxious Distress (instead of Neuroticism). In addition, two complementary factors were recovered, labeled Activity and Irritability. Sociability was defined by elements such as sociability and expressiveness, whereas energy, social presence, and activity level (traits typically loading extraversion in adults) loaded the sixth factor, Activity. Anxious distress represented a more limited range of negative affects (e.g., anxiety, nervous worry, guilt, low self-esteem) than typically found on adult Neuroticism factors. The Irritability factor was defined by more inappropriate and immature negative affect regulation as reflected in whining, crying, tantrums, excessive sensitivity to teasing, frustration, and irritability.

Hence, these bottom-up analyses suggest that both the Extraversion and Neuroticism constructs as found in adults might be more differentiated in youngsters, hinting that Extraversion splits out in two distinct traits (Sociability and Activity) whereas Neuroticism is represented in two distinct aspects of negative affect (Anxious versus Irritable Distress). [John et al. \(1994\)](#) recommended the further study and replication of these two additional factors in other samples and instruments because they thought it was unlikely that these two factors were error factors, instrument-specific factors, or just facets of the five classic FFM dimensions. They considered both factors as good candidates to represent relatively independent dimensions in young adolescence or even childhood.

In the same year, [Van Lieshout and Haselager \(1994\)](#) performed similar principal component analyses on the Dutch translation of the CCQ set using parent as well as teacher ratings of 720 children and adolescents. In this broader age group (3 to 16 years) these authors also recovered a variant of the FFM and two additional factors, which they interpreted as Activity (strongly similar to the one reported by [John et al., 1994](#)) and Dependency (not found by [John et al., 1994](#)), a trait that reflects emotional overreliance on significant others (e.g., eager to please, manipulative). The separate Irritability trait was not found in the factor structures across age groups. Yet, Irritability-related CCQ items primarily loaded on the Agreeableness factor. The factor Neuroticism (labeled Emotional Stability) was primarily indicated by anxious distress and low self-worth. [Van Lieshout and Haselager \(1994\)](#) also provided unique analyses of the multidimensional factor structure of self-ratings and peer-ratings (made by best friends) of 158 early adolescents. Compared to adult person descriptions, however, adolescent peer-descriptions and self-descriptions fitted the FFM less clearly. Both in self-reports and best friends’ descriptions, the strongest support was found for the factors Agreeableness, Emotional Stability, and Conscientiousness. In best friends’ person descriptions, a combined Openness–Activity factor was found, but a clear Extraversion factor was absent. In self-ratings, traces of Extraversion were found to be present (especially Sociability and Social Attractiveness versus Social Withdrawal) in addition to a separate Activity factor. Notably, a clear Openness factor was not found.

Even though this work on the CCQ is a prominent example of the approach that derives FFM proxies from questionnaires operationalizing alternative theoretical models, other examples are available. For

example, [Resing, Bleichrodt, and Dekker \(1999\)](#) used principal component analyses to evaluate the multidimensional structure underlying the School Behavior Checklist of [Zaal \(1978\)](#), an instrument targeting child adjustment in the field of educational practice. They recovered a four-dimensional structure, which they interpreted in terms of four of the FFM dimensions (Extraversion, Attitude toward School Work, Agreeableness, and Emotional Stability). Interestingly, a separate Openness component could not be established in this study.

In the past decade, the approach of deriving FFM proxies of alternative theoretical models has even expanded its scope beyond instruments targeting child or adolescent development. For example, studies have now successfully developed FFM markers from Tellegen's originally adult-oriented Multidimensional Personality Questionnaire ([Tellegen & Waller, 2008](#)) for use with children and adolescents (e.g., [Cukrowicz, Taylor, Schatschneider, & Iacono, 2006](#); [Tackett, Krueger, Iacono, & McGue, 2008](#)). These proxies are labeled as Negative and Positive Emotionality (akin to Neuroticism and Extraversion), Agreeableness, Constraint (akin to Conscientiousness), and Absorption (akin to Openness-to-Experience).

Bottom-up: Constructing new taxonomies from free description research. The two approaches discussed so far have been of utmost importance in the process of validating FFM dimensions in nonadult groups. The top-down strategies (e.g., the rational FFM scale development, downward FFM adaptations) have provided the most unambiguous replications of the FFM in nonadult groups. Other strategies, also including elements of a bottom-up approach, have yielded more problems in identifying *all* five domains (Openness in particular) or have identified more than five domains. Moreover, from [Tables 12.1](#) and [12.2](#), it can be inferred that although all retrieved traits can be organized easily within the FFM framework, not all of these retrieved factors may be qualitatively similar. In this regard, the range of diverse labels chosen by scholars interpreting their factor structures and describing the resulting scales should be noted: for example, how similar are scales such as Openness, Resourcefulness, Absorption?

As there is no guarantee that semantically similar labels actually share the same trait variance, further empirical validation is needed to avoid the “jingle-jangle” fallacy ([Block, 1995](#)). This phenomenon reminds trait psychologists that they sometimes study the same trait under different names (jingle) or use the same label to describe different traits (jangle). Unfortunately, surprisingly few studies have addressed the empirical relationships between multiple coexisting child personality measures, so that the empirical convergence remains for a large part unknown (some exceptions can be noted: [Barbaranelli et al., 2003](#); [De Fruyt et al., 2000](#); [Parker & Stumpf, 1998](#); [Soto & John, 2014](#); [Tackett et al., 2013](#)).

There are other problems with these first two approaches too. Most importantly, both approaches do not provide any warranty that the personality of children or adolescents is assessed optimally ([De Fruyt et al., 2000](#)). As the first approach imposes the structure of the adult FFM to nonadult groups and as the second approach derives scores from scales not designed for FFM assessment, both approaches run the risk that other factors, beyond the FFM, are important for the assessment of individual differences in childhood and adolescence. Therefore, a third approach aims to start from a conceptually blank slate and aims to develop new taxonomies of childhood traits from the bottom-up, based upon careful observation of the wide range of behavioral differences manifested by children and adolescents.

Examples of such pure bottom-up approaches are studies relying on free-response techniques. Research has found evidence that the FFM can be used to organize and classify a substantial portion of children’s free descriptions of their own and peers’ personalities as elicited by projective personality tests ([Donahue, 1994](#)). More impactful, however, has been the research on parental and teachers’ free descriptions. Regarding teacher descriptions, [Mervielde \(1994\)](#) showed that more than 60% of 3,265 personal constructs, generated by 226 teachers, can be clearly classified within the FFM framework. Regarding parent descriptions, a large international collaborative research project was initiated by [Kohnstamm, Halverson, Mervielde, and Havill \(1998\)](#). This project assembled an immense database of parents’ free descriptions of their children in and across seven countries, which were subsequently coded on the basis of an intuitive, rational coding system (yet not entirely unaffected by FFM premises). A key finding was that—across countries—70% to 80% of descriptors can be easily classified within the first five categories of the lexicon. Markedly, these first five categories show strong correspondence to the FFM in adults. The research consortium noted, however, that this finding alone is insufficient to fully establish the FFM’s validity to describe childhood individual differences because these results are still contingent on a prestructured classification process ([Kohnstamm et al., 1998](#); [Mervielde et al., 2005](#)).

Hence, more work is required to illuminate the underpinnings of the personality dimensions relevant for a specific age group. In the wake of the international classification study, two research groups undertook the endeavor to thoroughly structure and classify the raw material of free parental descriptions, collected for children from multiple age groups. In doing so they used a bottom-up approach. This method is exceptional as it provides a unique occasion to disentangle the lower versus higher levels of child personality taxonomies. In adulthood, similar studies of the natural, culture-specific language to describe personality have greatly helped to clarify the taxonomical framework of personality (John et al., 2008). These time- and labor-intensive projects resulted in two childhood trait taxonomies, from which two influential personality instruments were developed: the Hierarchical Personality Inventory for Children (HiPIC; Mervielde, De Fruyt, & De Clercq, 2009) and the Inventory for Childhood Individual Differences (Deal, Halverson, Martin, Victor, & Baker, 2007; Halverson et al., 2003).

For the construction of the HiPIC, more than 9,000 Flemish parental descriptions were collected and organized into 100 homogeneous clusters that covered three age groups: 5 to 7, 8 to 10, and 11 to 13 years. Notably, for each of these age groups, principal component analyses at the item level clearly tended to cluster items according to FFM-like dimensions. Additional analyses were done to explore the facet structure within each of these five dimensions in the three age-specific item sets. In each age-specific set, 18 highly reliable facets were found. Given the substantial overlap in content across these three groups, the three age-specific item sets were merged into one item set measuring personality in primary school children (Mervielde & De Fruyt, 1999; Mervielde et al., 2005).

The 18 HiPIC facets primarily load on five broadband dimensions, labeled as Conscientiousness, Benevolence, Extraversion, Imagination, and Emotional Stability. These five are clearly related, yet not identical, to adult FFM domains. Conscientiousness (grouping the facets Achievement Motivation, Concentration, Perseverance, and Orderliness) and Extraversion (grouping the facets Shyness, Optimism, and Expressiveness, but also Energy—which did not acquire the status of a separate factor in this study) can be considered as closest to their adult counterparts. Benevolence appears broader in content than adult Agreeableness: the facets Egoentrism and Irritability have the highest loading on this factor [reminiscent of the Irritable Distress factor of John et al. (1994)], in addition to Dominance (a typical Extraversion facet in adults), Compliance, and Altruism (reflecting the purest Agreeableness content). Imagination is more limited than adult Openness because it groups only Intellect, Curiosity, and Creativity. Finally, the smallest HiPIC component is Emotional Stability, grouping an Anxiety facet and one measuring Low Self-Confidence [content reminiscent of the Anxious Distress factor of John et al. (1994)].

Although the HiPIC was originally targeting primary school age, its factor structure has now been recovered in parent ratings of preschool children (De Pauw et al., 2009) as well as in parent- and self-ratings of adolescents (e.g., van den Akker, Dekovic, Asscher, & Prinzie, 2014). Moreover, a joint principal-component analysis of the HiPIC and NEO PI-R (Costa & McCrae, 1992) largely confirmed the proposed correspondence of HiPIC and NEO PI-R relations using adolescent self-reports (De Fruyt et al., 2000). Only two HiPIC facets, Dominance and Irritability, as rated by adolescents aged 12 to 17 years, were situated more at the intersection of Benevolence–Extraversion and Benevolence–Neuroticism, respectively, than documented in parent-report data (where these two facets uniquely load on Benevolence). This finding suggests that these two traits might migrate from childhood to adulthood, taking a more intermediate position in adolescent personality taxonomies (De Fruyt et al., 2000).

Even though the construction of the Inventory for Childhood Individual Differences (ICID) is related to the HiPIC, it followed a more theory-driven process because the classification of descriptors was closely aligned with the intuitive rational FFM-coding system that was developed for the international collaboration project (Kohnstamm et al., 1998). The ICID is based upon free parental descriptions collected from a U.S. sample and items imported from similar instruments constructed in the Netherlands, Greece, and China (Halverson et al., 2003; Mervielde et al., 2005). The initial questionnaire resulted in 144 items that matched the distribution of the FFM phrases in the parental lexicon. The factor structure of this original ICID globally resembled the adult Big Five, but also showed some deviations, such as a restricted Intellect factor (which was labeled as Openness but includes only one facet, Intellect), a broadened Extraversion factor (with primary loadings of the facets Openness and Considerate), as well as a Neuroticism factor primarily indicated by Shyness (Halverson et al., 2003; Mervielde et al., 2005). In 2007, the ICID was reduced and refined into a 108-item instrument (Deal et al., 2007) assessing 15 mid-level scales that show a purer

factoring into the FFM. Still, five facet scales (Positive Emotions, Negative Affect, Compliant, Distractible, and Intellect) are assigned to more than one FFM domain.

In accordance with the goals and results of the international collaborative project, the ICID domains are labeled with exact FFM nomenclature: Neuroticism (comprising Fearful, Negative Affect, and Distractible as facets), Extraversion (grouping Sociability, Shy, Activity Level, and Positive Emotions), Openness (capturing Intellect and Openness), Agreeableness (consisting of the facets Considerate, Compliant, Positive Emotions, Antagonism, Strong-Willed, and Negative Affect), and Conscientiousness (consisting of the facets Organized, Achievement Oriented, Distractible, Compliant, and Intellect).

Are We There Yet? Strengths and Weaknesses of the Three Approaches

Each of the three discussed approaches clearly has its own assets and pitfalls. The greatest advantage of the first, top-down, approach is that it enables youngsters' traits to be described according to the same reference structure as in adults. This is a major asset for researchers interested in personality development, because it allows them to perform both cross-sectional and longitudinal comparisons across age (De Fruyt et al., 2009; McCrae et al., 2005; Soto et al., 2008). Using a single set of constructs (perhaps with some items adapted to age-specific population characteristics) across development, from early childhood to late adulthood, might be the ultimate dream for charting lifespan development in personality (John et al., 1994). However, there are important caveats in simply imposing the adult FFM structure onto younger age groups. For example, how far can we go in lowering the age limit of adult-oriented FFM measures? Can we be sure that these item sets, derived from the complex world of adults, are appropriate to describe children's behavioral reality? Finding structural invariance of adult measures in nonadult groups is not sufficient to assert that these measures are also the "best" assessment of child personality. Moreover, imposing an adult structure on nonadult groups may obscure important age-specific features. Hence, this line of research should be preferably complemented with more bottom-up approaches and by research rigorously screening other developmental psychological constructs (De Fruyt et al., 2000; Kohnstamm et al., 1998; Soto et al., 2008).

The second approach, deriving FFM proxies from alternative models, provides strong evidence that FFM-like dimensions underlie the rich and heterogeneous descriptions of children's behavioral differences. However, these scales can only be considered as proxies for the FFM as they are restricted by the theoretical framework of the original instrument or by the a priori selection of the researcher. In the CCQ, for example, content related to Agreeableness is overrepresented whereas content related to Openness-to-Experience is predominantly restricted to intellectual and imaginative tendencies (Gjerde & Cardilla, 2009; Soto & John, 2014). Hence, the derived scales do not necessarily reflect child characteristics that are perceived as salient by observers at different ages. Moreover, it is difficult to deduce whether retrieved personality factor structures actually reflect child features or simply result from instrument-specific idiosyncrasies. Furthermore, other important traits beyond Big Five may be relevant in younger age groups and are risked to be overlooked by this method.

The third approach is a remarkable illustration that the development of five factor personality theory in childhood is not restricted to theory-driven construction methods and hence cannot merely be considered as an extension of adult personality theory. As evidenced by the construction histories of the HiPIC and, to lesser extent, the ICID, this bottom-up approach relies in a unique way on an age-specific informant-based approach to instrument construction. Consequently, this approach may be considered to provide the most comprehensive description of individual differences in childhood (Soto & John, 2014; Tackett et al., 2013). It also yields the most compelling evidence for the validity of the FFM in childhood. Moreover, both the HiPIC and ICID taxonomies are exceptional in contemporary child personality assessment because they include lower-level facets. In adults, the hierarchical framework of the FFM is well-established, with each FFM dimension subsuming several, more specific lower-order facets. Even though same-dimension facets are substantially correlated (around .4 in adults), correlations are not nearly perfect. Thus, lower-order facets provide unique information and reveal distinctive, or even idiosyncratic, developmental changes (Caspi et al., 2005; Soto et al., 2011). Likewise, recent research with the HiPIC and ICID facets provides crucial information on the development (e.g., Deal, Halverson, Havill, & Martin, 2005; de Haan, De Pauw, Van den Akker, & Prinzie, *under review*) and differential predictive impact (e.g., Becht, Prinzie, Dekovic, Van den

Akker, & Shiner, 2015; Prinzie, van Harten, Dekovic, van den Akker, & Shiner, 2014) of the more specific, concrete, lower-order facets.

Yet this third approach also has drawbacks. Researchers interested in addressing childhood personality with this approach have no other choice but to use different scales at different ages, which hampers comparisons in developmental studies wanting to adopt a lifespan perspective (but note that studies have found adequate properties for young adults' HiPIC and ICID self- and other-ratings; Deal et al., 2005; Van den Akker et al., 2014). Moreover, even though HiPIC as well as ICID shows excellent reliability and validity when used in adolescence (e.g., De Fruyt et al., 2000; Tackett et al., 2013; van den Akker et al., 2014), both taxonomies were originally developed to represent the structure of parental descriptions of young and preadolescent children (HiPIC: 5–13 years; ICID: 3–13 years). To our knowledge, a similar attempt to chart the personality of adolescents from a bottom-up approach has not been undertaken, so that it is not entirely clear whether there are other salient facets typifying adolescents' personality beyond those described in the HiPIC or ICID. For example, it is feasible that given its prominence in the adolescent developmental literature, a trait such as "Self-Worth" (Harter, Waters, & Whitesell, 1998) would play a much more pronounced role in bottom-up adolescent personality taxonomies (De Fruyt et al., 2000). From a more practical point of view, the length of the HiPIC and ICID measures is sometimes considered a barrier. For the ICID, a shorter, validated version is already available, whereas for the HiPIC, a shorter version for research purposes is currently under construction (De Fruyt & Mervielde, 2013).

Child versus Adult Personality Taxonomies

Toward a Better Understanding of Child Personality Traits in Their Own Right

Even though the quest for the most optimal child personality instrument is not settled yet, our review reveals that researchers and practitioners today can choose from a wide array of measures to address FFM(-like) traits in childhood or adolescence. More intriguing, however, is the more fundamental discussion about the basic architecture of children's and adolescent's personality. In this section, the issue of child personality structure is addressed more deeply by describing the apparent differences between child and adult personality taxonomies, based on the research reviewed so far.

Are there traits above and beyond the FFM? Our state-of-the-art review of child personality measures summarizes compelling evidence that childhood personality models, developed in the tradition of the FFM model in adults (McCrae & Costa, 1987), can validly and reliably describe the structure of individual trait differences of adolescents, preadolescents, primary school children, and even preschool children (e.g., De Pauw et al., 2009; Grist et al., 2012). These findings are vitally important as they counter the classic allegation that "temperament" would be the childhood precursor of later developing "personality." Instead, these findings emphasize that childhood traits, from preschool age onward, can be rightfully considered as *personality* (Caspi & Shiner, 2006; De Pauw & Mervielde, 2010; Shiner & DeYoung, 2013).

On the other hand, the contention that the FFM provides the "best" comprehensive model to describe individual differences in children and adolescents has gradually been toned down in recent years. Even though all five FFM dimensions have clear relevance to capture behavioral individuality in youth, scholars should attend more to the developmental nuances of personality structure across childhood and adolescence (De Pauw et al., 2009; Soto & John, 2014; Tackett et al., 2013). From our review, it becomes evident that the strongest and purest replications of the FFM structure are typically found in studies in (pre)adolescence (starting from approximately age 10 years) that adopt top-down approaches, with clearly prestructured FFM measures. Yet, even some of these top-down studies have had difficulties in retrieving all five of the FFM dimensions (Openness-to-Experience in particular). Moreover, the bottom-up-driven approaches emphasize that the basic structure underlying childhood traits looks less similar to the adult structure, particularly when considering the younger age groups (i.e., primary school and preschool age).

Therefore, we concur with Tackett and colleagues' recent call that "the study of child personality should move forward to gain a better understanding of child personality traits in its own right, rather than assuming child personality traits are merely identical to those measured in adults" (Tackett et al., 2013, p. 739). Slowly but steadily, the outlines of the differences between adult and child personality taxonomies become more visible. First, there is increasing evidence that "Activity" should be regarded as an important

additional factor in youth. Second, evidence suggests that there are developmental nuances in the content of the other five classic FFM domains.

FROM LITTLE FIVE TO LITTLE SIX? THE CASE OF ACTIVITY

Recently, [Soto and John \(2014\)](#) published a groundbreaking paper in which they profoundly reevaluate the multidimensional structure of parental CCQ ratings from an explicit bottom-up perspective. They applied [Goldberg's \(2006\)](#) “bass-ackwards” method to analyze the foundational hierarchical structure of parental CCQ ratings of 16,000 children, adolescents, and young adults. These ratings were sampled from a large online platform in which parents completed a slightly adapted Common CCQ in a questionnaire format (instead of the fixed Q-sort). The authors sampled 500 males and 500 females for each individual year from age 3 to 17 years, and from a broader young adult group aged 18 to 20 years, hence enabling the cross-sectional comparison of trait structure across 16 age groups. [Goldberg's \(2006\)](#) “bass-ackwards” method makes it possible to examine the hierarchical structure based on the interrelations between principal-component scores from rotated solutions. Beginning with one dimension, each next analysis extracts and rotates an extra dimension. The correlations among the component scores from adjacent levels are then interpreted as path coefficients in a hierarchical structure.

This study is unique because it provides very detailed and comprehensive insights in the hierarchical structure of personality traits from early childhood to early adulthood. Its findings emphasize that the personality trait structure of youths is clearly hierarchically organized, but that significant similarities as well as differences between youth and adult personality hierarchies should be noted. Most importantly, Soto and John conclude that, from middle childhood onward (age 6 years and beyond), children’s personality hierarchy rests on a foundation of six, rather than five, dimensions. Next to traits interpreted as Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness-to-Experience, Activity emerged systematically as a major factor across the structural models. Accordingly, the authors proposed that these “Little Six” are to be preferred above the “Little Five” when speaking about child and adolescent traits. These Little Six proved to be more replicable than the Big Five across childhood and adolescence. However, [Soto and John \(2014\)](#) noted that the Big Five structure became more replicable with age and was clearly recovered in the late adolescence and early adult age groups (ages 15 to 18–20 years). In the 18–20 year age groups, the Big Five was even more plainly recovered than the Little Six. Activity, in particular, was less apparent in the emerging adult group, and content related to this trait was subsumed by Extraversion as well as Conscientiousness in the Big Five model. These findings imply that during the transition to adulthood, the personality hierarchical foundation may shift from a Little Six structure to a Big Five structure ([Soto & John, 2014](#)).

Importantly, [Soto and John \(2014\)](#) also reported that fewer and simpler structures replicated more easily in the early childhood samples (ages 3 to 5 years). Only three structures were replicated in these young age groups: a one-dimensional structure (labeled Adjustment), a two-dimensional structure (discerning Benevolence from Emotionality), and an alternative five-dimensional structure. In this latter structure, versions of Agreeableness, Neuroticism, Extraversion, and Conscientiousness are retrieved, in addition to a dimension that combines aspects of Activity and Openness-to-Experience. [Soto and John \(2014\)](#) interpret this finding as preliminary support for the theoretical hypothesis of [Caspi et al. \(2005\)](#) that Openness-to-Experience may begin to develop early in life, but due to ongoing cognitive development, its conceptual core may shift from exploration of the physical world in early childhood to intellectual curiosity and imagination by middle childhood and early adolescence. Hence, openness in young children would not only be defined by cognitive characteristics (e.g., imagination, creativity), but also by aspects of motor activity and physical exploration.

Even though this study’s results are confined by their cross-sectional nature and the use of only parent reports on a particular measure (CCQ), it is a landmark for the child personality discipline, as it gently challenges the bold proposals of earlier times (e.g., [Caspi et al., 2005](#); [De Pauw & Mervielde, 2010](#); [Digman, 1994](#); [Mervielde et al., 2005](#)) that a strict version of the FFM is the “best” model to describe child and adolescent trait differences. Nevertheless, more studies, particularly in younger age groups and based on longitudinal designs, are needed to further substantiate the suggestions of [Soto and John \(2014\)](#) that personality structure would follow a curvilinear developmental trajectory, becoming more complex from

early to middle childhood (when the Little Six would emerge), and then less complex from adolescence to adulthood (when they merge into the Big Five).

SIMILAR, NOT IDENTICAL: OUTLINING THE DIFFERENCES BETWEEN ADULT AND CHILD TAXONOMIES

In addition to the growing recognition of Activity as a sixth fundamental factor (Shiner & DeYoung, 2013; Soto & John, 2014), marked progress has been made in uncovering differences between child and adult personality taxonomies in the past decades. Here we summarize the most salient differences that have been identified for the classic FFM domains, primarily in studies adopting the bottom-up rationale.

The case of Extraversion/Sociability. The growing evidence that Activity represents an independent dimension from at least middle childhood to middle adolescence implies that Extraversion represents more narrow content in young age (primarily capturing content related to Sociability) and that the meaning of this trait gradually expands when getting older. The age-specific analyses of Soto and John (2014), for example, illustrate that the meaning of Activity shifts dramatically when middle childhood groups are compared to older adolescent groups. Whereas during primary school age, Activity is indicated mainly by physical aspects such as energy level and motor activity, at older ages this factor includes more aspects related to psychological agency, such as motivation and competitive drive. This shift may reflect a broader developmental process by which Activity gradually merges with aspects such as sociability to form a broader Extraversion component (e.g., De Pauw & Mervielde, 2010; De Pauw et al., 2009; Eaton, 1994) but also by which Activity merges with achievement-motivation aspects to form a broader Conscientiousness component (Shiner & DeYoung, 2013; Soto & John, 2014).

Studies also demonstrated other developmental differences between child and adult Extraversion. For example, in all bottom-up analyses, there is little evidence for a separate Honesty–Humility trait in children, even though this is a very prominent trait in adults (Soto & John, 2014). Another difference relates to Assertiveness, or its counterparts in child taxonomies, Dominance (HiPIC) or Strong-Willed (ICID). Whereas this is a salient facet of Extraversion in adults, the HiPIC and ICID taxonomies allocate this content to the broader Agreeableness/Benevolence factor. Clearly, more developmental research on these diverse trait aspects is needed.

The case of Agreeableness/Benevolence. Bottom-up analyses suggest that the childhood analogue of Agreeableness (i.e., Benevolence) captures a much broader content than its adult counterpart. Specifically, this factor combines content related to parents' views of manageability of a child (i.e., low irritability, low egocentrism–Neuroticism facets in adults—and low assertiveness—an Extraversion facet in adults) with more typical content related to Agreeableness such as altruism, compassion, and cooperativeness (De Pauw et al., 2009; Mervielde et al., 2009; Tackett et al., 2008, 2012). A label such as Benevolence might better reflect this heterogeneity in content than the classic label Agreeableness (Mervielde et al., 2009).

It is remarkable that parental free description-based taxonomies primarily identify negatively poled markers of this domain, reflecting Disagreeableness/Antagonism. This is evidenced by HiPIC facets such as Dominance, Egocentrism, and Irritability or ICID facets such as Strong-Willed and Antagonism. In children, Agreeableness/Benevolence is also represented by aspects of Agreeable Compliance, a feature less present in the typical FFM models in adults (i.e., Compliance in HiPIC and Obedience in ICID). All these traits primarily reflect salient differences in how well children can self-regulate in the service of maintaining positive relationships with significant others and how well they can inhibit their hostile and aggressive impulses (Shiner & DeYoung, 2013). Notably, these bottom-up-derived taxonomies identify less descriptors of individual differences in empathic emotional reactions to others' emotions, concerns, and desires. Only one HiPIC facet (Altruism) and one ICID facet (Considerate) reflect more prosocial tendencies, which are so central in adult models of Agreeableness. It is interesting that in free descriptions research, parents use more lexicon to denote the quality of the social interactions of their children (are they obedient or stubborn, irritable or indulgent) than to describe their children's empathic responses to others.

In contrast to free description research, FFM-oriented analyses of existing, generic instruments for child development have identified much more “pure” markers of Agreeableness in children and adolescents. The analyses of both the CCQ scales and the Digman scales emphasize that traits such as warmth, kindness, considerate, helpfulness, empathy, friendliness, and trustworthiness can readily be recognized, even in very young children (Goldberg, 2001a; Soto & John, 2014). The inclusion of such pure “Agreeableness” content

in the bottom-up constructed inventories may have important added value for a more comprehensive assessment of this childhood trait.

Interestingly, developmental psychologists have traditionally paid much attention to identifying childhood markers of prosocial and aggressive tendencies with relevance to the Agreeableness/Benevolence trait (Graziano & Eisenberg, 1997; Knafo & Israel, 2012). Yet this line of developmental research has been evolving in relative isolation of the work of other developmental psychologists on temperament. Temperament theorists have typically not considered Agreeableness-related traits (e.g., Aggression, Considerateness, Empathy) in their models, perhaps because they have regarded these traits as being products of socialization in conjunction with other temperamental tendencies, rather than temperament per se (Shiner & DeYoung, 2013). Yet there are multiple reasons to consider these traits relevant to Agreeableness/Benevolence as being fundamentally like other temperament traits. There is emerging evidence that such Agreeableness-related traits are discernible early in life and show moderate stability throughout early childhood. For example, 1-year-old children already vary in their display of physical aggression and the average display of such aggressiveness peaks around the age of 3 years (Tremblay et al., 2004). By preschool age, children show major differences in physical aggression as well as in relational aggression and these two types of aggression are strongly related in young children (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007). In addition, even children as young as 14 months exhibit moderately stable and situationally consistent differences in empathy and moderately stable tendencies toward prosocial behaviors by the age of 3 years (Knafo, Zahn-Waxler, Van Hulle, Robinson, & Rhee, 2008). Moreover, as discussed before, research using bottom-up approaches has provided strong support that Agreeableness/Benevolence constitutes a basic trait dimension, even from very early in development.

Developmental work on childhood analogs of Agreeableness/Benevolence raises further interesting research suggestions. For example, developmental scholars have emphasized that Antagonism/Aggressiveness and Prosocial tendencies should not be considered to be opposite ends of a single dimension, even though they tend to covary strongly and negatively throughout childhood (Graziano & Eisenberg, 1997; Knafo & Israel, 2012; Shiner, 1998). In future child personality taxonomies, more work can be done to unravel the potential distinctiveness of these traits. Including these different aspects in a single dimension might run the risk that the differential patterns of these traits are being obscured (Shiner, 1998).

The case of neuroticism/emotional stability. Commensurate with the broader content of Agreeableness/Benevolence, a more restricted Neuroticism factor in childhood is suggested by bottom-up research. This trait tends to be indicated primarily by content related to anxious distress and lower feelings of self-worth. Given the key importance of Neuroticism in the development of mental health and psychopathology, it is remarkable that parental free description research derived only a few descriptors covering this domain (e.g., HiPIC Anxiety and Self-Confidence, ICID Fearful and Negative Affect). A developmental psychopathological perspective may provide a much wider lexicon to describing nuances of Emotional Distress/Stability in youngsters. For example, it seems relevant to differentiate Fearfulness (related to specific stimuli) from a more general Anxiety disposition (De Pauw & Mervielde, 2010) or to differentiate between more mood colors within a broader negative affect category (e.g., discomfort, sadness, misery). Adult Neuroticism is covered by a more diverse range of features including self-consciousness and social anxiety, vulnerability to distress, feelings of depression, sadness, despondency and loneliness, impulsiveness (childhood analogs of this trait tend to load on Conscientiousness), and angry-hostility (childhood analogs of this trait tend to load on Benevolence). It is remarkable that similar traits have not been retrieved from parental free description research, even though some of these markers have been retrieved in factor analyses of the generic developmental questionnaires. Hence, future research on childhood personality structure might look for a more comprehensive conceptualization of this trait at both the positive and negative poles. Finally, it is noteworthy that many FFM studies prefer the label Emotional (In)stability instead of Neuroticism in describing this trait in youngsters, possibly because this label has a less pejorative connotation to use in youth.

The case of Conscientiousness. Both top-down and bottom-up approaches emphasize that Conscientiousness is a very robust childhood personality factor covering basic tendencies such as impulse control, effortful attention, or task persistence as well as individual differences in orderliness, dependability, and the motivation to strive for high standards and to pursue goals over time in a determined manner. This

broader content of a Conscientiousness trait has been documented in both top-down and bottom-up approaches and has been identified as early as preschool age. It is likely, however, that these tendencies become even more salient to other observers as children are faced with the demands for more sophisticated work in primary school (Shiner & DeYoung, 2013).

Although this broad content of the Conscientiousness factor in childhood meshes well with the adult Big Five domain, the social aspect of Conscientiousness, as manifested in facets such as Dutifulness or Responsibility, is not recovered in bottom-up taxonomic work in childhood (De Pauw et al., 2009; Soto & John, 2014). Given the growing demands from society on productivity and accountability during adolescence, it seems plausible that traits such as dutifulness and responsibility become even more salient throughout adolescence. Hence, they are not included in child taxonomies, but they could be retrieved by future bottom-up endeavors entangling specific taxonomies underlying adolescents' personality. Evaluating further differences between child and adult Conscientiousness, some researchers have noted that in childhood, traits such as attentional and impulse control appear to be more central in children than in adults (De Pauw et al., 2009; Soto & John, 2014).

The case of Openness-to-Experience/Intellect. The fifth FFM trait remains the most heterogeneous FFM dimension of adult personality (John et al., 2008). The longstanding debate about the best conceptualization of this trait as either "Openness-to-Experience" or "Intellect" has significantly marked the early decades of FFM or Big Five research. The questionnaire-based FFM tradition preferred the term "Openness," whereas the psycholinguistic Big Five tradition preferred the term "Intellect" (see also the chapter by De Raad and Mlačić). This historical differential preference for Openness versus Intellect is also reflected in the nomenclature presented in [Tables 12.1](#) and [12.2](#).

Also in childhood, Openness/Intellect remains the most controversial factor (Gjerde & Cardilla, 2009; Herzoff & Tackett, 2012; Mervielde, De Fruyt, & Jarmuz, 1998). A first controversy relates to when this Openness/Intellect dimension in children first emerges. In this regard, some scholars have argued that Openness may not be a meaningful personality dimension prior to adolescence (Lamb et al., 2002). Lamb et al. (2002) analyzed CCQ ratings from a longitudinal study of 102 Swedish children, followed from 2.5 to 15 years of age (across five waves), relying on the top-down FFM CCQ scales proposed by John et al. (1994). Their study showed that the Openness-to-Experience scale was adequately reliable in the parent Q-sorts of adolescents, but did not reach adequate reliabilities when children were younger. In our review above, we have pointed out that both in top-down and bottom-up approaches, several studies reported low reliability for Openness/Intellect scales. Moreover, in some studies, this trait does not emerge as a separate factor in instruments' structural analyses (e.g., Resing et al., 1999). In addition, particularly at younger ages, studies have found that content related to Intellect tends to group together with content related to Conscientiousness (Mervielde et al., 1995, 1998).

Still, it should be stated that a majority of studies within the top-down approach have retrieved psychometrically sound scales for Openness or Intellect, both in caregiver and self-reports (see [Tables 12.1](#) and [12.2](#)). In addition, bottom-up strategies have yielded strong evidence that Openness or Intellect content does emerge as a separate trait in component structures of generic developmental questionnaires. In analyses of the Digman scales, this domain groups traits such as imaginative, aesthetically sensitive, and quick to learn, whereas in the CCQ, this domain groups traits such as creative, active fantasy life, interesting and arresting child, responds to humor, or resourcefulness in initiating activities. Strong evidence also comes from free description research showing that parents and teachers (from many countries) spontaneously and frequently use words referring to the Openness/Intellect domain when asked to describe their children or pupils (Halverson et al., 2003; Kohnstamm et al., 1998; Mervielde et al., 1995, 1998). Again, it can be stated that there might be more problems in discerning Openness/Intellect as a separate trait in preschoolers. Even though the youngest children in this free response research were 3 years of age (Halverson et al., 2003), there remains ambiguity about the point in early childhood at which this trait emerges (De Pauw et al., 2009; Herzoff & Tackett, 2012; Shiner & DeYoung, 2013). More developmental research about the early manifestations of Openness-related traits is certainly required.

A second controversy relates to how this Openness/Intellect trait is best conceptualized in childhood. Even though parental free descriptions provide strong support for the existence of such a dimension, its content is clearly more restricted than in adult FFM models. In adulthood, the classic debate about the terms Openness versus Intellect has been largely resolved by the recognition that both Openness and Intellect

describe distinct yet equally central aspects of this FFM domain, with Openness capturing perceptual and aesthetic interests and with Intellect capturing intellectual interests (Shiner & DeYoung, 2013; see also the chapter by Sutin). Both tendencies are—to some degree—present in the NEO PI-R Openness scale of Costa and McCrae (1992), which distinguishes Intellect-capturing facets Open to Ideas (e.g., intellectually curious and open to new ideas) and Open to Values (e.g., reexamination of traditional social, religious, and political values) from more Openness-capturing facets Open to Fantasy (e.g., vivid imagination and fantasy life), Open to Feelings (e.g., receptiveness to inner emotional states and valuing emotional experience), and Open to Actions (e.g., trying new activities, visiting new places, trying new foods).

In contrast, the childhood analogs of the Openness/Intellect dimensions are clearly more restricted in terms of content. In the ICID, the Openness domain is heavily defined by intellectual tendencies, even though it is labeled as Openness. The HiPIC does allow for a differentiation between intellectual (such as quick to learn, clever, insightful, curious) and imaginative tendencies (such as imaginative, creative, and aesthetically sensitive) within the Imagination trait. Significantly, the joint factor analysis of NEO PI-R and HiPIC facet scales in adolescents' self-reports (De Fruyt et al., 2000) revealed a clearly identifiable factor indicated by both the NEO Openness and HiPIC Imagination scales. Yet although the HiPIC Intellect scale had a primary loading on this joint factor, the correlations with the NEO PI-R Openness facets were small to moderate. This finding suggests that adult personality measures such as the NEO PI-R do not cover the Intellect domain as thoroughly as childhood personality measures such as the HiPIC. In addition, this finding suggests that in bottom-up approaches, features of intellect are more determining of child personality structure than of adult structure (De Fruyt et al., 2000; Tackett et al., 2012).

More work can be done to broaden the scope of this Openness/Intellect trait. Some researchers have already suggested additional markers of childhood Openness/Intellect that go beyond the ones identified in bottom-up approaches. For example, children high on this trait might be enthusiastically involved in extracurricular activities, eager to take on creative and intellectual work, and show imaginativeness and resourcefulness in play, confidence, and adaptability in the face of uncertainty (Abe, 2005; Goldberg, 2001a; Shiner & DeYoung, 2013). As we will discuss in the third part of this chapter, it has also been suggested that perceptual sensitivity, a trait delineated by the temperament tradition, might be considered as a childhood analog of the aesthetical and perceptual interests of adult Openness (De Pauw et al., 2009; Herzhoff & Tackett, 2012).

Multiple studies have documented meaningful associations between childhood Openness/Intellect traits and a wide array of psychosocial outcomes, including the development of mental health problems (Herzhoff & Tackett, 2012; John et al., 1994), competencies (Herzhoff & Tackett, 2012), and individuals' values, political beliefs, or academic and creative achievements (Caspi & Shiner, 2006; Shiner & DeYoung, 2013). This research emphasizes the importance of this trait in youth. Nevertheless, more research is certainly needed on how to evaluate this trait in a more comprehensive (i.e., broader than intellective tendencies) and developmentally appropriate manner (Herzhoff & Tackett, 2012). The additional markers of childhood analogs mentioned before provide interesting candidates to attain a more comprehensive coverage of this fascinating childhood trait.

Are We There Yet? Further Challenges for Research on Child Personality

The research reviewed in this second part clearly illustrates the marked progress that has been made in unraveling the underlying structure of child and adolescent personality. Yet, as noted throughout this review, this field of research clearly remains a “work in progress.” Most importantly, the higher-order objective of “delineating the most comprehensive structure of individual differences, at each point in development” (Caspi & Shiner, 2006) cannot be considered as fully attained. In this section, a number of lacunae and unresolved issues that require further empirical and conceptual attention are examined.

Personality in babies? How early can we tell? Very little is known about when the Little Six dimensions first emerge in development and about what the developmental precursors of these traits are. Therefore, it is not clear from what point in development we can rightfully speak of youngsters' traits as *personality*. Put in other words, what are the lower-age boundaries of FFM measures in early childhood?

A number of studies have now suggested that FFM-like dimensions can already be retrieved in parent ratings of children as young as age 2 or 3 years, relying upon parental CCQ ratings (Abe, 2005; Abe &

Izard, 1999; Asendorpf & Denissen, 2006; Lamb et al., 2002) and HiPIC or ICID ratings (de Haan et al., under review; Halverson et al., 2003; Tackett et al., 2012; Zupancic, 2004; Zupancic, Podlesek, & Kavcic, 2006). These studies generally support the notion that content related to Activity, Extraversion/Sociability, Benevolence/Agreeableness, Emotional Stability, Conscientiousness, and even Openness/Imagination is already salient in the minds of informants who judge toddlers prior to the preschool years. However, just as there are problems with top-down approaches stretching adult measures for use in adolescents and children, there are problems in the downward stretching of preschool- or middle childhood-appropriate measures to infants and toddlers.

Most importantly, such approaches do not address the question of the extent to which Little Five or Little Six structures fully and adequately represent behavioral individuality in these young children. Therefore, more work is needed to resolve the question how individual differences are best captured in toddlers and infants. One straightforward approach to disentangle infants' and toddlers' trait structure is to scrutinize relevant trait concepts from the broader developmental literature in the youngest age groups. As the cradle of the most prominent temperament models can be found in infancy (Buss & Plomin, 1975; Rothbart, 1981; Thomas & Chess, 1977; Thomas et al., 1963), a simultaneous evaluation of multiple temperament instruments developed for assessment in the first year would be a valuable starting point to delineate the major traits in these youngest groups (De Pauw et al., 2009; Mervielde & De Pauw, 2012). To search for traits beyond those already part of traditional temperament models, in addition, one could collect natural language descriptors of infants and toddlers. There is one small-scaled Slovenian study that has already analyzed free parental descriptions of infants and toddlers (Zupancic, 2004). This study applied the coding scheme as used in the international study of Kohnstamm and colleagues (1998) to classify parents' descriptions of infants/toddlers (mean age 15 months) and preschool children (mean age 50 months). Interestingly, over 80% of parental responses of both groups were coded within the FFM, suggesting that the FFM taxonomy might be useful for describing even younger children than previously thought.

As we discussed in the review for older children, the complementary combination of a top-down approach (items constructed by theorists to assess potentially relevant traits in children) and a bottom-up approach (researchers collected descriptors frequently used by caregivers or researchers analyze fine-grained observations of child behaviors) may have the greatest potential to uncover the most comprehensive trait taxonomies. We advocate a similar approach for research on younger children. In addition, empirical studies, ideally including side-by-side multiple age-appropriate trait measures from multiple temperament and personality frameworks, are needed to further validate these conceptually derived comprehensive sets of traits in early childhood (Caspi & Shiner, 2006; De Pauw et al., 2009). Given the considerable and rapid developmental changes in the first years of life, such empirical research requires measurements at multiple short time intervals, for example, using cohorts of children at 3, 6, 9, 12, 15, and 18 months. Repeated follow-up studies of these samples will make it possible to detect the time in development at which personality-like traits emerge and merge with temperament-based precursors. Such longitudinal work may also help to better understand how trait differences in preverbal children unfold into the personality characteristics that can be readily identified in preschoolers. This line of research has much to gain from an open-minded collaboration between developmental and personality psychologists.

How will we capture change and continuity in personality structure development? In recent years, the improved measurement of children's personality has given an impetus to the study of normative personality development. Multiple studies have now examined mean-level change and differential stability of FFM personality traits prior to adult age, particularly from middle childhood to early adulthood (De Fruyt et al., 2006; de Haan et al., under review; Klimstra et al., 2009; McCrae et al., 2002; Roberts, Walton, & Viechtbauer, 2006; van den Akker et al., 2014). Denissen, van Aken, Penke, and Wood (2013) recently performed a meta-analysis of those studies reporting mean-level age differences in child personality FFM traits, thereby charting differences across early and late adolescence (from 10 to 20 years). Their meta-analysis summarized 14 studies (reporting data on 20 samples, including 16 with a longitudinal design) targeting mean-level differences across this time period. Both caregiver and self-ratings were included in the study, but type of informant was not studied as a moderator. Intriguingly, this meta-analysis found that three personality factors (Neuroticism, Extraversion, and Agreeableness) showed substantial continuity from middle childhood to late adolescence. For Conscientiousness, however, there was evidence of a linear mean-level shape of effect sizes, suggesting that this trait tends to decrease in early adolescence but then increases

later in adolescence. In addition, Openness-to-Experience showed both a linear and quadratic trend, decreasing rather steeply in early adolescence and increasing relatively less steeply later in adolescence.

Recent work on both large cross-sectional (Soto, 2015; Soto et al., 2008, 2011) and longitudinal (de Haan et al., *under review*; van den Akker et al., 2014) samples further replicated these interesting patterns of Conscientiousness and Openness-to-Experience throughout the transition from late childhood into adolescence. Interestingly, these studies also suggest a similar curvilinear age pattern for Agreeableness/Benevolence: This trait tends to increase from middle to late childhood, but temporarily declines from pre- to mid-adolescence, and increases again thereafter. Van den Akker and colleagues (2014) cross-validated these temporary declines in HiPIC Benevolence, Conscientiousness, and Imagination across both mother and child self-ratings of personality. They also demonstrated a temporary decline in Emotional Stability in early adolescence followed by an increase thereafter, but this latter trend was only found in the mother reports. Together, these results are now interpreted as evidence for the “disruption hypothesis” (Soto, 2015), alternatively labeled as “a temporary defiance of the maturity principle” (van den Akker et al., 2014). The “maturity principle” refers to the observation in many adult studies that personality characteristics become gradually more adaptive and desirable. The discussed research hence suggests that early adolescence (10–15 years) is an exception to this maturity principle. During this period, characterized by substantial changes in biological (puberty), psychological (separation-individuation), and social (increased importance of peer relationships) development, personality development shows temporary declines in psychosocial maturity, at least in two or three of the FFM traits (Soto, 2015; van den Akker et al., 2014).

Supplementing this work on big traits, de Haan et al. (*under review*) conducted one of the first long-term longitudinal studies tracing lower-order HiPIC personality facets across two samples, spanning an age range from young childhood to young adulthood. This study provides further evidence that distinctive developmental changes are most apparent in the transition from late childhood to mid-adolescence, particularly for Benevolence and Conscientiousness facets. Moreover, this study emphasizes that even same-dimension facets show idiosyncratic changes, indicating that examining personality development exclusively on the level of higher-order traits might obscure distinctive changes of the more specific, concrete, lower-order facets.

To summarize, recent research reveals important personality changes throughout childhood and adolescence that require further empirical attention and understanding. In addition, it should be noted that even though these changes are salient, they are limited in terms of absolute size. Hence, this research also provides support to the conception that childhood personality traits show both continuity and change (Asendorpf & Denissen, 2006; Denissen et al., 2013). Thus, future research faces the challenge of better understanding the origins and reasons of stability and robustness in personality across the lifespan on the one hand, as well as the multiple aspects of change in personality development on the other.

This research endeavor will benefit from an integration of all retrieved findings on developmental continuity and change into one single hierarchical taxonomy, such as the Big Five or Little Six. Such a taxonomy can serve as a steering framework to “orient developmental research about the origins and sequelae of personality differences across the life course” (John et al., 1994, p. 161). Ideally, this taxonomy will include relevant traits for each age group, which can then be compared across the different stages in development. Using such a taxonomy will enable researchers to chart homotypical and heterotypical paths of personality development and to study how different phenotypes are linked to one another across time (Caspi et al., 2005; Caspi & Shiner, 2006). To trace the developing structure of personality from infancy to old age, such a taxonomy should be necessarily conceptualized as a dynamic evolving system. For example, a trait conceived as a facet at a younger age might evolve into a more encompassing behavioral trait later in life, so that it becomes a domain rather than a facet. Conversely, a trait that subsumes broader content in childhood may become a more specific personality feature when children get older and may become a more crystallized, stand-alone trait at older ages.

Methodological issues: The need for more varied methods and informants. To close this second part of the chapter, we briefly highlight some methodological problems still plaguing research on childhood personality.

Informant troubles. First, the overreliance on questionnaires is a well-known concern for adult personality research that also applies to child personality research. In adults, personality structure is primarily derived from self-report questionnaires. In younger populations, and particularly in children, self-

report measures are generally not the first option, given the nature of language and cognitive development in these age groups. Hence, the personality structure of children and adolescents is derived almost by default from ratings by parents or teachers. Given this overreliance on caregiver reports critics may wonder whether the Big Five/Little Six structure identified so consistently across studies exists mainly or only in the mind of adult perceivers. Therefore, it is imperative to unravel when and how children's perceptions of themselves and significant others develop. This is important not only from a developmental point of view, but also to gain further insight in the developmental roots of the FFM and its generalizability across the lifespan (Mervielde & De Fruyt, 2000).

In Table 12.2, we summarized the evidence retrieving FFM-like dimensions based upon children and adolescents' self-reports and peer-reports. This summary shows that children above age 10 can reliably and validly provide self-reports on their personality characteristics. Yet when we consider the factor-analytic evidence from more bottom-up strategies (e.g., of CCQ sorts or adjective lists), multiple studies have reported deviant factor structures emerging from adolescents' self-reports and peer-reports (e.g., Mervielde & De Fruyt, 2000; Scholte et al., 1997; Van Lieshout & Haselager, 1994). Hence, the question when the Big Five/Little Six structure emerges in youngsters' self-reports cannot be considered as fully answered.

In this regard, there is one interesting study suggesting that the FFM structure might already show up in self-descriptions of personality in early to middle childhood. Measelle, John, Ablow, Cowan, and Cowan (2005) found that young children aged 5 to 7 years could already provide meaningful, longitudinally stable, and reliable self-descriptions on top-down-derived FFM dimensions when they were administered an age-appropriate puppet interview (Berkeley Puppet Interview). Interestingly, the authors noticed that these Big Five self-perceptions became more differentiated across a 2-year interval. By age 5 years, there was substantial convergence between the children's self-reports and adult ratings on Extraversion, Agreeableness, and Conscientiousness. By age 6 and 7 years, convergence between raters was shown for Neuroticism and Openness-to-Experience, respectively (Measelle et al., 2005). However, more research is needed to replicate these findings and to determine from what age children's self-reports can be used to describe their own personalities. One other study, for example, has been less successful in determining reliable and valid FFM-like factors from a similar puppet interview in 4- and 5-year-old children's self-reports (Roth, Dadds, & McAloon, 2004).

Validation across raters and instruments. As noted throughout the discussion of measurement, very few studies have simultaneously included teacher-ratings, parent-ratings, and self-ratings of child personality measures [but for exceptions see Barbaranelli et al. (2003) and van den Akker, Dekovic, & Prinzie (2010)]. As a consequence, validity and replicability across raters have not been examined systematically for most contemporary child personality measures. A further crucial validation issue pertains to the empirical convergence across these wide sets of currently available instruments. In contrast with the well-documented relations among common FFM measures in adulthood (e.g., John et al., 2008; Markon et al., 2005), surprisingly few studies have included and compared multiple coexisting measures for child personality. As an exception, Tackett and colleagues (2013) recently provided a rigorous evaluation of the empirical congruence between two well-established bottom-up child personality measures, that is, the HiPIC (English translation version) and the short version of the ICID(-S). This study demonstrated clear convergence between the higher-order domains of both instruments within the same sample, with the highest correlations between analogous traits in each measure. Notably, this analysis also documented some asymmetries in content between the two measures. Most outstandingly, unique variance in ICID-S Openness positively predicted HiPIC Extraversion, whereas HiPIC Imagination negatively predicted ICID-S Extraversion. In addition, some marked divergences in predictive validity of these measures were noted. For example, this study identified HiPIC Benevolence as being a strong negative predictor of internalizing problems but with ICID-S Agreeableness being a strong but positive predictor of internalizing problems. This positive connection between ICID-S Agreeableness and internalizing is surprising and requires further consideration. According to the authors, the positive link with internalizing might reflect the "nonantagonistic" content captured by the ICID trait. In this way, this positive relation would corroborate the evidence in adult groups that extreme elevations in Agreeableness (e.g., being overly accommodating, self-sacrificing, or self-effacing) are a risk factor for internalizing symptoms (Widiger, 2011). This effect could also reflect the more heterogeneous content of this trait as ICID-S Agreeableness includes the facets Considerate, Compliant, Antagonism, and Strong-Willed, as well as the subscales Positive Emotions and Negative Affect (Deal et al.,

2007). Alternatively, this phenomenon may be caused by the fact that different facets within ICID-S Agreeableness and HiPIC Benevolence may manifest differential and idiosyncratic predictive patterns. These differential effects are then obscured if only the higher-order dimensions are considered. This notion is supported by recent longitudinal evidence on the HiPIC facets. This study revealed that two facet scales of Benevolence, Irritability and Altruism, positively predicted pathways of elevated anxious and depressive symptoms. Moreover, the facet Compliance positively predicted pathways of elevated anxiety (Prinzie et al., 2014).

Taken together, this discussion emphasizes that there is no guarantee that semantically similar labels actually share the same trait variance (i.e., the jingle-jangle fallacy mentioned before), so that researchers, particularly in the study of childhood individual differences, should be extremely cautious to judge traits of different frameworks only by their labels (De Pauw et al., 2009). Moreover, this discussion strongly emphasizes the need for research that thoroughly addresses the differential patterns of the lower-order facets across development (e.g., Becht et al., 2015; de Haan et al., under review; Prinzie et al., 2014).

Validation across cultures. The cross-cultural generalizability of personality structure in childhood also remains a vital yet understudied topic in child personality research (Caspi et al., 2005; Tackett et al., 2012). As an exception, Tackett and colleagues (2012) have evaluated hierarchical personality structures based upon parent ratings of the ICID-long version across five countries and four age groups. Based upon the “bass-ackwards method” of Goldberg (2006), this study provided strong evidence that the hypothesized FFM-like structure of the ICID could be replicated across all countries and was already salient in the youngest age groups. Interestingly, some of the differences between child and adult taxonomies discussed before (i.e., the prominence of antagonism in Agreeableness and the covariation of Conscientiousness-Intellect in childhood) were found to replicate across countries. Yet more work is welcomed to further investigate cross-cultural differences in emergent personality in youth, potential cultural differences in informants and methods, and in the role that culture plays in shaping youngsters’ personality throughout development (Tackett et al., 2012).

Moving beyond questionnaires. Finally, there is a clear need to go beyond the classic approach of administering questionnaires in order to establish child personality structure by more varied methods and reporters. Future research should aim to validate the questionnaire ratings of child personality with other methodological approaches, such as behavioral tasks or observational measures. Such behavioral observation research (for example, coding thin slices of behavioral observations) has been successfully carried out in adult FFM research (Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004; Borkenau, Riemann, Angleitner, & Spinath, 2001) but is only very limited in the study of child personality (for exceptions see Markey, Markey, & Tinsley, 2004; Tackett, Herzhoff, Kushner, & Rule, 2015). In further pursuing this line of work, inspiration can be gathered from temperament research (Shiner & DeYoung, 2013) in which there is a rich tradition of relying not only on questionnaires but also on other methods, such as home observation systems, to code naturalistic observations of children (Buckley, Klein, Durbin, Hayden, & Moerk, 2002) and laboratory tasks that elicit specific contexts in which children’s behaviors can be observed and coded (Goldsmith & Rothbart, 1999; Majdandzic & van den Boom, 2007).

Lessons from Research on Temperament

Toward a More Comprehensive Taxonomy of Childhood Traits

In the conclusion of the preceding section, we argued that research on children’s personality structure may benefit from the methodological diversity typical for research in the temperament tradition. In addition, a more essential question can be raised: How does childhood personality relate—in substantive terms—to this historical “sovereign framework” for trait description in youth? For too many years, research on child personality has been proceeding in relative isolation from research on child temperament. As a consequence, our current understanding of the convergence between adult and child personality is greater than our understanding of the convergence between child temperament and child personality (De Pauw & Mervielde, 2010; Tackett, 2006). In this final part of the chapter, we address the understudied topic of temperament-personality convergence. Integrating all reviewed information on childhood personality and temperament, we finally propose a more comprehensive taxonomy of trait differences in childhood.

The stretching of temperament and personality concepts. There is a historical reason why temperament and personality research are not better integrated. Temperament researchers have primarily focused on individual differences among infants, toddlers, and preschoolers (Buss & Plomin, 1984; Rothbart, 1981; Rothbart & Ahadi, 1994; Thomas et al., 1963) whereas personality psychologists primarily targeted traits in adults (John et al., 2008). To document the continuity of temperament in older age groups, theorists have stretched their constructs to suit school-aged children (Hegvik, McDevitt, & Carey, 1982; Simonds & Rothbart, 2004), adolescents (Capaldi & Rothbart, 1992), and even adults (Evans & Rothbart, 2007; Thomas, Mittelman, Chess, Korn, & Cohen, 1982). Notably, this operation entails the reverse movement of the one we discussed for top-down child personality research, where adult-oriented personality models have been adapted downward to document the relevance in younger ages. The risk of both stretching operations is that they may have narrowed the scope and representativeness of the sampled behavioral repertoires. More specifically, these stretching operations have presumably narrowed the representativeness of the sampled behavioral repertoires of temperament for older groups and of personality for younger groups. Nevertheless, these stretching operations have resulted in the current availability of coexisting temperament and personality measures that can be used by researchers and practitioners in almost all age groups (except in infants and toddlers). As we aim to compile a more comprehensive trait taxonomy based upon both the child personality and temperament tradition, we first discuss the major trait content embedded in the most prominent temperament models.

What's in temperament? Historically, temperament has been studied intensively from the 1960s, primarily by developmental psychologists. However, after more than 60 years of discussion, there is still no clear consensus on a single model, definition, or on the main dimensions underlying temperamental variation of children (Goldsmith et al., 1987; Mervielde & De Pauw, 2012). Here, we briefly sketch the content of three temperament models that have generated the most theoretical and methodological contributions. These are the models of Thomas and Chess et al. (1963, 1977), Buss and Plomin (1975, 1984), and Rothbart (1981, 2012).

Thomas and Chess. In their landmark New York Longitudinal Study, Alexander Thomas and Stella Chess followed the development of 138 babies from white middle-class families and 95 infants from economically disadvantaged families, using extensive observations, psychiatric assessments, and in-depth interviews with caregivers (Thomas et al., 1963; Thomas & Chess, 1977). They became intrigued by the marked differences that could already be observed very early in development. They first described these differences as “primary, innate response patterns.” Notably, these differences were not easily explained by the prevailing behavioristic or psychoanalytical paradigms of that time. As such, their work launched the scientific study of early apparent, relatively stable, internal individual differences, under the label of temperament.

According to Thomas and Chess (1977), temperament refers to stylistic (e.g., how intense does an infant cry) rather than motivational (e.g., why does an infant cry) or content (e.g., what does an infant do while crying) aspects of behavior. From inductive content analysis of interviews with 22 parents of infants, Thomas and Chess derived nine “behavioral styles” that they considered relevant for the child’s later psychosocial adjustment. These traits were (1) Activity level, (2) Rhythmicity of biological functions, (3) Approach or withdrawal from new stimuli, (4) Adaptability to new situations, (5) Threshold of sensory responsiveness, (6) Intensity of emotional reactions regardless of their positive or negative quality, (7) General quality of mood (e.g., being either pleasant or irritable), (8) Distractibility (e.g., the capacity for external stimuli to interrupt a child’s behavior), and (9) Task persistence or the degree to which a child can sustain attention.

These traits were first identified in infants, but were later also assumed to be fundamental in toddlers, preschoolers, and primary school age. Even though the same nine dimensions are presumed to exist across the lifespan, behavioral styles theory emphasizes that these nine behavioral styles are manifested in different behaviors throughout development, analogous to the growing behavioral repertoire of the child. Hence, this tradition emphasizes the need for age-specific item sets for assessing the nine behavioral styles. Notably, the assumed basic traits are identically labeled from infancy to late childhood (even though they are assessed with different items), except for the trait Rhythmicity, which was described as Predictability/Quality of Organization in middle childhood (Hegvik et al., 1982). In this age group, this trait is broader than

rhythmicity in biological functions (e.g., sleeping and eating) but taps more overall predictability as well as task performance.

Even though Thomas and Chess's nine-dimensional conceptualization is still well represented in past and present research, there appears little empirical support for the proposed nine-dimensional structure. A dozen item-level factor analyses of behavioral styles instruments were reviewed by [Martin, Wisenbaker, and Huttunen \(1994\)](#) and [Presley and Martin \(1994\)](#). These authors suggested that four rather than nine factors are sufficient to categorize the items. These dimensions were labeled Irritable Distress, Social Inhibition, Activity, and Attention.

Buss and Plomin. Whereas Thomas and Chess initially focused on traits appearing in infancy, Arnold Buss and Robert Plomin ([1975](#), [1984](#)) chose to focus on traits that show relative continuity from infancy into adulthood. As such, they framed temperament as being the developmental precursor of later developing personality. They proposed five inclusion criteria, specifying that a trait can be considered truly as "temperament" only if it is substantially heritable, apparent in phylogenetic relatives, evolutionary adaptive, and if it is relatively stable during childhood and retained into adulthood. From these criteria, [Buss and Plomin \(1975\)](#) proposed that only four traits can be considered as truly temperamental in nature. These traits were Emotionality (i.e., intensity of emotion, first undifferentiated distress but later focusing on both fear and anger), Activity (i.e., quantity of motor activity), Sociability (i.e., closeness to others), and Impulsivity (i.e., quickness versus inhibition). This latter dimension was later dropped because the evidence for the heritability of impulsivity was mixed. Also, in the latest version of their model, [Buss and Plomin \(1984\)](#) make a theoretical distinction between the traits Sociability (i.e., the preference for interaction with others) and Shyness (i.e., feeling uncomfortable in the interaction with unfamiliar others). In empirical studies, however, it remains difficult to distinguish these two traits through factor analysis ([De Pauw et al., 2009](#); [Gasman et al., 2002](#); [Mervielde & De Pauw, 2012](#)). The work of [Buss and Plomin \(1984\)](#) is unique as it points researchers to the importance of understanding trait consistency across multiple age groups. Moreover, even though their model is criticized as painting a too narrow picture of temperament, they have identified some of the most important traits appearing across temperament models ([Shiner & DeYoung, 2013](#)).

Rothbart. Mary Rothbart's ([1981](#), [2012](#)) model is without a doubt the most popular model in contemporary temperament research. Inspired by the great discoveries in psychobiology in the 1970s and 1980s, she extended the original temperament construct of Thomas and Chess to also encompass emotional, motivational, and attentional processes. Rothbart ([1981](#), [2012](#)) defined temperament as "constitutional differences in reactivity and self-regulation," with "constitutional" referring to the biological make-up of a person. In Rothbart's model, temperamental differences are determined by the responsiveness of underlying neural systems. Reactivity then refers to the extent to which these neural systems are aroused. These systems are primarily systems responsible for emotional (affect), physical (active), and orienting (attention) responses. Self-regulation, then, refers to the processes that make it possible to control and modulate this reactivity. These differences in reactivity and self-regulation are considered to be relatively consistent across situations and time, but their expressions can be modified by heredity, maturation, and experience. Hence, according to Rothbart's theory, new temperament traits may emerge over time, for example, in response to new challenging developmental tasks or as a result of physiological maturation in a child.

Even though this model has strong psychobiological underpinnings, its default assessment method has also been caregiver questionnaires. Initially, Rothbart developed her model to describe temperament in the first year of life. In the past two decades, the model was conceptually and methodologically extended to older age groups, first to preschool and young school children ([Rothbart & Ahadi, 1994](#)) and then to adolescents ([Capaldi & Rothbart, 1992](#)), and only recently, to toddlers ([Putnam, Gartstein, & Rothbart, 2006](#)) and adults ([Evans & Rothbart, 2007](#)). It can be noted that these extensions were primarily developed as part of doctoral dissertations. The principal aim of these studies was to link temperamental differences to other important developmental constructs (e.g., puberty, reward sensitivity). As such, Rothbart and her students were primarily interested in identifying temperamental indicators of salient neurological systems in specific age groups, rather than in constructing comprehensive temperament taxonomies across these age groups. Consequently, the multiple questionnaires developed for the multiple age groups show only limited consideration of traits that were already found in younger or older age groups. As a result, Rothbart's instruments vary markedly in the number and content of proposed lower-order traits ([Putnam, Ellis, &](#)

Rothbart, 2001). This large variety of lower-order temperament scales is a major impediment for longitudinal research with this model because it is not clear whether changes in temperament across age groups reflect true developmental changes or only differences in measurement (Mervielde & De Pauw, 2012). Moreover, given the nonsystematic and primarily theory-driven construction of Rothbart's measures, it is hard to establish the comprehensiveness of the proposed taxonomies for each age group.

Nevertheless, factor analyses of Rothbart and colleagues' measures yield strong support for the conception that three trait dimensions underlie temperament ratings from infancy through late childhood (Rothbart & Bates, 2006; Rothbart, 2012). These dimensions are labeled Negative Affect, Surgency, and Effortful Control. Negative Affect refers to children's tendencies toward a wide range of negative emotions such as sadness, fear, anxiety, and difficulty to be soothed after high arousal, but also encompasses irritability and frustration. Surgency taps into children's levels of energy and physical activity, and rapid approach but also expressions of positive emotions, pleasure and excitement in social interaction. Effortful Control refers to individual differences in focusing and sustaining attention, and inhibiting dominant responses in favor of a subdominant response. Whereas these differences in self-control typically become most apparent in the second and third year of life (Kochanska & Knaack, 2003), individual differences in focusing and sustaining attention can already be detected in infants. This precursor of Effortful control is labeled Orienting Regulation. This trait shows substantial cross-time correlations with Effortful Control assessed in toddler and preschool age (Putnam et al., 2001; Putnam, Rothbart, & Gartstein, 2008).

Notably, in more recent conceptualizations of her framework, Rothbart has suggested that the broader Negative Affect-trait might be decomposed into Anxious Distress versus Irritable Distress to accommodate the empirical observation that Negative Affect strongly relates to both internalizing and externalizing problems (Rothbart & Posner, 2006). Interestingly, this distinction mirrors the distinction made in bottom-up child personality taxonomies between Anxious and Irritable Distress (John et al., 1994). Another notable recent evolution in Rothbart's model pertains to the content of Effortful Control. In Rothbart's taxonomies for toddlers, preschoolers, and school children (but not in adolescents), this trait encompasses pleasure in low-intensity activities (e.g., enjoys looking at picture books, enjoys sitting in the sun), and sensitivity to perceptual experiences (e.g., notices the smoothness or roughness of objects she or he touches). Recent research (De Pauw et al., 2009; Herzhoff & Tackett, 2012) now suggests that these scales form a separate Sensitivity trait, distinct from the more attention-focused trait of Effortful Control. Delineating Sensitivity as a distinct childhood trait would hence result in a better alignment of Rothbart's child and adult temperament taxonomies. In the recently developed taxonomy for adults, similar Sensitivity traits are subsumed by a fourth higher-order domain, which is labeled Orienting Sensitivity (Evans & Rothbart, 2007). Finally, Rothbart's taxonomies for adolescents also propose another higher-order trait, which relates to the need to spend time with significant others; this trait is labeled Need for Affiliation.

Are We There Yet? What Is the Basic Structure of Temperament?

As noted, all three "classic" temperament traditions had their cradle in infant research and were later stretched to older age groups. Moreover, all three models have their original roots in the conceptualization of Thomas and Chess (1977). Both Buss and Plomin (1975) and Rothbart (1981) departed from Thomas and Chess's original framework, modifying and extending it with their specific emphases about the nature of temperament. The resulting taxonomies hence can be considered as the product of primarily top-down and theory-driven construction methods (Halverson et al., 2003). This implies that it is uncertain whether important domains were excluded because these theorists were not interested in them, or that dimensions were included because the theorists wrote many items to measure what they believed to be important (Halverson et al., 2003).

Therefore, it is not surprising that there is insufficient agreement on the dimensional structure among the different models of temperament (Halverson et al., 2003; Mervielde & De Pauw, 2012). This deficient empirical validation of the theoretical underpinnings can be considered a major weakness of temperament research, which has resulted in an uncontrolled growth of disparate measures capturing all sorts of temperament traits. In this regard, the dearth of empirical studies that link the various temperament models and accompanying instruments is notorious (De Pauw et al., 2009; Mervielde & De Pauw, 2012).

As a consequence of this lack of empirical evidence, scholars interested in the basic structure of temperament are forced to turn to narrative, semantic analyses to condense the multitude of proposed temperament traits into a higher-order structure. Such reviews (e.g., Rothbart & Bates, 2006; Shiner & Caspi, 2003) now generally agree that child temperament can be summarized by at least three higher-order traits: Surgency/Positive Emotionality, Negative Emotionality/Affect, and Effortful Control/Constraint (notice that these labels are primarily Rothbart's terminology). Other reviews (De Pauw & Mervielde, 2010; Mervielde et al., 2005) have also followed the suggestion of Buss and Plomin (1975) to separate Activity from Sociability/Extraversion. These narrative reviews have had tremendous value in advancing the integration of temperament findings across studies and models. Yet these narrative reviews have most strongly relied on the more conveniently arranged set of theoretically proposed dimensions instead of on the host of empirically derived age-specific temperament factors across studies (De Pauw et al., 2009; Mervielde & De Pauw, 2012). To empirically delineate the basic structure of child temperament definitely remains a key priority for future research.

How Shall We Conceive the Linkages between Child Personality and Temperament?

The narratively identified traits in child temperament show striking similarities to the higher-order traits of child personality. Therefore, the most crucial questions remain: How should we conceive the linkages between child temperament and child personality? And, how shall we speak of individual trait differences in youth? Do we need separate temperament and personality frameworks? These key questions have fueled some fiery conference and email discussions in the past decades, with temperament adherents making strong calls to perpetuate the distinction and with (mainly adult) personality adherents pleading to simply conceptualize all child trait differences as personality. Here, we review some important arguments and recent evolutions in this debate.

Temperament is not the biologically based precursor of personality. Even though temperament scholars have had their disputes concerning the nature and number of dimensions, there is a general consensus that temperament forms the biologically based foundation of later-developing personality (Buss & Plomin, 1984; Goldsmith et al., 1987; Rothbart & Bates, 2006). In some temperament models, this relation is seen as a sequence, with temperamental traits being the early building blocks of substrates that develop into more complex personality traits over time (Cicchetti, 1990). The environment is assumed to interact with temperament to produce personality (Kagan, Snidman, Zentner, & Peterson, 1999). Another viewpoint holds that temperament is a lifelong, yet distinct, component of personality. This position is, for example, asserted by Rothbart and Ahadi (1994), who emphasize that the "personality domain contains much more than temperament," such as patterns of habitual behavioral skills, content of individual thoughts, values, needs, and goals, and perceptions of self, others, and events.

Definitely, personality can be conceived as a broader concept than temperament (Shiner & DeYoung, 2013). For instance, McAdams and Pals (2006) distinguish three different levels within the study of personality: basic traits, characteristic adaptations, and personal narratives. First, the *basic traits* are the relative consistencies in behavior, emotions, and cognitions across contexts and across time, and have—at least in adults—the Big Five as the underlying structure. Second, the *characteristic adaptations* are a wide range of motivational, social-cognitive, and developmental adaptations that are specific to a particular time, place, or role. These are, for example, the goals and values that an individual holds regarding academic performance or romantic relationships. Finally, from adolescence on, humans begin to form *personal narratives*, which help them to make sense of their identities and selves over time. These narratives are totally unique to each person but can be studied empirically in terms of their common features across individuals. Yet, even though personality can and should be studied well beyond this level, the study of basic traits remains the most prevalent approach in personality psychology (and all research reviewed in this chapter).

At this level of *basic traits*, temperament and personality are hard to distinguish empirically (for a review see McCrae et al., 2000; Shiner & DeYoung, 2013). Arguments against this historical divide stem from behavioral genetic studies (both temperament and personality traits arise from the complex interplay of genes and experience, including personality-only traits such as Openness-to-Experience and Agreeableness), ethological studies (animals display proxies of the most important temperament traits in childhood and of all

key personality traits in adulthood), as well as longitudinal studies (both temperament and personality show substantial stability and change across time). Other salient arguments arise from the reviewed evidence in the first two parts of this chapter, documenting that individual differences manifested by children beyond age 3 (and perhaps younger) can be rightfully considered as “personality.” Moreover, the strong conceptual similarities across childhood temperament and personality further indicate that the distinction between these constructs is more the historical result of research traditions than a substantive matter.

The FFM seems relevant, yet not sufficient to embrace both domains Based on the evidence reviewed here, prominent scholars now agree that temperament and personality systems have many traits in common (Rothbart, 2012; Rothbart & Bates, 2006; Shiner, 1998), and that temperament and personality increasingly appear to be “more alike than different” (Caspi et al., 2005; Caspi & Shiner, 2006, 2008; De Pauw & Mervielde, 2010; Mervielde et al., 2005; Shiner, 1998; Shiner & Caspi, 2003; Shiner & DeYoung, 2013). In a number of seminal, yet primarily narrative, reviews (e.g., Caspi et al., 2005; De Pauw & Mervielde, 2010; Mervielde et al., 2005), it has been argued that the Five Factor Model, as retrieved in adults, appears to embrace the content embedded in both trait systems. These reviews consider the FFM dimensions as overarching dimensions in a preliminary joint taxonomy capturing both temperament and personality. In this taxonomy, it is hypothesized that the FFM dimensions of Neuroticism, Extraversion, and Conscientiousness represent the three temperament domains of Negative Emotionality, Surgency/Positive Emotionality, and Effortful Control/Constraint, respectively. In this joint view, the child personality system is considered the most comprehensive because it also includes Agreeableness and Openness-to-Experience, traits that have not been recognized as major temperament dimensions. Notably, the latest version of this taxonomy (Shiner & DeYoung, 2013) also incorporates the recent emphasis on Activity in child personality as well as temperament research. This version no longer proposes the FFM, but the Little Six as higher-order underpinnings of a joint taxonomy.

These reviews and their proposed taxonomies have had great significance in improving communication among researchers using different trait concepts, and in integrating research findings across different research traditions and disciplines. Yet we emphasize that these taxonomies too were necessarily based on narrative analyses and conceptual comparisons, because empirical studies on temperament and personality have been essentially lacking.

More empirical work is needed to disentangle temperament–personality relations. In recent years, such empirical research relating temperament and personality has become available slowly but steadily. A handful of studies have been conducted in adults (Angleitner & Ostendorf, 1994; Evans & Rothbart, 2007; McCrae & Costa, 1985) and, more recently, in children (De Pauw & Mervielde, 2011; De Pauw et al., 2009; De Pauw, Mervielde, Van Leeuwen, & De Clercq, 2011; Deal et al., 2007; Grist et al., 2012; Halverson et al., 2003; Tackett et al., 2013). In both adults and in children, consistent support has now been found for the expected associations of temperamental Negative Affect, Surgency/Positive Emotions, and Effortful Control/Constraint with FFM-based scores on Neuroticism, Extraversion, and Conscientiousness, respectively.

However, in all the above identified studies, it is consistently noted that the mapping of temperament on FFM personality is less clean as would be expected by the semantic similarity of scale labels. There appears to be no perfect one-to-one correspondence between the expected connections, so that a simple hierarchical mapping fails to capture the complexity of these interrelations. These observations indicate that temperament and personality cannot be considered as totally redundant systems of child trait differences. Instead, these findings imply that temperament and child personality scales capture unique as well as overlapping variance (De Pauw et al., 2009, 2011; Tackett et al., 2013).

Strikingly, these reports also suggest that content related to the FFM traits Agreeableness/Benevolence and even Openness-to-Experience/Imagination is not entirely missing in temperament models. Studies have remarkably converged in demonstrating substantial connections between Agreeableness/Benevolence and negative Affect/Emotionality traits (e.g., De Pauw & Mervielde, 2011; De Pauw et al., 2009, 2011; Evans & Rothbart, 2007; Tackett et al., 2013) and between Agreeableness/Benevolence and temperament scales capturing Impulsivity, Activity, and Effortful Control (e.g., De Pauw & Mervielde, 2011; De Pauw et al., 2009, 2011; Deal et al., 2007). In addition, multiple studies have now also identified substantial correlations between Openness-to-Experience/Intellect scales and Rothbart’s Effortful Control scale (De Pauw et al., 2009; Evans & Rothbart, 2007; Grist et al., 2012; Herzhoff & Tackett, 2012; Tackett et al., 2013).

One study (De Pauw et al., 2009) went beyond simple correlational convergence. In a sample of 4- to 5-year-old children, we carried out a joint principal component analysis of HiPIC personality facets as well as facets from the three described temperament measures. We retrieved six dimensions rather than the supposed FFM dimensions. These were labeled Activity, Sociability, Emotionality, Disagreeableness, Conscientiousness, and a sixth unexpected factor, which was labeled Sensitivity. This latter factor is defined by specific content from Rothbart's childhood Effortful Control scale. As already noted in the appraisal of Rothbart's model, a similar Sensitivity trait has been identified in her adult temperament taxonomy. Also, as noted in the research suggestions to recover more childhood analogs of Openness-to-Experience/Intellect, research has now repeatedly shown substantial connections between Sensitivity-related content and Openness-to-Experience-related content in both adults (Evans & Rothbart, 2007) and children (De Pauw et al., 2009; Herzhoff & Tackett, 2012). Yet more work is definitely needed to further establish whether these two traits should be integrated into a single dimension in childhood. In this regard, in the joint component analysis in preschoolers, all HiPIC Imagination facets loaded on a broader Conscientiousness factor. Interestingly, the separate HiPIC principal-component analysis clearly differentiated between the two domains. Hence, it is possible that the imbalance of imagination-related content across temperament and personality languages has precluded the Imagination trait from surfacing as a major independent dimension in this study (De Pauw et al., 2009).

To summarize, the empirical relationships between temperament and personality traits have not been addressed comprehensively (De Pauw & Mervielde, 2010; De Pauw et al., 2009; Tackett et al., 2013). The substantial empirical links between temperament and personality traits suggest that both systems are indeed "more alike than different" (Caspi et al., 2005, p. 454), but that they are less redundant than expected on the basis of the semantic similarities of scale labels.

Temperament and Personality as Complementary Languages of Trait Differences

So, how shall we speak about individual differences in children and adolescents: as temperament or as personality or as temperament *and* as personality? Both temperament and personality taxonomies can be considered as reliable and valid "languages" to describe childhood traits (De Pauw & Mervielde, 2011; De Pauw et al., 2009, 2011). These languages are clearly related, yet also complement each other as measures of individual differences in childhood and adolescence. How much unique and shared "vocabulary" these two languages have in describing behavioral individuality across developmental age groups remains a critical question for future empirical research.

Based on their historical backgrounds, the temperament language presumably provides the richest lexicon for the younger age groups, whereas the personality language presumably provides the richest lexicon for older age groups. The reviewed evidence encourages the continuous evaluation of both similarities and differences between the temperament and personality measures in further studies. Also, it seems vitally important that researchers interested in integrating study findings across temperament and personality frameworks take into account these salient differences between temperament and personality "vocabulary" and avoid an assimilation of findings based solely on semantic similarity.

With these cautionary notes in mind, we have drafted a new version of a preliminary joint taxonomy of temperament and personality traits (presented in Table 12.3). In this taxonomy, we attempted to integrate in a nuanced fashion many reviewed convergences between adult and child personality taxonomies on the one hand, and between child personality and temperament taxonomies on the other. For example, at the top row, the higher-order structure differentiates between seven potential basic traits. With this proposal for a differentiated structure, we encourage researchers to further inquire the separateness of Activity from Sociability (see the comments on child Extraversion), of Openness /Imagination from Conscientiousness, and of Sensitivity from Openness /Imagination.

In addition, we encourage researchers to take a developmental approach to further unravel the basic structure underlying youth's traits. The way the taxonomy is displayed in Table 12.3 may mistakenly suggest that the temperament/personality structure is static and can be applied invariantly across childhood and adolescence. We hope that future research will yield more insights in the rapid developmental changes that determine children's personality development. In this regard, more empirical work on the lower-order structure of childhood traits is definitely needed. The middle row of Table 12.3 summarizes some of the

most important groupings that are identified throughout the temperament and personality languages. These facet-level traits can be considered as capturing an important part of the mid-level of a joint childhood trait taxonomy. Moreover, we have underlined the facet traits (primarily stemming from temperament) that are well-established to be readily observable in preverbal children ([Caspi & Shiner, 2006](#); [Rothbart & Bates, 2006](#); [Shiner, 1998](#)).

A final goal of this taxonomy is to encourage future joint factor analytic work in order to enable decisions on the location of “ambiguous” traits ([Caspi & Shiner, 2006](#); [Rothbart & Bates, 2006](#)). These traits appear to show coherent conceptual or empirical linkages to more than one higher-order trait across the different temperament and/or personality languages. Some of the most salient “conceptual blends” are summarized in the bottom row of the taxonomy.

Summary

This chapter discussed state-of-the-art insights in child and adolescent personality, addressing salient questions on its measurement, its foundational structure, and its convergence with child temperament. First, we discussed the discovery and contemporary measurement of personality in youth, highlighting pitfalls as well as promises of the various approaches. Second, we pleaded for the study of child personality traits in its own right, rather than assuming that child personality taxonomies are identical to those established in adults. Finally, we reviewed how the relationships between child temperament and child personality are more messy than one would hope and noted that a simple hierarchical mapping fails to capture the complexity of these relationships. Instead, we advocated to consider temperament and personality to be “more alike than different” trait systems but also as systems that adequately complement each other as “languages” of individual differences. Researchers from both personality and developmental psychology are invited to take into account the salient differences between the various child personality approaches, child and adult personality taxonomies, and child temperament and personality “vocabularies.” In addition, researchers are invited to avoid assimilation of trait findings in childhood based solely on the semantic similarity of labels.

Acknowledgments

This manuscript is dedicated to the memory of Ivan Mervielde (1947-2011) and his pioneering research identifying developmental antecedents of the Five Factor-Model in childhood and adolescence.

Table 12.3 A Common Taxonomy of Temperament and Personality in Children and Adolescents

Domain Level	Activity	Sociability	Emotionality	Benevolence	Conscientiousness	Openness–Intellect ^{a,b}	Sensitivity ^b
Abbreviation	ACT	SOC	EMO	BEN	CON	OPE	SEN
Alternative labels	Activity level, Surgency	Positive Emotionality, Surgency, Extraversion	Negative Emotionality, Emotional Stability [®] , Neuroticism	Agreeableness, Friendliness, Love, Hostility [®]	Task Persistence, Constraint, Effortful Control	Intellect, Imagination, Openness-to-experience	Sensory threshold
Facet level	Activity level (energy, physical restlessness)	Positive emotions (joy, pleasure)	Anxious distress (fear, anxiety). Affective distress	Antagonism [®] , Egoentrism [®] , Willfulness [®] , Compliance	Attention control, Concentration, Activation control, Perseverance, Orderliness, Achievement motivation	Intellect Creativity Curiosity Open-to-fantasy	Orienting sensitivity Perceptual sensitivity Aesthetic sensitivity Affective sensitivity
High Intensity Pleasure	Sociability	(sadness, discomfort, soothability)	Empathy, Altruism, Prosocial tendencies				
Pleasure	Need for Affiliation Expressiveness Optimism	Self-confidence					
				Warmth, Trust			
Conceptual blends	SOC + ACT	SOC [®] + EMO	EMO + BEN [®]	BEN [®] + SOC [®]	CON [®] + BEN [®] + ACT	CON + OPE	EMO [®] + OPE
Talkativeness	Social Inhibition, Withdrawal, Shyness	Irritable distress (anger/frustration)	Manageability [®]	Dominance, Assertiveness	Impulsivity [®] , Inhibitory control	Mastery motivation Absorption	Resourcefulness

Note. Traits denoted with [®] should be interpreted as reversed coded. Traits marked in italics are primarily derived from personality literature. Traits that are underlined are well-established as recognizable in preverbal children.

^a Research suggests that Openness-to-Experience scales are strongly related to Conscientiousness in preschool children.

^b Some research suggests that Sensitivity might be subsumed by childhood Openness-to-Experience, but this should be further validated empirically.

Alexander Weiss and Marieke C. Gartner

Abstract

Animal personality has been studied for decades, and a recent renaissance in the field has revealed links to health and life outcomes that echo those found in humans. Some of this research is tied to the Five Factor Model—the predominant model of human personality—which informs animal personality research as well, and allows for comparative work that points to evolutionary pathways that delineate phylogenetic continuity. From personality facets and traits to factors, this work has implications for human and nonhuman animal genetics, life history strategies, survival, and well-being, as well as development and social relationships. Working together, scientists from a variety of fields who study personality can hope to puzzle out causality, use personality as a tool for health, and simply define personality, across species, and therefore evolutionary time.

Key Words: animal, behavioral syndrome, coping styles, evolution, genetics, health, personality, phylogeny, temperament, well-being

Animal personality research is a major endeavor in fields ranging from comparative psychology to evolutionary biology to the agricultural and veterinary sciences. As a consequence, there are multiple approaches to studying personality in animals, some being rooted in older research traditions and others that are just being developed. Although much has been written about what can be learned about animal personality by understanding more about human personality, including the Five Factor Model ([Digman, 1990](#)), we will show that the converse is also true.

A Brief History

Early Origins

The observations that animals are consistent in how they behave, how they react to the world, and even how they perceive the world probably originated long before modern psychology or biology. In the scientific sense,

the study of animal personality has a pedigree that extends at least as far back as to Charles Darwin's *The Expression of the Emotions in Man and Animals* (Darwin, 1872/1998).

More recent origins of the idea that animals have personality goes back to Pavlov, who described four types of personality profiles or, to use his terminology, "nervous system types" (excitable, lively, calm, and inhibited; Pavlov, 1941) in dogs (*Canis familiaris*). According to Pavlov, these personality types dictated how dogs learned—for example, how rapidly dogs were able to extinguish a conditioned response. According to Locurto (2007), these ideas influenced Eysenck's first model of human personality, which was built on two axes, one ranging from neurotic to emotionally stable and the other ranging from introversion to extraversion.

Early studies on nonhuman primate personality began in the 1930s and 1940s at the Yale Laboratories of Primate Biology. In speeches that Yerkes gave (e.g., 1939), he noted the objections that some had to his research but he and those with whom he worked not only observed individual differences in the chimpanzees (*Pan troglodytes*) they studied they also presented their work with no doubt that personality existed in these animals. Crawford (1938) noted that just a few days with chimpanzees revealed individual differences among them. To test this idea, she had people who worked with laboratory chimpanzees rate them on 22 behaviors and traits via a survey. She found good interrater and retest reliabilities for the items, and based on intercorrelations of the items, suggested two group factors. The first was composed of intelligence, motor skill, confidence in the observer, and desire to please; the second was composed of friendliness with strangers, cheerfulness, and noisiness. Timidity with strangers, although a single item, was negatively related to almost all other items.

Yerkes later observed in a speech that "... there is no question about the reality of chimpanzee mind, individuality, personality" (1939, p. 97). Working with laboratory chimpanzees, he noted that they generally have two types of personality: commanding and obedient, but also discussed how some chimpanzees are immediately trusting, whereas others are not, as well as patient, tractable, docile, suggestive, gentle, friendly, or their opposites. Similarly, Hebb (1949) noted that chimpanzee personality is similar to that of humans in complexity. He tested this idea with behavioral reactions of chimpanzees to both humans and inanimate objects. He found test-retest reliability over 8 years, and individual variation in the behavior of

chimpanzees toward familiar caretakers, a “timid” unfamiliar human, a “bold” unfamiliar human, and inanimate objects.

By the 1960s, however, the idea of personality in nonhuman animals was losing favor in the scientific community, and especially in ethology and psychology. At the same time, Jane Goodall traveled to what is now Tanzania’s Gombe National Park to study chimpanzees. While there, she named the animals she was observing—including David Graybeard, the first animal observed to make and use tools, and the first to let her observe him—and attributed personalities to them (as well as acknowledging that they had minds and feelings; [Goodall, 1986](#)), using words such as “affectionate” and “supportive.”

The Decline

However, despite such promising beginnings, with research being led by the most prominent researchers of the day, the study of animal personality soon thereafter suffered a steep decline. Although there were, to our knowledge, only a few direct attacks on animal personality research (see, e.g., [Goodall, 1990](#)), it suffered from multiple shifts in the science of human and animal behavior.

Most prominent among these shifts was a change in the view of what should constitute the scientific method for the study of behavior. In psychology this change was exemplified by the rise of the radical behaviorists, who argued that the focus of research should be on observable behavior and how the consequences of behavior and the cues that signal these consequences change behavior ([Skinner, 1964](#)). Psychologists also did not view individuals’ inner worlds, that is, their thoughts and emotions, as being valid subjects of study ([Skinner, 1964](#)). As such, although radical behaviorists did not argue against the existence of personality or against studying it, they viewed personality as behavioral habits that reflected each individual’s learning history and not individual differences in traits rooted in the organism’s biology ([Skinner, 1964](#)).

For those interested in studying animal behavior, there was no refuge to be found in the study of ethology, either. Although the early ethologists disagreed with the radical behaviorists on many fronts, most notably on whether we should study behaviors that are learned or behaviors that naturally occur, they agreed that only observable behavior merited scientific study ([Tinbergen, 2005](#)).¹

Another development hindering the study of animal personality was the decline in trait-oriented human personality research that followed the publication of [Walter Mischel's *Personality and Assessment* \(1968\)](#). In his book, Mischel drew on social learning theory and early cognitive psychology, but he also reevaluated the evidence for personality that had been collected in previous studies, such as the association between individuals' personalities and how they behave within groups ([Mischel, 1968](#), p. 79). Based on his findings and a review of the field, he concluded that personality stability was an illusion, resulting from cognitive biases, such as projection or the tendency of individuals to see others only in certain situations that elicit those behaviors, and to other artifacts. Mischel also pointed out that the correlations between personality and actual behavior such as the aforementioned behavior in groups rarely exceeded .3 and were thus small in comparison to the power of situations to predict behavior. Mischel therefore argued that it would be more fruitful to study the dynamics of behaviors and their elicitation by situations and cues. Mischel's more recent work exemplifies this by operationalizing personality as individual differences in the response of individuals across multiple situations ([Shoda & Mischel, 1996](#)).

One development with a mixed effect on the study of animal personality was the emergence of cognitive ethology in the 1970s. [Donald Griffin \(1978\)](#), a founder of the field of animal cognition, put forward the view that consciousness was not exclusive to humans, and could be scientifically studied. On the other hand, some prominent researchers in animal cognition were (and still are) of the opinion that we should not use cognition as understood in humans as a basis for making predictions about animal cognition or in interpreting animal behavior (e.g., [Shettleworth, 2012](#)). Moreover, these researchers labeled [Darwin's \(1871\)](#) view that the differences between humans and animals were continuous as "anthropomorphic" or "anthropocentric" (e.g., [Shettleworth, 2012](#)). They argued that when explaining the seemingly intelligent behavior of animals, we should adhere to [Morgan's Canon \(1894\)](#) and should use the simplest explanation possible.

A recent example illustrates this divide in views on how to interpret animal behavior. Santino is a male chimpanzee housed in the Furuvik Zoo in Gävle, Sweden ([Osvath, 2009](#)). He was known for throwing stones and pieces of concrete at visitors for at least a decade. Further investigation

revealed that his “missiles” were not merely objects that had come to hand, but that he collected and stored the stones and pieces of concrete in strategic locations, and had even shaped the concrete. This behavior took place prior to the zoo’s opening hours and so there was a delay of several hours between the gathering and throwing of stones and concrete. These and other behaviors led to the conclusion that Santino’s behavior was premeditated. Others, however, argued that because the caches of stones were not observed until Santino’s behavior caught the attention of the keepers, it is unclear whether they had been gathered for some other reason (Shettleworth, 2010, 2012; Suddendorf & Corballis, 2010). Of course this is a possibility, though it is worth noting that neither Shettleworth nor Suddendorf and Corballis commented on the fact that Santino had broken off and shaped the pieces of concrete that he added to his arsenal.

The Renaissance

The 1970s also marked the start of new beginnings in the study of personality in nonhuman animals. This period was originally focused on studies of nonhuman primates, but grew to encompass other species. It was also marked by the use of psychometric and multivariate methods now commonly used in human personality research. The use of these methods likely helped further legitimize the study of animal personality (Joan Stevenson-Hinde, personal communication, May 25, 2014). The studies of this period were chiefly focused on personality or behaviors related to it in baboons (*Papio anubis*; Buirski, Kellerman, Plutchik, Weininger, & Buirski, 1973), chimpanzees (Buirski, Plutchik, & Kellerman, 1978), and rhesus macaques (*Macaca mulatta*; Stevenson-Hinde & Zunz, 1978; Stevenson-Hinde, Stillwell-Barnes, & Zunz, 1980a, 1980b). Wild baboons in Kenya were rated on the 12-item Emotions Profile Index (Buirski et al., 1973). The interrater reliabilities all exceeded .7, and individual differences were found among the troop. The authors also found that more submissive animals were rated as more social and affectionate, as well as more fearful, than dominant animals. This work was replicated in wild chimpanzees (Buirski et al., 1978), and again the ratings were reliable. Individual differences were found, as were sex differences (females were more timid, depressed, and trusting than males, whereas males were more aggressive, sociable, and impulsive). The authors also found a positive relationship between dominance rank and aggressiveness. Finally, they compared profile results

among baboons, chimpanzees, and humans, and found very high correlations among males, with all groups showing high scores in gregariousness and trust, and lower scores on depression, aggression, and distrust.

[Stevenson-Hinde and Zunz \(1978\)](#) and Stevenson-Hinde et al., (1980a, 1980b) carried out what are now considered seminal works on nonhuman primate personality. The first stage of this research (the 1978 study) involved developing what has come to be known as the Madingley Questionnaire ([Stevenson-Hinde & Hinde, 2011](#)),² which was composed of “behaviorally-defined adjectives” based on behaviors they observed in rhesus macaques and on [Sheldon’s \(1942\)](#) measure of human temperament. They then asked individuals with considerable experience in observing and recording the behaviors of these monkeys to rate each monkey using this questionnaire at three time points. They used a principal components analysis to interpret their results for each set of ratings. In the first phase, the 19 items deemed to have sufficient interrater reliabilities yielded the same two components, Confident to Fearful and Active to Slow. In the second phase, 23 items had sufficient interrater reliabilities. Principal components analysis of these items found two components similar to those identified in the earlier waves and a third component, Sociable to Solitary.

In addition to identifying these components, they identified age, sex, and maternal effects. Males scored higher on the first two factors, whereas females scored higher on the third. Over the study’s 4 years, Confident to Fearful scores remained stable, whereas the remaining two factors were stable only in adults. For example, young males with an adverse experience within the first 8 months of life were more Active than other males, but just as Confident and/or Sociable. In terms of maternal effects, Confident and Sociable mothers had Confident and Sociable infants, respectively. Active mothers had infants that were Fearful. Finally, first-time mothers showed stability in their scores for Active from prepregnancy to postpregnancy.

[Feaver, Mendl, and Bateson \(1986\)](#) used a method similar to this early primate work to assess personality in domestic cats (*Felis silvestris catus*). Using behavioral observations and a questionnaire based on the Madingley Questionnaire but altered to suit cat behavior, the authors found three personality factors: Alert, Sociable, and Equable (as all the cats were female, sex effects were not investigated).

Personality work in domestic dogs began in the 1930s, and slowly began proliferating ([Jones & Gosling, 2005](#)). Rating methods, however, did not

begin until the 1980s ([Serpell, 1983](#)), and became more common in the 1990s and beyond. Previous work utilized test batteries and observational tests. Work in dogs has been breed or work related most commonly.

The Age of Discovery

The field of animal personality began to truly emerge in the 1990s with two studies that set the path for the research that has continued to date. In the first study, [Gold and Maple \(1994\)](#) assessed nearly 300 gorillas (*Gorilla gorilla*) housed in zoos using a modified version of the Madingley Questionnaire. Their study identified personality factors they labeled Dominant, Extroverted, Fearful, and Understanding, which suggested that some personality dimensions in great apes were human-like. The second study was conducted by [King and Figueiredo \(1997\)](#), who asked zoo keepers and volunteers to rate 100 chimpanzees on the Chimpanzee Personality Questionnaire. This questionnaire consisted of 43 adjectives, of which 41 were sampled from each of the domains in Goldberg's characterization of the Five Factor Model ([1990](#)). Adjectives were adapted for use in chimpanzees by pairing each with one to three sentences that set them in the context of behavior ([King & Figueiredo, 1997](#)). Factor analysis of the 41 reliable items revealed six factors. The first and largest factor was unlike domains found in human studies of personality and contained a mix of items denoting assertiveness, independence, low fear, and aggression. It resembled the rhesus macaque dimension Confidence ([Stevenson-Hinde & Zunz, 1978](#)) and the gorilla dimension Dominant ([Gold & Maple, 1994](#)). This chimpanzee dimension was thus labeled Dominance. The remaining five factors, labeled Surgency, Dependability, Agreeableness, Emotionality, and Openness, resembled the Five Factor Model domains of Extraversion, Conscientiousness, Agreeableness, Neuroticism, and Openness, respectively.³ Finally, during this period, personality began to be studied in nonmammals in natural populations, to understand its evolutionary implications. For example, the shy–bold continuum was viewed as a product of natural selection, with implications for survival strategies, frequency-dependent selection, and phenotypic plasticity ([Wilson, Clark, Coleman, & Dearstyne, 1994](#)).

[King and Figueiredo's 1997](#) study was soon followed by two other articles. In the first [Gosling \(1998\)](#) asked raters to assess the personality traits of spotted hyenas (*Crocuta crocuta*). Traits were sampled from the Big Five

mini-markers (Saucier, 1994, cited in Gosling, 1998), traits used in prior studies of animal personality, and traits devised to capture aspects of hyena behavior that were not captured by the other traits. Principal components analysis of the 44 reliable items yielded dimensions labeled Assertiveness, Excitability, Human-Directed Agreeableness, Sociability, and Curiosity. In the second article Capitanio (1999) used a variant of the Madingley Questionnaire. In addition to identifying three rhesus macaques dimensions similar to those described by Stevenson-Hinde et al. (1978, 1980a), he took up the gauntlet (John P. Capitanio, personal communication, June 1, 2014) laid down by Mischel (1968) and showed that the ratings predicted behavior over long periods of time and in situations other than those in which personality was assessed.

Thus, by the late 1990s, enough work had been done on personality in a variety of species for a review to be carried out. Gosling and John (1999) found 19 studies of personality factors in 12 species, and found, based on the Five Factor Model, that Extraversion, Neuroticism, and Agreeableness generalized the most across those species, with Openness being identified in fewer species and Conscientiousness being identified only in chimpanzees.

This was followed by Gosling's (2001) review and meta-analysis that showed strong evidence for the interrater and retest reliabilities of animal personality measures and also for their association with behavior. This review agreed with the 1999 review by Gosling and John with respect to which personality dimensions appeared most commonly and highlighted the tendency for animal personality studies to identify dimensions related to dominance and/or activity. One interesting difference between human and nonhuman animal personality is the common occurrence of a Dominance factor in the latter, and its absence in the former. Recent work has shown that although there is no independent Dominance factor in humans, there are Dominance-related traits, as well as a dimension measured by the Psychopathic Personality Inventory (Lilienfeld & Andrews, 1996) called Fearless Dominance. This dimension is composed of traits such as social dominance, charm, physical fearlessness, and immunity to anxiety (Lilienfeld et al., 2012). This dimension is associated with healthy psychological adjustment (e.g., Benning, Patrick, Hicks, Blonigen, & Krueger, 2003; Patrick, Edens, Poythress, Lilienfeld, & Benning, 2006). In terms of the Five Factor Model, higher levels of Extraversion and Openness

and lower levels of Neuroticism and Agreeableness predict Fearless Dominance ([Ross, Benning, Patrick, Thompson, & Thurston, 2009](#)).

The Modern Era

Establishing reliability and validity in nonhuman animal personality assessment and determining personality structure are still continuing in a variety of species that have not had the same focus as primates (e.g., in felids, [Gartner, Powell, & Weiss, 2014](#)). In addition, a new focus in personality research aims to explain it in evolutionary and genetic terms (e.g., [Adams, King, & Weiss, 2012](#); [Suomi, 2006](#); [Weiss, King, & Figueredo, 2000](#)), and to link it to health outcomes (e.g., [Capitanio, Mendoza, & Baroncelli, 1999](#); [Weiss, Gartner, Gold, & Stoinski, 2013](#)). Behavioral ecologists also address evolutionary issues, but with a different focus, using the traits that comprise personality to show that it can affect species distribution, species adaptability, and speciation rates (e.g., [Réale, Reader, Sol, McDougall, & Dingemanse, 2007](#); [Sih, Bell, Johnson, & Ziembka, 2004](#)). Reviews of this type of work showed that personality affects fitness in a wide range of wild and captive species ([Dingemanse & Réale, 2005](#); [Smith & Blumstein, 2008](#)).

The Five Factor Model’s Contribution to Animal Personality Research

Despite the rebirth of animal personality research, the scars from the previous assaults remain. This is particularly the case when it comes to anthropomorphism, which Jane Goodall referred to as the “cardinal sin” in ethology ([1990](#), p. 13). Although there are some researchers who make efforts to avoid even the appearance of the possibility of anthropomorphism, others tend to make due with purchasing indulgences before or confessing and engaging in acts of contrition after committing the sin. The latter cases are recognizable by Introduction and Discussion sections in which much ink is spilled to justify the use of methods common to the human literature such as questionnaire ratings (e.g., [Weiss, Adams, Widdig, & Gerald, 2011](#)). Whether these tendencies are some ingrained Western tradition that predates the modern scientific era is hard to say, but it is an unfortunate state of affairs. The knowledge gained in comparative psychology, evolutionary biology, anthropology, and any number of similar fields by adopting

[Darwin's \(1871\)](#) gradualist view of a continuity of species has been great. Not surprisingly, questions, approaches, and findings from human personality research and the Five Factor Model have contributed to the development of animal personality research.

Identifying Species-Typical Structures

Perhaps the most important idea that found its way from studies of human personality and the Five Factor Model has been the importance of studying personality structure, that is, testing whether the Five Factor Model or Big Five is a human universal ([McCrae & Costa, 1997](#)), is a linguistic-cultural artifact, and is found only in Anglo-Germanic language groups ([Saucier & Goldberg, 2001](#)), or whether fewer dimensions (e.g., [Eysenck, 1970](#)), more dimensions (e.g., [Lee, Ogunfowora, & Ashton, 2005](#)), or a different configuration of traits (e.g., [Zuckerman, Kuhlman, Thornquist, & Kiers, 1991](#)) best characterize human personality differences (see also the chapters by [Allik and Realo](#), by [Costa and McCrae](#), and by [De Raad and Mlačić](#)).

The importance of studying personality structure as a species universal in animals came to the fore with [King and Figueiredo's \(1997\)](#) study of chimpanzee personality. The finding that the similarities and differences between humans and their close phylogenetic cousins revealed differences in degree, that is, chimpanzees possessed five human-like domains, and differences in kind, namely the identification of a chimpanzee-specific Dominance domain, allowed for the idea that the evolutionary continuity of personality could be studied.

Further research took a cue from the studies that showed that the Five Factor Model exists in cultures very different from that in which it was identified ([McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#)). These studies sought to determine whether [King and Figueiredo's \(1997\)](#) findings were robust across different samples or, putting it another way, whether the personality structure that they identified was a “chimpanzee universal.” To this end, researchers used the same questionnaire to study personality structure among chimpanzees living in a naturalistic sanctuary in the Republic of the Congo ([King, Weiss, & Farmer, 2005](#)) and in Yerkes National Primate Research Center, a laboratory setting ([Weiss, King, & Hopkins, 2007](#)). They also used an expanded version of the questionnaire to study chimpanzees living in zoos, research institutes, and a sanctuary located in Japan ([Weiss et al., 2009](#)). These studies yielded similar

results. Targeted orthogonal Procrustes rotation ([McCrae, Zonderman, Costa, Bond, & Paunonen, 1996](#)) yielded overall congruence coefficients of .89, .90, and .85, respectively, indicating that the whole structure replicated, high congruence coefficients indicating that Dominance, Extraversion, Conscientiousness, and Agreeableness replicated, and markedly lower congruence coefficients for Neuroticism and Openness that were not consistent with the replicability of these dimensions. In short, the personality structure identified by [King and Figueiredo \(1997\)](#) was, for the most part, not likely an artifact of the zoo environment, the English language, or culturally based expectations on the part of raters. As Neuroticism or Openness was defined by only three and two questions, respectively, and so would be less stable, the question of whether one or both of these domains are a feature of chimpanzee personality remains.

Of course it is possible that features of the questionnaire, such as the adjectives chosen and how descriptor sentences were worded, may be wholly or partly responsible for the high degree of consistency in chimpanzee personality structure. Excluding this possibility requires studying personality using this same instrument in species that differ enough in their evolutionary origins, in their socioecology, and in other features ([Gosling, 2001](#); [Gosling & Graybeal, 2007](#)). With respect to nonhuman primates, this was tested in a study of orangutans using an augmented version of the questionnaire used in [King and Figueiredo's study \(1997\)](#) that included five new items that attempted to tap into the Neuroticism and Openness domains ([Weiss, King, & Perkins, 2006](#)). Orangutans shared a common ancestor with humans and chimpanzees approximately 15 million years ago ([Purvis, 1995](#)). Crucially, orangutans differ from chimpanzees and humans in that they are semisolitary ([Galdikas, 1985](#); [MacKinnon, 1974](#)). As such, their personality might be expected to differ from humans and chimpanzees, two very social species. This is what [Weiss et al. \(2006\)](#) found. Orangutan personality was characterized by Extraversion, Neuroticism, and Agreeableness domains that resembled those of chimpanzees and humans, a Dominance domain, which somewhat resembled that of chimpanzees, though it mainly included traits indicative of low Agreeableness, such as “bullying,” and a domain, “Intellect,” which combined traits that tapped Openness, such as “intelligent,” and those related to Conscientiousness, such as “independent.”

A later study by Weiss, Adams, Widdig, et al. (2011) investigated rhesus macaques, which shared a common ancestor with humans and great apes approximately 25 to 30 million years ago (Purvis 1995). Although rhesus macaques, like chimpanzees and humans, are a highly social species, their societies are differently arranged; females remain in the group in which they were born and arrange themselves in hierarchies based around female lines, whereas males leave the group into which they were born just prior to puberty (Colvin, 1986; Gouzoules & Gouzoules, 1987; Manson, 1995; Melnick & Pearl, 1987). This study used an augmented version of the instrument used to rate orangutans (Weiss et al., 2006) that included six additional items related to Conscientiousness and Openness. The study found six personality dimensions. Two domains, Confidence and Anxiety, represented emotional reactions to social and nonsocial stimuli, respectively. There was also a Dominance domain similar to the chimpanzee and orangutan Dominance domains (King & Figueiredo, 1997; Weiss et al., 2006), and the social aspect of Extraversion and traits related to Agreeableness were found in a domain labeled Friendliness. Finally, there were separate domains related to Activity and Openness.

Recently, a similar study investigated personality structure in brown capuchin monkeys (*Sapajus apella*; Morton et al., 2013), which share a very distant common ancestor with the macaques, the great apes, and humans some 40 million years ago (Purvis, 1995). Of particular interest was the question of whether brown capuchin monkey personality would resemble that of chimpanzees, since brown capuchin monkeys, like other capuchin monkeys, behaviorally resemble chimpanzees in many respects, including their fission–fusion social structure and the creation and use of tools (Fragaszy, Visalberghi, & Fedigan, 2004). Brown capuchin monkey personality structure resembled that of chimpanzees as it included a domain similar to Dominance labeled Assertiveness, as well as Neuroticism and Openness domains. It also included a narrow variant of Conscientiousness labeled Attentiveness (Morton et al., 2013). The only difference between brown capuchin monkey and chimpanzee personality structure was that items related to Extraversion and Agreeableness loaded on a single dimension, labeled Sociability (Morton et al., 2013).

These findings are not unique to this family of questionnaires or studies of nonhuman primates. Similar findings were described in studies that relied on other animal personality questionnaires, including the Madingley

Questionnaire and a blend of the Madingley Questionnaire and King and Figueredo's questionnaire developed by Konečná et al. (2008). Studies using the Madingley Questionnaire identified different structures in rhesus macaques (Capitanio, 1999; Stevenson-Hinde & Zunz, 1978), gorillas (Gold & Maple, 1994), chimpanzees (Murray, 2011), bonobos (*Pan paniscus*; Murray, 1995), elephants (*Loxodonta africana*; Lee & Moss, 2012), and other species. Likewise, studies using the questionnaire devised by Konečná and her colleagues identified different structures in two species of free-ranging Old World monkeys, Hanuman langurs (*Semnopithecus entellus*; Konečná et al., 2008) and Barbary macaques (*Macaca sylvanus*; Konečná, Weiss, Lhota, & Wallner, 2012).

Similarly, using a questionnaire developed for felids that was also based on the Five Factor Model, the personality of domestic cats, Scottish wildcats (*Felis silvestris grampia*), clouded leopards (*Neofelis nebulosa*), snow leopards (*Panthera uncia*), and African lions (*Panthera leo*) was assessed and compared (Gartner et al., 2014). This study, which revealed differences among species in both *Panthera* and *Felidae*, from solitary to semisolitary to social species, also found a striking similarity across these species, with most having a Dominance domain, a Neuroticism domain, and an Impulsivity domain (Scottish wildcats had a Self-Control factor and an Agreeableness factor that were related to others' Impulsiveness domains; clouded leopards had a mixed Dominance/Impulsiveness domain and an Agreeableness/Openness domain that were related to others' Impulsiveness domains; and snow leopards had a mixed Impulsiveness/Openness domain that was related to others' Impulsiveness domains). This suggests that the evolution of personality in felids may be continuing on the trait level, or possibly among the Dominance domains, which differed across species.

Clearly, studies of animal personality are able to identify robust structures that characterize a given species. More importantly, these studies are able to detect different structures where they would be expected.

Understanding and Interpreting Personality Traits

The Five Factor Model has also benefited animal personality research by illustrating how to understand animal personality traits, that is, by working out what theoretical constructs personality dimensions represent and what predictions can be made about these dimensions. As Gosling and John (1999) noted, this is important as there are numerous ways to measure

human and animal personality, each with a different name, and more may even be developed in the future. A similar problem beset studies of human personality, and therefore early research on the Five Factor Model points the way forward. One key to it becoming the dominant model of personality is illustrated in the Revised NEO Personality Inventory manual ([Costa & McCrae, 1992](#)), chapters in this volume, and countless articles; scales for many different instruments are highly correlated with the Five Factor Model domains and facets (see also the chapter by [O'Connor](#)). In short, the Five Factor Model largely subsumes other scales.

Some early animal personality research conducted before the widespread acceptance and adoption of the Five Factor Model either applied the same scales and structures across species, as was the case in studies using the Emotions Profile Index ([Martau, Caine, & Candland, 1985](#)), or referred to existing human personality models, such as [Eysenck and Eysenck's \(1964\)](#), when interpreted the resulting personality dimensions ([Chamove, Eysenck, & Harlow, 1972](#)). However, these approaches, perhaps because of the widespread fear of anthropomorphism, were rare. [King and Figueiredo \(1997\)](#) were perhaps the first to explicitly link the composition of the personality factors they discovered to the human Five Factor Model, namely by indicating from which of the Five Factor domains each item was sampled (see their Table 1), and using this as a means to label factors. In other words, although they did not impose the Five Factor Model on chimpanzees, they linked similar chimpanzee factors to their human counterparts based on the phylogenetic, behavioral, cognitive, and physiological similarities between the species.

Not many would argue that the Five Factor Model *sensu stricto* should be the personality model for any species other than humans, let alone higher groupings, such as taxa. However, the importance to animal personality research of finding theoretical constructs (domains) that explain variation across a given species or taxa and leads to predictions cannot be overstated. This was acknowledged and cemented in Gosling's reviews that used the Five Factor Model to help interpret findings from previous studies ([Gosling, 2001](#); [Gosling & John, 1999](#)). This point was also not lost on the authors of a review and discussion of animal personality research in behavioral ecology. Specifically, [Réale et al. \(2007\)](#) linked behavioral tests used to assess personality in nonhuman animals to the “temperament traits” of Aggressiveness, Sociability, Boldness, Activity, and Exploration (see their

Figure 2), and stressed the importance of validating these measures (see also [Carter, Feeney, Marshall, Cowlishaw, & Heinsohn, 2012](#)).

Two studies illustrate the importance of seeing traits as measures of theoretical constructs. Boldness is a label behavioral ecologists have given a trait in a range of species, including humans, that captures the degree to which individuals are risk prone as opposed to risk averse ([Wilson et al., 1994](#)). Boldness is often measured via behavioral tests ([Réale et al., 2007](#)), such as how likely an individual will be caught in a baited trap. Although seemingly simple and straightforward, [Bergvall, Schäpers, Kjellander, and Weiss \(2011\)](#) showed that behavioral tests for boldness in fallow deer (*Dama dama*), such as how long it took subjects to enter an arena that contained a novel object, were associated with a wide range of rated traits capturing aspects of the Five Factor Model domains of low Neuroticism and high Extraversion, Conscientiousness, and Openness. In a study of wild chacma baboons (*Papio ursinus*), [Carter, Marshall, Heinsohn, and Cowlishaw \(2012\)](#) compared multiple behavioral tests assumed to measure boldness, that is, responses to a model puff adder and an unfamiliar food item. Contrary to their predictions, they found that alarm calls were associated with more time spent inspecting the model puff adder and that responses to the model puff adder that would be interpreted as “boldness” were not associated with responses to the novel food stimuli that would be interpreted as “boldness.” In short, studies of animal personality would benefit from personality models and the ability to examine associations between different measures and these models.

Facets

The examination of personality at the level of facets has not yet taken hold in much of animal personality research. This is despite the fact that there is no reason not to believe that animal personality, like human personality ([Costa & McCrae, 1995](#)), is hierarchically organized ([King & Weiss, 2011](#)). This view is consistent with classic ethological perspectives on how behavior is organized ([Eibl-Eibesfeldt, 1970](#)) and views of personality by modern behavioral ecologists ([Araya-Ajoy & Dingemanse, 2014; Réale et al., 2007](#)).

Human personality research has benefited hugely from the study of facets, for example, as they make it possible to better understand why some personality domains are related to health outcomes. Specifically, studies that

examine the association between personality and health have revealed that among the five human domains, Conscientiousness stands out as a robust predictor of health behaviors and outcomes, such as cigarette smoking, obesity, inflammatory markers, and premature mortality (Deary, Weiss, & Batty, 2010). Studies that have examined these associations at the facet level show that, for example, the tendency for more conscientious individuals to be higher in self-discipline is what underlies the association of Conscientiousness with longer life (Weiss & Costa, 2005) and with taking better care of one's health (Terracciano & Costa, 2004). Studies of human personality development have also benefited from an examination of facets: although there are overall modest changes in mean levels of personality domains over time, there is some variability in trajectories at the facet level (Terracciano, McCrae, Brant, & Costa, 2005).

One deliberate study of animal personality facets was conducted by King, Weiss, and Sisco (2008), who examined sex and age differences in chimpanzee personality to determine whether the overall patterns matched those of humans. As part of their study, along with looking at the domain level, they divided, *a priori*, Extraversion and Conscientiousness into two facets each. The Extraversion facets were labeled Gregariousness and Activity, as they were similar in composition to the like-named NEO PI-R facets (Costa & McCrae, 1992). The Conscientiousness facets were labeled Tameness and Predictability. The former described individuals who did not display aggressive behavior, whereas the latter described individuals who were reliable and consistent in their behavior. These facets showed different associations with sex and age (King et al., 2008). Whereas Extraversion was lower in older age groups and did not differ between males and females, males were higher in Activity than females, and the age effects for Gregariousness, but not Activity, were stronger in females than males. Distinct patterns of sex and age differences also characterized the Conscientiousness facets. Males were lower in Conscientiousness, and although age effects suggested an increase, the effect was not significant. However, although the sex and age differences were similar for both facets of Conscientiousness, the age effects indicated that older individuals were higher in both facets.

Examining personality at the level of facets may also help researchers understand the evolutionary mechanisms responsible for maintaining heritable personality variation. Considerable research has shown that

personality in humans and animals is related to survival and reproductive success and we would therefore expect there to be no additive genetic variation underlying personality (Dingemanse & Réale, 2005; Nettle & Penke, 2010; Smith & Blumstein, 2008). However, that is not what is found in humans (Bouchard & Loehlin, 2001) or animals (van Oers, de Jong, van Noordwijk, Kempenaers, & Drent, 2005). One proposed explanation for this maintained additive genetic variation is that the fitness benefits of personality traits vary across different environments, a process that is also known as balancing selection by environmental heterogeneity (Penke, Denissen, & Miller, 2007). Another (not incompatible) proposed mechanism is that each personality trait comes with fitness costs and benefits (see Table 1 in Nettle, 2006).

Although much of the additive genetic variance within each human personality domain is shared in common (McCrae, Jang, Livesley, Riemann, & Angleitner, 2001; Pilia et al., 2006; Yamagata et al., 2006) and would therefore react to selection in the same way, there is some evidence that the specific or residual variance of the Five Factor Model facets is heritable (Jang, McCrae, Angleitner, Riemann, & Livesley, 1998; see also the chapter by Jarnecke and South). Thus, another mechanism that may act to maintain additive genetic variation, alone or in combination with these other mechanisms, is heterogeneity within personality domains. This is consistent with the findings noted above that health consequences such as length of life appear to be related to specific facets, such as Self-Discipline. Moreover, it is easy to see how some facets of Extraversion, such as Warmth, or of Agreeableness, such as Trust, may be more strongly associated with mating success than their Activity or Compliance facets, respectively. Similarly, the personality facets of a given domain may differ in terms of their respective fitness costs or benefits. Turning again to Extraversion, although its Excitement-Seeking facet may lead to injury or early mortality due to misadventure, its Activity facet may lead to health promotion behaviors such as regular exercise, and, consequently, longer life (see also the chapter by Wilt and Revelle).

Going Beyond Behavior

One less appreciated way in which the Five Factor Model has and can continue to contribute to animal personality research has been in the work showing that personality domains and facets are more than “stand-ins” for

behavior, but are biologically based basic tendencies (McCrae & Costa, 1999). This led researchers to examine the associations between personality and outcomes beyond simple behaviors (Deary et al., 2010; Ozer & Benet-Martínez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). For example, as noted briefly before, personality has implications for health, including immune function, stress, morbidity, mortality, and well-being (see also the chapter by Kern and Friedman).

Immune function. In nonhuman primates, research with rhesus (Capitanio et al., 1999, 2008) and long-tailed macaques (*Macaca fascicularis*; Kaplan et al., 1991) shows that the personality factor Sociability has a protective role in relation to the immune system, similar to what is found in humans (Ironson, O'Cleirigh, Schneiderman, Weiss, & Costa, 2008). Rhesus monkeys higher in Sociability who are exposed to social stress experience an increase in antibodies in response to inoculation with simian immunodeficiency virus (SIV), whereas those lower in Sociability had a decrease in antibodies. In addition to the negative effects of the virus and the resulting acquired immune deficiency syndrome (AIDS), an inability to fight an infection following SIV infection can negatively affect longevity (Capitanio et al., 2008).

Similarly, cynomolgus monkeys (*Macaca fascicularis*) both high in affiliation and low in aggression exposed to social stress show a healthier immune response, with a greater proliferation of lymphocytes (a type of white blood cell) in response to stimulation with mitogens (a chemical substance that causes cells to divide; this is a common way of testing immune function), and greater natural killer (NK) cytolytic activity (cells that kill virally infected cells; Kaplan et al., 1991; see also Cohen, Kaplan, Cunnick, Manuck, & Rabin, 1992).

In pigtailed (*Macaca nemestrina*) and bonnet (*Macaca radiata*) macaques, the personality factor Emotional Reactivity in response to a stressor may compromise immunity. In one experiment, monkeys were separated from their mothers; those that vocalized more on the first day of separation had less proliferation of white blood cells 2 weeks later in response to mitogens (Laudenslager, Held, Boccia, Reite, & Cohen, 1990). Similar results were found in rhesus monkeys (Laudenslager, Rasmussen, Berman, Suomi, & Berger, 1993).

Stress. Activation of the hypothalamic–pituitary–adrenal (HPA) axis is related to stress (Tsigos & Chrousos, 2002), disease susceptibility, and also

to personality. In humans, Neuroticism can influence increases in anxiety and the tendency to expose oneself to stressors ([Bolger & Shilling, 1991](#)). Similarly, [Wielebnowski, Fletchall, Carlstead, Busso, and Brown \(2002\)](#) found that clouded leopards rated as more fearful/tense, and who self injured, paced, slept, and hid more often, had increased overall, base, and peak fecal corticoid concentrations, indicating chronic stress.

A relationship between personality and stress is found in nonhuman primates as well. Rhesus macaques rated as higher in Excitability had lower basal cortisol concentrations, and those rated as higher in Confidence had higher cortisol concentrations ([Capitanio, Mendoza, & Bentson, 2004](#)). Brown capuchins showed positive and negative correlations between personality traits strong and submissive, respectively, and baseline cortisol, as well as correlations between apprehensive, fearful, insecure, and tense and confident, curious, effective, and opportunistic, respectively, and peak cortisol ([Byrne & Suomi, 2002](#)).

There is evidence that personality interacts with behavioral reactions to stress as well. Solitary, irritable, and aggressive Diana monkeys (*Cercopithecus diana*) demonstrate increased abnormal behavior during high visitor density, whereas active, playful, and excitable monkeys show an increase in species-typical behaviors, including play ([Barlow, Caldwell, & Lee, 2007](#)). [Sapolsky \(1994\)](#) found that certain behavioral styles were associated with lower basal cortisol concentrations, including those that allow the animal to differentiate between threatening and neutral situations, those in which the animal is the initiator of aggression, those that dictate how the animal behaves after either winning or losing a battle with a rival in which winners display affiliative behavior and losers display displacement behavior, and those in which the preceding three traits are correlated.

Similarly, a review of the relationship between personality and cortisol in birds found that for those species studied [great tits (*Parus major*), Japanese quail (*Coturnix coturnix japonica*), and hens (*Gallus gallus domesticus*)], those with proactive personalities had lower corticosterone stress responses to stimuli than those with reactive personalities ([Cockrem, 2007](#)).

Morbidity and mortality. Immune function and stress are not the only way that personality affects morbidity. In humans, high Conscientiousness and Extraversion and low Neuroticism are associated with a reduced risk for mental disorders such as depression, panic attacks, generalized anxiety disorder, and substance abuse; high Conscientiousness is also associated

with a reduced risk for physical disorders such as diabetes, high blood pressure, and sciatica (Goodwin & Friedman, 2006).

A link has also been found between personality and disease contraction in domestic cats. Natoli et al. (2005) analyzed temperament, social rank, and prevalence of feline immunodeficiency virus (FIV), which is transmitted by biting (Fromont, Artois, Langlais, Courchamp, & Pontier, 1997), in three cat colonies. The most aggressive and affiliative (proactive) males who marked (spraying or rubbing cheeks) frequently had the highest social rank and the most reproductive success, but were also more likely to be infected with FIV. The opposite result is found in domestic cats with feline leukemia virus (FeLV), which is transmitted mainly during affiliative interactions including licking and grooming (Fromont et al., 1997). More aggressive cats, then, have lower levels of FeLV, whereas socially active cats have higher levels (Fromont et al., 1997).

This link between personality and morbidity can be found in other species as well. Female Sprague–Dawley rats (*Rattus norvegicus*) labeled as neophobic had significantly more risk of developing spontaneous mammary and pituitary tumors than neophilic females, and therefore increased mortality—they died 6 months earlier (Cavigelli, Yee, & McClintock, 2006). In addition, aggressive wild-type rats are more susceptible to experimental autoimmune encephalomyelitis (an animal model of brain inflammation) than nonaggressive rats (Kavelaars, Heijnen, Tennekes, Bruggink, & Koolhaas, 1999). This is not surprising, as aggression bears similarities to toxic characteristics of type A personality in humans, which is characterized by, among other things, antagonistic hostility (related to lower Agreeableness and moderately related to higher Neuroticism: Dembroski & Costa, 1987), and which may play some role in coronary heart disease (Booth-Kewley & Friedman, 1987).

Personality has also been shown to predict mortality in a variety of species, including humans; both Conscientiousness and Extraversion seem to be protective and influence longevity, whereas Neuroticism has an unclear effect (Roberts et al., 2007). Male neophobic Sprague–Dawley rats are 60% more likely to die at any point in time than neophilic rats, with a 20% decrease in overall lifespan (despite dying of the same causes; Cavigelli & McClintock, 2003). In gorillas, Extraversion predicts longer survival, regardless of demographics such as age, sex, or husbandry practices (Weiss et al., 2013).

Well-Being. Personality is also one of the strongest and most consistent predictors of well-being in humans (DeNeve & Cooper, 1998; Steel, Schmidt, & Shultz, 2008) and nonhuman primates (e.g., chimpanzees; King & Landau, 2003), especially in relation to Extraversion and Neuroticism, where the former is related to positive affect and the latter is related to negative affect. In chimpanzees, King and Landau (2003) found that subjective well-being was related to higher Dominance, Extraversion, and Conscientiousness. Weiss et al. (2009) replicated those results, but also found a positive relationship between subjective well-being and Agreeableness and Openness and a negative relationship with Neuroticism. In addition, orangutan personality—specifically Extraversion, Agreeableness, and low Neuroticism—is also related to subjective well-being (Weiss et al., 2006). Finally, a similar relationship is found in rhesus macaques, where higher Confidence and Friendliness and lower Anxiety are related to subjective well-being, concurrently and prospectively (Weiss, Adams, Widdig, et al., 2011).

Similarly, in clouded leopards, snow leopards, and African lions, Neuroticism is negatively related to well-being; in lions, Impulsiveness is also negatively related to well-being (Gartner et al., 2014). In clouded leopards, well-being is positively related to Agreeableness/Openness (Gartner et al., 2014), whereas in Scottish wildcats it is positively related to Self-Control, a factor with similarities to Conscientiousness (Gartner & Weiss, 2013).

These relationships are important because subjective well-being is associated with longer life in humans (Diener & Chan, 2011) and orangutans (Weiss, Adams, & King, 2011). As such, well-being may be a good marker for health outcomes, as personality may be influencing health via subjective well-being. For example, in long-tailed macaques, depression, a facet of the negative affect aspect of subjective well-being, mirrors that in humans in terms of physiology, neurobiology, and behavior, including increased cardiovascular disease risk, increased mortality, and more, and is subject to individual differences in terms of response to environmental challenges (Willard & Shively, 2012).

Learning and social relationships. Personality reaches beyond health and well-being outcomes, with implications for both learning and social relationships. In humans, higher Conscientiousness (Busato, Prins, Elshout, & Hamaker, 2000), Openness, and Extraversion (Duff, Boyle, Dunleavy, &

Ferguson, 2004) are associated with academic success, whereas Neuroticism and Agreeableness are associated with less academic success. As mentioned earlier, Pavlov observed differences between excitable and inhibited dogs and between lively and calm dogs in learning (Pavlov, 1941). For example, Excitable dogs were able to learn quickly in response to both strong and weak stimuli, but were slower in learning tasks that required switching between the two. Lively dogs were best at associative learning in general, whereas Calm dogs learned consistently but slowly. Finally, Inhibited dogs were slow to learn. More recent work has shown that personality is associated with other types of learning as well. In fallow deer, those animals who were high on a component called Flexibility were better learners in reinforcement tasks (Bergvall et al., 2011), whereas capuchin monkeys that rated high on the personality factor Openness and low on Assertiveness performed better on cognitive tasks (Morton, Lee, & Buchanan-Smith, 2013).

Social behavior is also affected by personality. In humans, similarity in Extraversion, Openness, and Agreeableness is related to friendship, and this extends to chimpanzees as well, in terms of Sociability and Boldness (Massen & Koski, 2014). Similarly, social rank in Barbary macaques is affected by personality: Confidence is associated with higher future rank (Konečná et al., 2012). In terms of social learning, both bolder and more anxious baboons showed greater improvement in task solving after watching a demonstrator (Carter, Marshall, Heinsohn, & Cowlishaw, 2014). Slow-to-explore male great tits have shorter latencies when accompanied by a faster companion, whereas fast males show no effect from companion birds (van Oers, Klunder, & Drent, 2005).

Animal personality research's contribution to the Five Factor Model

Unlike many areas of psychology, such as behavior genetics (e.g., Scott & Fuller, 1965), personality psychology developed largely independently from animal research. This is unfortunate, particularly as the fields that grew from or with animal research can arguably be said to have benefited from the experience. What, then, might research on the Five Factor Model gain from the animal personality work that has been conducted and that may be conducted?

Phylogeny and Ultimate Explanations

One overarching contribution that animal personality can make involves offering new means to test hypotheses about personality evolution. Although attempting to understand human personality evolution is important and an active area of research (see [Nettle, 2006](#)), as pointed out by [Gosling and Graybeal \(2007\)](#), researchers who ignore phylogeny may do so at their peril, in that they may make unwarranted assumptions about the environment and timing during which a particular personality dimension evolved. To be consistent with Gosling and Graybeal's choice of sociability as an example, let us consider Extraversion. If individual differences in Extraversion describe differences in adaptive strategies within social contexts, then we would expect to find it only in social species. Thus, a test of this hypothesis would be to search for this trait in solitary or semisolitary species. As is clear from the previous study of orangutan personality ([Weiss et al., 2006](#)), this prediction is not supported.

Comparing species, then, offers a means of conducting strong inferential tests ([Platt, 1964](#)). These tests make it possible to rule out hypotheses concerning when domains and facets of the Five Factor Model evolved and what their functions are ([Gosling & Graybeal, 2007](#)). To see how this works, it is only necessary examine [Figure 13.1](#), a cladogram created to try and capture the results of the then existing work on personality in humans, chimpanzees, orangutans, and rhesus macaques ([Weiss, Adams, Widdig, et al., 2011](#)). It highlights, for example, the likelihood that Conscientiousness evolved before or after the common ancestor of chimpanzees split from that of gorillas. A study of gorilla personality, then, would resolve when this would have happened. Moreover, as gorilla social structure differs from that of humans, chimpanzees, and brown capuchin monkeys, being composed of unimale harems ([Robbins, 1995, 1996](#)), finding Conscientiousness in gorillas would rule out the hypothesis that Conscientiousness evolved in species with human-like social structures. A preliminary report on captive gorilla personality ([Schaefer & Steklis, 2014](#)) suggests that Conscientiousness did evolve in the common ancestor of chimpanzees and gorillas and that the complex social structures that characterize humans, chimpanzees, and brown capuchin monkeys did not lead to its emergence. The other hypotheses are equally testable and there is no doubt that this picture will change as more data are collected.

The benefits of grounding studies on human personality evolution within results from animal research are clear. For example, recent work in this vein in modern populations was conducted by Figueredo, Vásquez, Brumbach, and Schneider (2007) who investigated links between Five Factor Model domains and psychometric measures of life history strategies. They found evidence that personality profiles characterized by low Neuroticism and high Extraversion, Openness to Experience, Agreeableness, and Conscientiousness were associated with the adoption of a slower life history strategy, that is, a tendency to delay reproduction and to invest more in individual offspring. Likewise, a study of rural villages in Senegal (Alvergne, Jokela, & Lummaa, 2010) showed that in women, higher Neuroticism was associated with having more offspring and that among women in lower social classes, higher Neuroticism was also associated with lower child body mass. This study also found that men who scored higher on Extraversion were in higher social classes, were more likely to be polygynous, and had more children. Finally, a recent study of another traditional society, the Tsimane of Bolivia, revealed associations between personality and fitness, as measured by fertility and health, though in women these associations were not consistent across regions (Gurven, von Rueden, Stieglitz, Kaplan, & Rodriguez, 2014).

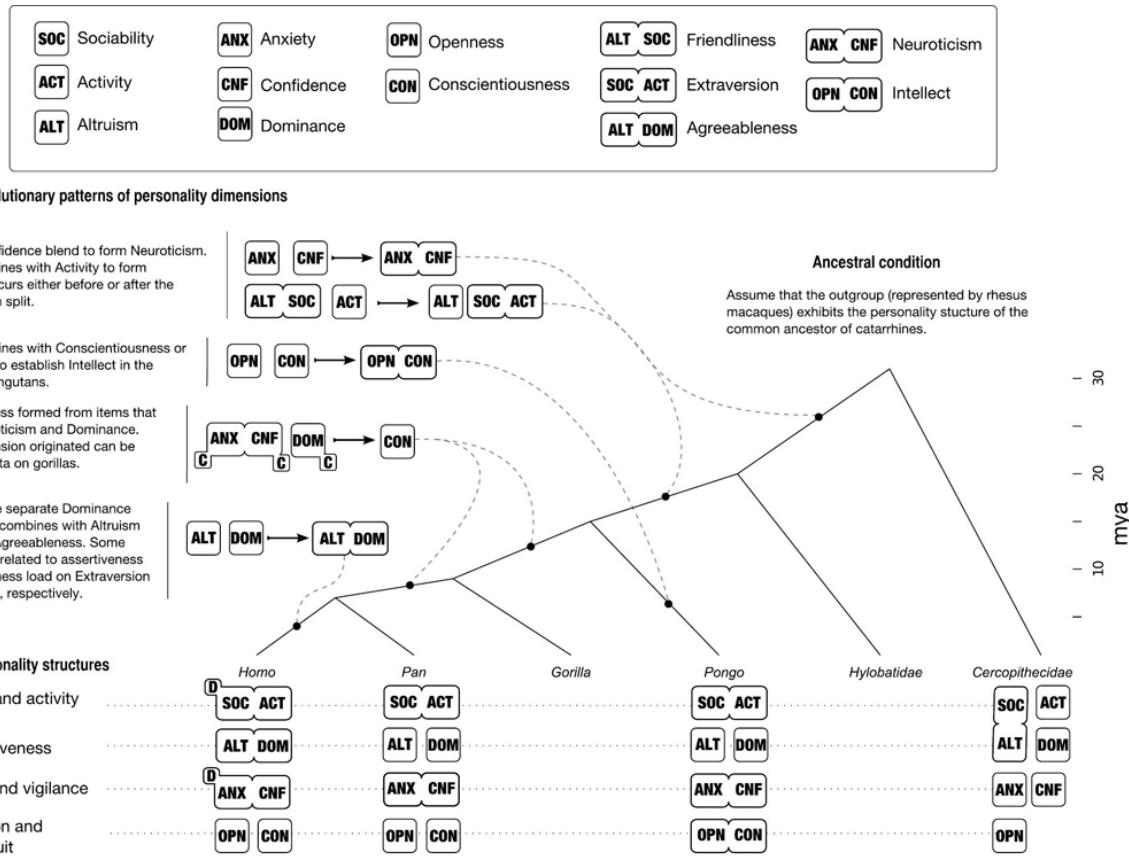


Figure 13.1. Cladogram of the hypothesized patterns of personality evolution in the parvorder Catarrhini. Personality structures are described as a combination of “basic” or “blended” dimensions, for example, Friendliness in rhesus macaques is a blend of Altruism and Sociability. The evolutionary transitions are interpreted as the integration or disintegration of these dimensions, shown by horizontal arrows between groups of dimensions. The possible transition points, indicated by the dashed lines, are placed according to phylogenetic parsimony. This picture is likely to change as more species are assessed. The structure of the genus *Pan* is represented by chimpanzees and the family Cercopithecidae by rhesus macaques. [From Weiss, A., Adams, M. J., Widdig, A., & Gerald, M. S. (2011). Rhesus macaques (*Macaca mulatta*) as living fossils of hominoid personality and subjective well-being. *Journal of Comparative Psychology*, 125, 72–83. Figure by the authors, licensed under a Creative Commons Attribution Unported License and published under the terms of this license.]

Clearing the Air

The universality of the Five Factor Model. Along with contributing to understanding the evolutionary bases of personality domains and the maintenance of additive genetic variation, research on animal personality can inform fundamental debates about the Five Factor Model. Take, for example, the question of whether the Five Factor Model is a human universal (McCrae & Costa, 1997) or is limited to so-called WEIRD (Western, Educated, Industrialized, Rich, and Democratic) people (Henrich,

Heine, & Norenzayan, 2010). Cross-cultural studies of personality using an “etic” approach, in which a questionnaire is translated into multiple languages, have found that the Five Factor Model can mostly be identified even in non-Western and/or less-developed nations (e.g., McCrae et al., 2005; see also the chapter by Allik and Realo). On the other hand, cross-cultural studies using an “emic” approach, in which questionnaires are devised based on personality descriptors from within that culture, do find cross-cultural differences in personality structure (Saucier & Goldberg, 2001). They suggest that differences between findings from the emic approach and those from the etic approach indicate that the etic approach constrains the structure that can emerge in samples (Saucier & Goldberg, 2001; see also the chapter by De Raad and Mlačić).⁴

Research on animal personality decreases the possibility that finding cross-cultural similarities in structure is constrained when the same questionnaire is applied across cultures. As noted earlier, studies of closely related animal species, for example, felids, using the same survey tool, shows evidence for species differences in personality (Gartner et al., 2014). Thus, human personality structure appears to largely an expression of the human genome, although the mostly etic study of the Tsimane (Gurven, von Rueden, Massenkoff, Kaplan, & Lero Vie, 2013) suggests that personality structure may also be a reflection of more modern social groups and environments.

Personality change. Animal personality research can also inform studies of personality development. In adulthood, as humans age, their personality changes in ways reflecting greater maturity, a pattern that includes declines in Neuroticism and Extraversion, increases in Agreeableness and Conscientiousness, and increases in Openness followed by declines (Roberts, Wood, & Caspi, 2008). There has been much debate over whether these trends reflect biological development (McCrae & Costa, 2003) or whether they are driven by social roles taken on by individuals, such as employment or marriage (Roberts, Wood, & Smith, 2005). Each side draws on several findings to support its position (see the chapter by Terracciano for more details). Those who favor Five Factor Theory point out that the amount of change is modest, is similar across different cultures, and is underpinned by shared genetic effects (McCrae & Costa, 2003). Those who favor Social-Investment Theory point out that within and across cultures, these shifts in personality are contemporaneous with transitions in life, such as leaving

home, beginning work, and beginning a family, and that behavioral genetic studies find evidence for nonshared environmental influences (Roberts et al., 2005). However, the comparable trends across cultures could just reflect the influence of experiences and roles that are part of being humans. Similarly, differences within and between cultures in terms of the rate of maturation could reflect genetic variation that, for example, makes some individuals' personalities develop more rapidly, thus preparing them for these roles sooner.

McCrae et al. (2000) noted that developmental trends in the behavioral traits of primates resemble those found in humans. A study by King et al. (2008) explored this further by directly comparing human and chimpanzee personality development and found that the pattern of age differences of the Five Factor Model domains was mostly conserved in chimpanzees. They also found that, correcting for the fact that chimpanzees do not live as long as humans, the magnitudes of age differences were similar in these two species (King et al., 2008). The main thing setting apart chimpanzee personality development from that of their human cousins is that male chimpanzees, but not male humans, show a slight, albeit significant, difference in some trends. In particular, as noted earlier, compared to females, males maintained higher Activity scores into older age and the association between age and Agreeableness was lower in males. In addition, the chimpanzee Dominance factor, while showing an increase and then a decline across age groups in females, showed an increase and plateau in males. As King et al. (2008) note, these findings support Five Factor Theory. However, they also noted that the sex difference in age-related trends suggests that selection has acted upon the way in which personality develops. In particular, the pattern of male chimpanzee personality development would be beneficial to species in which intragroup aggression among males is relatively high, such as it is in chimpanzees as opposed to humans (Wrangham, Wilson, & Muller, 2006, cited in King et al., 2008).

Unraveling causality. One notable contribution made by animal personality research has been with respect to explaining why human (and animal) personality traits are associated with life outcomes. Take as an example the association between personality and subjective well-being. In a 2002 study, Weiss, King, and Enns showed that in addition to being heritable in chimpanzees, subjective well-being shared nearly all of its genetic variance with Dominance, that is, all of the personality and subjective well-

being variance could be accounted for by common genetic influences; they named this phenomenon “covitality” (p. 1147). Since then, studies of personality and well-being in humans (Hahn, Johnson, & Spinath, 2013; Keyes, Kendler, Myers, & Martin, 2015; Weiss, Bates, & Luciano, 2008) and orangutans (Adams et al., 2012) have also shown that the associations between personality domains and well-being are mediated by common genetic influences.

Whereas personality is linked to a variety of life chances and outcomes, causality is not always apparent in humans as well as in nonhuman animals. For example, although a modest relationship between Type A personality and coronary heart disease has been found (Booth-Kewley & Friedman, 1987), methodological and other factors may play a role in this association, making it difficult to know what is causing what (Friedman & Booth-Kewley, 1988; Matthews, 1988). Later work described the components of Type A personality that were likely to affect this type of disease, namely antagonistic hostility, which is related to lower Agreeableness and higher Neuroticism (Dembroski, MacDougall, Costa, & Grandits, 1989). The question is, how exactly is health influenced by personality? One hypothesis is that health behaviors act as mediators between personality and its links to morbidity and mortality (Deary et al., 2010). For example, Conscientiousness is related to health-promoting behaviors (e.g., exercise) and to avoiding health-harming behaviors (e.g., fast driving). High Neuroticism and low Agreeableness have also been shown to be related to health-harming behaviors (Terracciano & Costa, 2004). Conscientiousness is also linked to better management of disease; for example, high Conscientiousness was associated with better adherence to medication in end-stage renal disease patients (Christensen & Smith, 1995). However, these mediators do not wholly account for the relationship between personality and mortality, and other factors such as the patient–health care practitioner relationship, demographic factors, socioeconomic status, other health behaviors, cognitive abilities, or other personality dimensions may be playing a role, and should be further explored (Deary et al., 2010).

Future Directions

Where in the study of animal (and even human) personality does this exciting field next point? We think the most important directions to pursue are those that will lead to the growth of both animal and human personality.

At the most basic level, to fully understand personality requires obtaining comparable personality measures, whether they are behavioral observations and/or tests, ratings, or some new method to be developed, on multiple traits and an even broader range of species. This will make it possible to test, for example, the extent to which personality tracks phylogeny (King & Weiss, 2011) and is an evolutionary character (Araya-Ajoy & Dingemanse, 2014). This work could help understand not just the evolutionary bases of personality variation, but also the genetics of the coupling and uncoupling of traits over evolutionary time.

Second, much like the research on personality and well-being cited here, studies of animal personality and outcomes related to welfare, psychopathology, and psychological needs could be used to better understand these associations in humans and could be informed by research on humans, too. In short, understanding whether personality is an actual causal factor or whether these associations are mediated by third variables, such as common genes, would lead to the ability to either identify individuals at risk, intervene to reduce risk, or both.

There is much more that those who study human and animal personality can learn from one another. With personality now being studied across a large variety of fields, conversations involving these subject areas and interdisciplinary research can only increase our knowledge of personality, its relationships and evolutionary history, and its potential to affect life outcomes for both humans and animals. We look forward to the discussion.

Acknowledgments

We greatly appreciate the thoughts and time that Joan Stevenson-Hinde, Sam Gosling, Lars Penke, and John Capitanio contributed prior to and during the drafting of this chapter.

Notes

1. Curiously, whereas Tinbergen is often cited by those who advocate a behavioral approach to studying animal personality [e.g., Uher, J. (2008). Comparative personality research: Methodological approaches. *European Journal of Personality*, 22, 475–496], Skinner is not.
2. The Madingley Questionnaire and the 54-item Hominoid Personality Questionnaire are freely available at <http://extras.springer.com/2011/978-1-4614-0175-9>.
3. To minimize the number of different terms in the literature, these labels were later replaced with the more common labels for the five domains.

4. The similarity between emic and etic approaches to studying cultures and the different approaches available to study animal personality have been noted [Gosling, S. D., and John, O. P. (1998, May). Personality dimensions in dogs, cats, and hyenas. Paper presented at the annual meeting of the American Psychological Society, Washington, DC; Uher, J. (2008). Comparative personality research: Methodological approaches. *European Journal of Personality*, 22, 475–496].

Behavior and Molecular Genetics of the Five Factor Model

Amber M. Jarnecke and Susan C. South

Abstract

Behavior and molecular genetics informs knowledge of the etiology, structure, and development of the Five Factor Model (FFM) of personality. Behavior genetics uses quantitative modeling to parse the relative influence of nature and nurture on phenotypes that vary within the population. Behavior genetics research on the FFM has demonstrated that each domain has a heritability (proportion of variation due to genetic influences) of 40–50%. Molecular genetic methods attempt to identify specific genetic mechanisms associated with personality variation. To date, findings from molecular genetics are tentative, with significant results failing to replicate and accounting for only a small percentage of the variance. However, newer techniques hold promise for finding the “missing heritability” of FFM and related personality domains. This chapter presents an overview of commonly used behavior and molecular genetic techniques, reviews the work that has been done on the FFM domains and facets, and offers a perspective for future directions.

Key Words: behavior genetics, molecular genetics, genes, environment, twin, family

Personality is a construct that taps into how people tend to feel, think, and behave. The Five Factor Model (FFM) of personality proposes that personality can be captured according to a person’s standing on five domains: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Each of the five higher-order domains are further subdivided into six facets (e.g., for extraversion, they are warmth, gregariousness, assertiveness, activity, excitement-seeking, and positive emotions). There is variability between individuals on each of these domains and facets. For example, some individuals may be more warm and assertive whereas others are cold and submissive. It is the unique combination of a person’s standing across the facets and domains that describes his or her personality. It is reasonable to ask, though, why some people are more or less likely to be extraverted and outgoing, open to new experiences and ideas, or prone to experiencing negative emotions. To

determine why a person's personality manifests in a particular way we can look to both genes and environment for an explanation.

The study of behavior and molecular genetics can help us examine where personality traits come from, how they develop, and how they change over time. Behavior genetics methods provide estimates about the comparative influence of genes and environment on a given personality trait (domain or facet) in the population. The behavior genetics field has firmly established that personality stems from both genetic and environmental influences; that is, both nature and nurture are at play in the origin of personality. Although behavior genetics methods demonstrate that genes play a role in personality, they cannot provide any information on which genes are exerting their influence on personality. From there it is necessary to turn to the methods of molecular genetics. Over the past few decades, the growing field of personality molecular genetics has attempted to identify measured genes that contribute to the variance in personality traits.

In this chapter, behavioral genetics and molecular genetics research on FFM personality domains and facets are reviewed. A broad overview of the methods will be presented, applications and limitations of this work in personality will be addressed, and recommendations for future work will be provided.

Behavior Genetics of Personality

Univariate Twin Studies

This chapter begins with an overview of the rationale and techniques of the twin method, the most commonly used behavior genetics method, before moving on to a review of what has been found for the FFM domains and facets and related personality traits.

Twin methodology. Behavior genetics relies on genetically informative family data—and a majority of the behavior genetics work on personality has relied on twin samples. Twins provide a natural experiment, offering the opportunity to unravel the comparative influence of genes and environment on a given phenotype; a phenotype is a variable, like personality, that varies continuously within the population. If a variable has little or no variance in the population, then it makes no sense to try to explain its variance (e.g., by and large the entire human population has two legs, in the absence of any rare genetic mutation). Personality traits do vary continuously throughout

the population, and it is this variation from person to person that we are trying to understand. That is, we are trying to explain why some individuals are very extraverted, enjoying the companionship of others on a near-constant basis, whereas others are more introverted and prefer being alone. The source of that variation can logically be located in either genetic differences between individuals in the population or differences in the environment which they encounter. Twins who grow up together in the same household have known degrees of genetic relatedness and shared family experiences, making them invaluable for understanding personality variation. There are, of course, other types of genetically informative family data that are useful for understanding genetic and environmental influences on personality (we discuss the powerful adoption design below), but for many pragmatic reasons the twin study is the most widely used.

Identical, or monozygotic (MZ), twins come from one fertilized egg that is split in two in utero and they share 100% of their genes. Fraternal, or dizygotic (DZ) twins, are the product of two eggs fertilized in utero at the same time. DZ twins share approximately 50% of their genes and, other than being born at roughly the same time and sharing a uterus, and are no more likely to be similar than any two nontwin siblings. DZ twins can be either same-sex (boy-boy, girl-girl) or opposite-sex (boy-girl) pairs; the latter are necessary for some types of modeling that investigate sex differences in genetic and environmental influences. To collect sample sizes that are large enough to have adequate power for biometric modeling, many researchers have established databases of twins based on publicly available birth records. In the United States, these twin databases are often regionally located, although the twin sample from the Midlife in the United States Study (MIDUS; see [Kandler, Thornton, Gilman, & Kessler, 2000](#)) is unique in being a nationwide sample of adult twins. An important consideration for twin databases is how zygosity is determined. For many twin samples, researchers will use a screener that asks questions such as “How often are you and your sibling mistaken for each other?” More recently, researchers have been able to confirm zygosity using genetic screening. Comparing the correspondence between MZ twins and DZ twins (all twins having been reared together, see below for twins reared apart) allows us to determine the extent to which genes and environment explain phenotypic variation.

To first determine the genetic and environmental variance of a trait, the correlations between twin pairs on a phenotype can be estimated and the

magnitude of the correlation for MZ twins is compared to the correlation for DZ twins. A rough estimate of heritability, or the proportion of variance in a variable due to genetic differences between people, is calculated using the formula $2 \cdot (r_{MZ} - r_{DZ})$. For instance, if we collected data on the NEO Personality Inventory-Revised (NEO PI-R; [Costa & McCrae, 1992](#)) from a sample of MZ and DZ twins, and the correlation between MZ twins for Neuroticism was .65 and the correlation between DZ twins was .40, then heritability would equal $2(.65 - .40) = .50$. That is, approximately 50% of the variance in NEO PI-R Neuroticism would be explained by genetic differences between people in the sample. In general, when the MZ correlation is larger than the DZ correlation the presence of genetic effects on a trait is inferred. If the MZ correlation is greater than twice the DZ correlation, the presence of dominant (nonadditive) genetic effects is indicated.

Formal *biometric* modeling of twin data can be accomplished through the use of structural modeling software that compares the covariance, or similarity, within MZ and DZ twin pairs on a phenotype, providing estimates for the proportion of variance explained by genetic and environmental influences. The univariate biometric twin model shown in [Figure 14.1](#) decomposes the total variance of one phenotype, P, into three components that account for the total variance in the population: additive genetic influences, abbreviated A in the figure, common or shared environmental influences, abbreviated C, and nonshared or unique environmental influences, abbreviated E ([Plomin, DeFries, McClearn, & McGuffin, 2008](#)). In this model, some parameters are fixed to certain values, which are derived from known relationships about twins reared together. Correlations between the A latent variables are set to 1.0 for MZ twins and 0.5 for DZ twins to account for the genetic relatedness of twins in a pair; the correlation between C latent variables is set to 1.0 to account for twins sharing the same common environment.

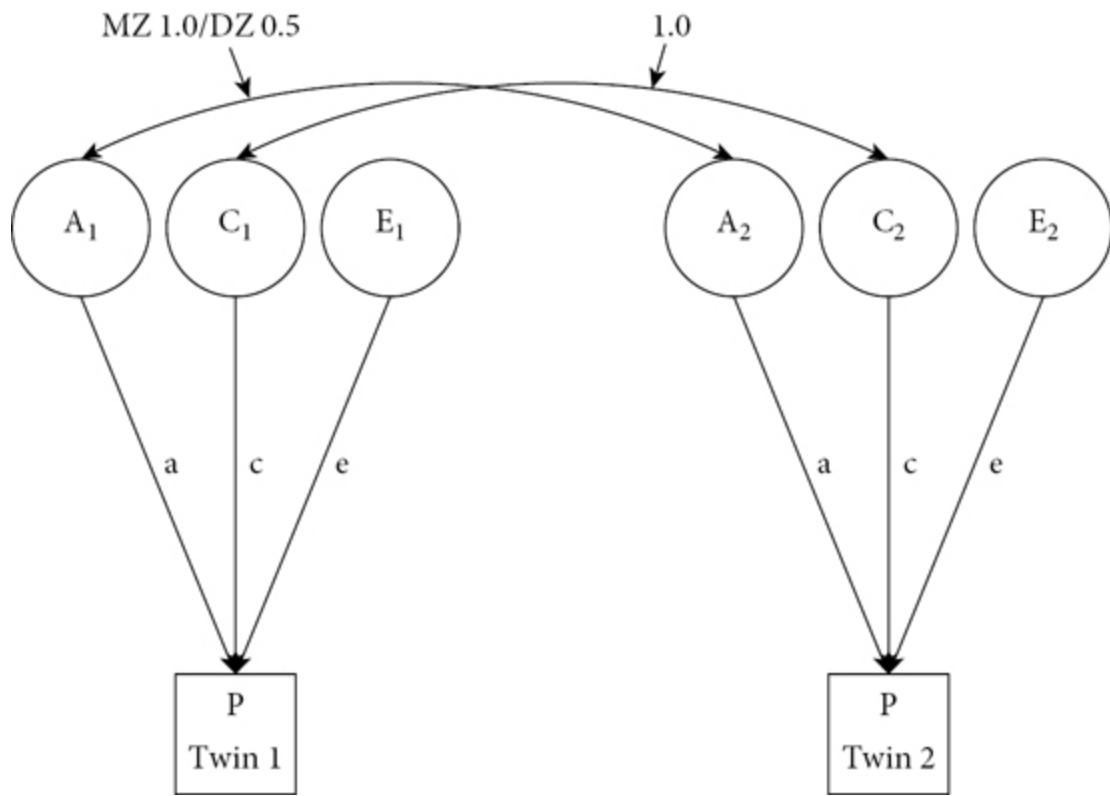


Figure 14.1. Univariate ACE model for the decomposition of a phenotype, P, into additive genetic (A), shared environmental (C), and nonshared environmental (E). Both members of the twin pair (P Twin 1 and P Twin 2) are shown. Correlations between latent genetic factors are set to 1.0 for MZ twins and 0.5 for DZ twins. Correlations between latent common environmental factors are set to 1.0 for MZ and DZ twins. Total phenotypic variance is calculated by summing the squared paths leading to it: $a^2 + c^2 + e^2$.

Heritability (abbreviated h^2) is the genetic variance A over the total variance in the phenotype or trait ($A + C + E$). It is important to note that heritability does not indicate how much of one person's genes influence his or her behavior. It is a population parameter that measures the amount of genetic variance over total trait variance (including genetic, shared, and nonshared environmental variation). Thus, if it is found that a personality trait has a heritability estimate of 40%, this means that genetic variation between people in that given population accounts for 40% of the trait's total variance. It would not be correct to infer that genes account for 40% of the personality trait in any one individual. Heritability estimates from twin models assume that genetic influences are additive, suggesting that the total genetic variance can be explained by many genes with small effect sizes located at different positions (or loci) on the genome. However, it is

possible that nonadditive genetic influences also contribute to phenotypic variation. There may be effects from a dominant gene or genetic contributions may interact with one another to influence personality. In fact, there is research supporting the presence of nonadditive genetic effects on personality (e.g., [Keller, Coventry, Heath, & Martin, 2005](#)). Estimates of nonadditive genetic effects (usually abbreviated D in biometric models) can be included in the univariate model shown in [Figure 14.1](#), but because of model constraints it is necessary to remove one of the other sources of variance, usually C.

Another source of influence on the variation of a phenotype is the shared or common environment (C). The shared environmental component of variance reflects the degree to which twins in a pair are alike because they grew up under the same roof. Aspects of the shared environment may include socioeconomic status (SES), neighborhood, similar peer groups, and/or comparable interactions with parents. Just as heritability is a proportion, the proportion of variance due to shared environment can be calculated [$C/(A+C+E)$], and is often abbreviated c^2 . The last source of variance examined by biometric models is from the nonshared or unique environment (referred to as E, raw variance, or e^2 , for proportion of variance). The nonshared environmental component reflects the amount that twins are different from one another even though they share the same genetic material and grew up in the same household. The nonshared environment may include traumatic events, different peer groups, events in utero, and unique interactions with parents. Measurement error is also accounted for in the nonshared environmental estimate. Therefore, nonshared environmental influences may be inflated if there is bias or imprecision in measurement.

Limitations and assumptions of the twin method. Differentiating environmental components that might fall under the shared environment versus the nonshared environment may be difficult to identify. For example, having similar peer groups may be thought of as a shared environmental influence that makes siblings more similar to one another. However, a peer group may act as a nonshared environmental influence if one twin's experience with the peer group is different or is perceived as different from his or her co-twin. Differences between twins on this experience would cause them to be less similar to one another and would be accounted for within the nonshared environmental component of variance.

The twin method also assumes that twins are, in general, just like other nontwin singletons. Some may question whether twins have unique personalities just by virtue of being a twin. [Johnson and colleagues \(2002\)](#) examined this issue using data on the Multidimensional Personality Questionnaire (MPQ; [Tellegen, 1982](#)) from the Minnesota Twin Registry, and found that the only difference between twins and singletons was greater Social Closeness in twins. Twin modeling is also based on the assumption that DZ twins share, on average, 50% of their differentiating genes. If assortative mating occurs, that is, the twins' parents are correlated on the phenotype of interest (e.g., perhaps they selected one another as a mate on the basis of sharing common personality traits), this could lead to greater than 50% sharing of genes. This would result in a higher DZ correlation than if there were no assortative mating, thus resulting in lower heritability estimates. Twin researchers should be careful to specifically model any assortative mating, but in general most studies of personality have found little evidence of similarity or assortative mating for personality (e.g., [Watson et al., 2004](#)).

Biometric modeling with twin data also relies on the equal environments assumption (EEA). We infer from twin data that if there are more similarities between MZ pairs raised in the same environment than DZ pairs, genetic influences are contributing to this similarity. Some have questioned, however, if MZ pairs are more alike than DZ twin pairs because their parents treated them in the same way (e.g., dressed them alike, treated them alike) than the parents of DZ twins. In this case, genetic influences would be overestimated. Although this is a concern regarding biometric models, there is evidence to support the EEA. In the cases in which the environment does seem to have an effect of making MZ twins more alike, research suggests that this does not impact phenotypic correlations for personality ([Loehlin & Nichols, 1976](#); [Scarr & Carter-Saltzman, 1979](#)).

Further support for the EEA is found in studies of twins reared apart. A unique and small group, these are twins who were separated usually at a very young age, were raised by different families, and often do not even know of the other's existence. It might be expected that heritability estimates for twins reared apart would be lower for twins raised in different environments, but studies generally find that twins reared apart show heritability estimates similar to those shown in studies examining twins reared in the same environment. For example, in a study of reared-together

twins and twins reared apart, correlations for MZ twins reared apart were very similar to correlations for MZ twins reared together on the MPQ scales ([Tellegen et al., 1988](#)). In addition, little support for influence from the shared environment was found for 2 of the 14 MPQ scales. Only the Positive Emotionality and Social Closeness scales showed a significant influence from the shared environment. This suggests that rearing environment may have less of an influence on the development of personality previously thought.

Findings from univariate twin studies. With regard to FFM research, it is consistently found that both nature and nurture contribute to personality traits. The heritability of all five higher-order domains (neuroticism, extraversion, openness, agreeableness, and conscientiousness) ranges from 40% to 50% and the majority of the remaining variance is ascribed to nonshared environmental factors ([Bouchard & Loehlin, 2001](#)). Studies examining the heritability of FFM domains have sampled participants from the United States, Canada, and Germany and have used variations of [Costa and McCrae's \(1992\)](#) measures, including in particular the NEO PI-R and the NEO-Five Factor Inventory (NEO-FFI) in addition to other Big Five or FFM measures. Many of these studies have found evidence for nonadditive genetic variance in one or more traits; however, the domains that show nonadditive influences vary between studies. This might be due to differences in measurement or population.

Heritability estimates have also been derived for FFM facets that lie within the higher-order domains. As it turns out, there is some variability in heritability estimates across facets within a domain ([Jang, Livesley, & Vernon, 1996](#)). One study using the NEO PI-R in a sample of Canadian adolescents and adults found that facets of Neuroticism showed the greatest consistency in genetic (26–44%) and environmental influences (56–74%), with the exception of Angry Hostility, for which nonadditive genetic influences were found ($d^2 = .33$). Facets belonging to the other four FFM domains presented greater variability in their etiology. Not surprisingly, additive genetic effects were found for some facets in each domain (e.g., Gregariousness from Extraversion, Fantasy from Openness, Altruism from Agreeableness). Additionally, nonadditive genetic effects were also found for other facets in extraversion, openness, and agreeableness (e.g., Warmth from Extraversion, Aesthetics from Openness, and Compliance from Agreeableness). For a few facets there was no evidence of significant

additive or nonadditive genetic influences, with all variance accounted for by shared and nonshared environmental influences: Feelings from the Openness domain, Modesty under Agreeableness, and Order, Self-Discipline, and Deliberation under Conscientiousness.

The studies reviewed above did not directly address the possibility of sex differences in estimates of genetic and environmental influences. Many behavior genetics studies control for effects of sex or gender ([McGue & Bouchard, 1984](#)), but a few in the personality literature have specifically examined sex differences. There are different types of sex differences that can be examined; *qualitative* sex differences exist when there are different genes operating for men and women, whereas *quantitative* sex differences occur when the genes are the same but the magnitude of genetic influences is different across sex. One study that drew its sample from twins from the United States and their families, as well as twins from Finland and Australia, found that the broad sense heritability (a combination of additive and nonadditive genetic influences) of extraversion was roughly the same for males and females (.47 and .52 for males and females, respectively) but heritability estimates of neuroticism were higher for females (.51) than males (.38; [Eaves, Heath, Neale, Hewitt, & Martin, 1998](#)). Another study that assessed personality using the MPQ did not find sex differences in the higher order factors of Negative Emotionality (similar to FFM neuroticism), Positive Emotionality (similar to FFM extraversion), or Constraint (a blend of FFM agreeableness and conscientiousness) but did find different heritability estimates for the lower-order scales of Alienation (25% for men, 16% for women), Control (2% for men, 20% for women), and Absorption (11% for men, 29% for women; [Finkel & McGue, 1997](#)).

For most univariate ACE models of personality, estimates of the shared environment are typically close to 0. This suggests that the family in which you are raised has little or no impact on personality variation beyond the influences from genes, leading some to conclude that the families have much less influence on development than other contextual factors (e.g., peer groups; see [Harris, 1998](#)). There are numerous rebuttals to this argument from outside the field of behavior genetics (see [Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000](#)). In addition, a few twin studies have uncovered shared environmental influence on certain personality traits. For example, [Krueger, Hicks, and McGue \(2001\)](#) found support for the effects of the shared environment on the personality trait of altruism. It

is also possible that many of the FFM twin studies that do not find evidence of shared environment are hampered by assessment method. In a study that examined NEO-FFI personality traits rated by unacquainted observers, influence from the shared environment was found (Borkenau, Riemann, Angleitner, & Spinath, 2001). In addition, it is possible that estimates of the shared environment hover around 0 because environmental factors have an interactive influence on personality. For example, researchers have reported higher estimates of C among individuals at the extreme ends of the parent-child relationship (an example of G×E that is addressed further later in this chapter; Krueger, South, Johnson, & Iacono, 2008). Standard biometric models would capture this source of influence in genetic or nonshared environmental estimates. However, newer biometric moderation models are capable of finding shared environmental influences at extreme ends of specific environments. These types of models will be discussed in greater detail later in the chapter.

Behavior genetic research using twin samples to examine personality generally, and the FFM specifically, is limited in some regard. Most of the research has used adult twin samples and self-report methods. The reliance on these samples and methods may bias estimates. When self-reports are supplemented by observer or peer reports, estimates from genetic influences increase (e.g. Borkenau et al., 2001; Riemann, Angleitner, & Strelau, 1997; Wolf, Angleitner, Spinath, Riemann, & Strelau, 2004). More recently, behavior genetics work on personality has included child and adolescent samples, rather than just adult samples, which have self- and observer-reported personality traits; however, thus far this work has not incorporated the FFM personality domains. Interestingly, the behavior genetic studies on personality in children have demonstrated the presence of shared environmental influences. In a sample of 9- and 10-year-old children, substantial heritability estimates were found for the Self-directedness and Harm Avoidance subscales of the Junior Character and Temperament Inventory (Cloninger, Svrakic, & Przybeck, 1993); shared environmental estimates were found for the Novelty Seeking and Cooperativeness subscales (Isen, Baker, Raine, & Bezjian, 2009). In another study examining inhibitory control (IC) in toddlers, 58% of the variation was attributed to genetic influences, 26% to shared environmental influences, and 16% to nonshared environmental influences for parent ratings; estimates were 38% genetic and 62% nonshared environment using

observer ratings. These studies provide some evidence that developmental period and rater may differentially influence estimates for the genetic and environmental effects on personality; however, these estimates need to be replicated in future work and extended to measures that assess the FFM domains and facets.

Multivariate and Longitudinal Twin Studies

In the twin studies discussed thus far, univariate biometric models were used to obtain estimates of the influence of genes and environment on FFM domains and facets considered individually. This type of model can be extended to examine the etiology of multiple personality traits or other phenotypes, which is referred to as *multivariate* biometric modeling. These types of models are useful in examining the structure and development of personality, as discussed below.

Multivariate twin methodology. Multivariate biometric modeling in personality research can be used to decompose the covariance between two or more personality traits or the covariance between a personality trait and another phenotype (e.g., a putative environmental risk factor). The model estimates the genetic and environmental influences unique to each phenotype as well as genetic and environmental variance common between phenotypes. The common variance presents as a correlation. For example, the genetic correlation represents the amount of genetic variance Phenotype A shares in common with Phenotype B. The respective environmental correlations represent the degree to which environmental influences on Phenotype A are shared with environmental influences on Phenotype B.

Examining the overlap between genetic and environmental influences on various personality facets and domains has the potential to inform our understanding of personality structure. In addition, exploring the overlap in personality traits with a longitudinal design may help us understand personality stability. Finding that nonshared environmental correlations among personality traits are large across time points, for example, would indicate that the stability of personality is largely influenced by environmental experiences unique to a twin in a twin pair.

There are three types of multivariate models that can be used to examine overlapping sources of variance. The simplest model employs a Cholesky decomposition, which parses the genetic and environmental variance shared between two or more phenotypes. This model is shown in [Figure 14.2](#); for

simplicity, one-half of the twin pair is displayed. In this model, one set of ACE influences (A_1 , C_1 , E_1) is estimated for all the phenotypes and a second set of uncorrelated ACE influences (A_2 , C_2 , E_2) is estimated for only the downstream variable. This model estimates the degree to which etiologic influences are shared between multiple phenotypes but does not impose any a priori constraints on why or how these influences might be shared; it is up to the researcher to determine the order of entry of the variables into the path model a priori. It is also possible to remove parameters, with the ultimate goal of obtaining the most parsimonious model to explain the relationships among the variables. This type of model would be useful, for example, to examine the shared genetic and environmental influences between an FFM domain and a putatively related environmental variable.

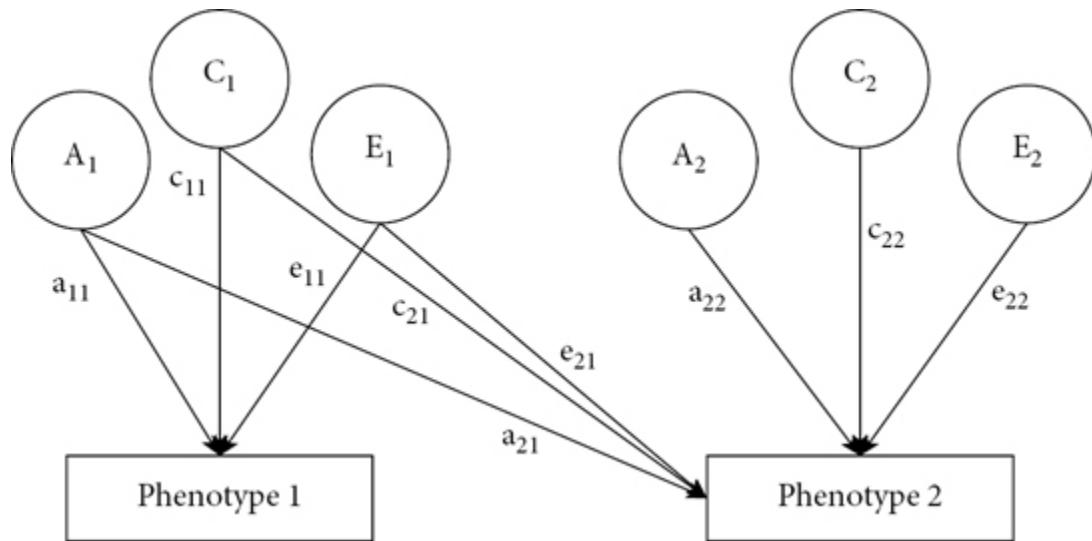


Figure 14.2. Path model for a Cholesky decomposition of variance into additive genetic (A), shared environmental (C), and nonshared environmental (E) sources. Shown for one twin in a pair.

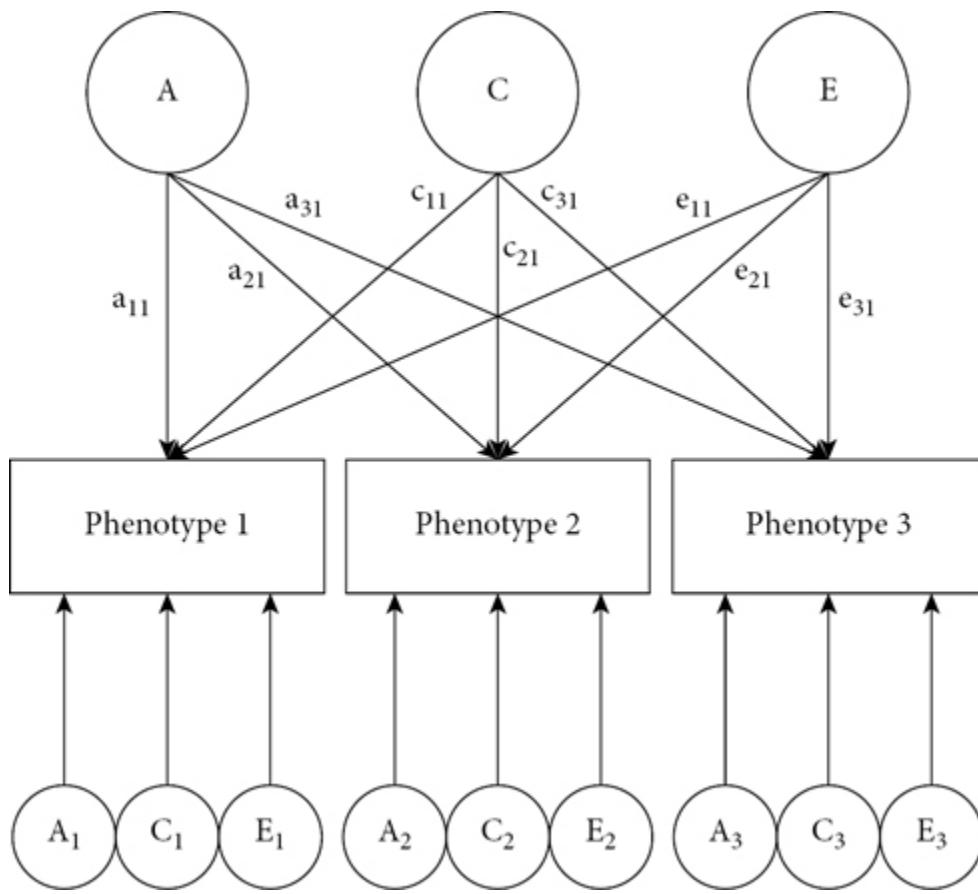


Figure 14.3. An independent pathways model for the genetic and environmental decomposition of variance into common latent genetic (A), shared environmental (C), and nonshared environmental (E) sources as well as ACE estimates specific to each phenotype. Shown for one twin in a pair.

The independent pathways (IP) model (Figure 14.3) builds on the Cholesky decomposition by positing that there are common latent genetic and environmental factors with direct effects on the phenotypes and genetic and environmental influences specific to each phenotype. As such, it is a stricter model than the Cholesky decomposition. In this model, one set of ACE factors is estimated for all phenotypes. Additionally, unique ACE components are derived for each phenotype in the model to estimate genetic and environmental influences that are not common to the other phenotypes.

The common pathways (CP) model is the third multivariate model. It imposes the greatest amount of structure on the etiologic influences contributing to a set of phenotypes (Figure 14.4). This model is most similar to a phenotypic factor analysis. It provides a single latent construct, P , that accounts for the covariance among multiple phenotypes that is decomposed into genetic and environmental effects (AP, CP, EP). It also

includes the ACE influences unique to each indicator. If an FFM domain is etiologically coherent, the CP model should fit the data better than the IP model or Cholesky decomposition.

Findings from multivariate twin modeling: environmental correlates.

The univariate twin model was vital in showing that personality variation was due to genetics and nonshared environment. However, the great challenge over the past few decades has been to determine the source of that nonshared variation. The “gloomy prospect” suggests that finding any aspect of the nonshared environment will be difficult if not impossible, because these environmental experiences are so idiosyncratic ([Turkheimer, 2000](#); [Turkheimer & Waldron, 2000](#)). Examining the overlap in the sources of variance between a personality trait and another variable has implications for understanding nonshared environmental factors that contribute to nearly 50% of the variance in personality. For example, the Cholesky decomposition can include a personality trait and a second environmental variable to estimate genetic and environmental influences shared between the two. This may help explain why personality is phenotypically related to a certain environmental variable.

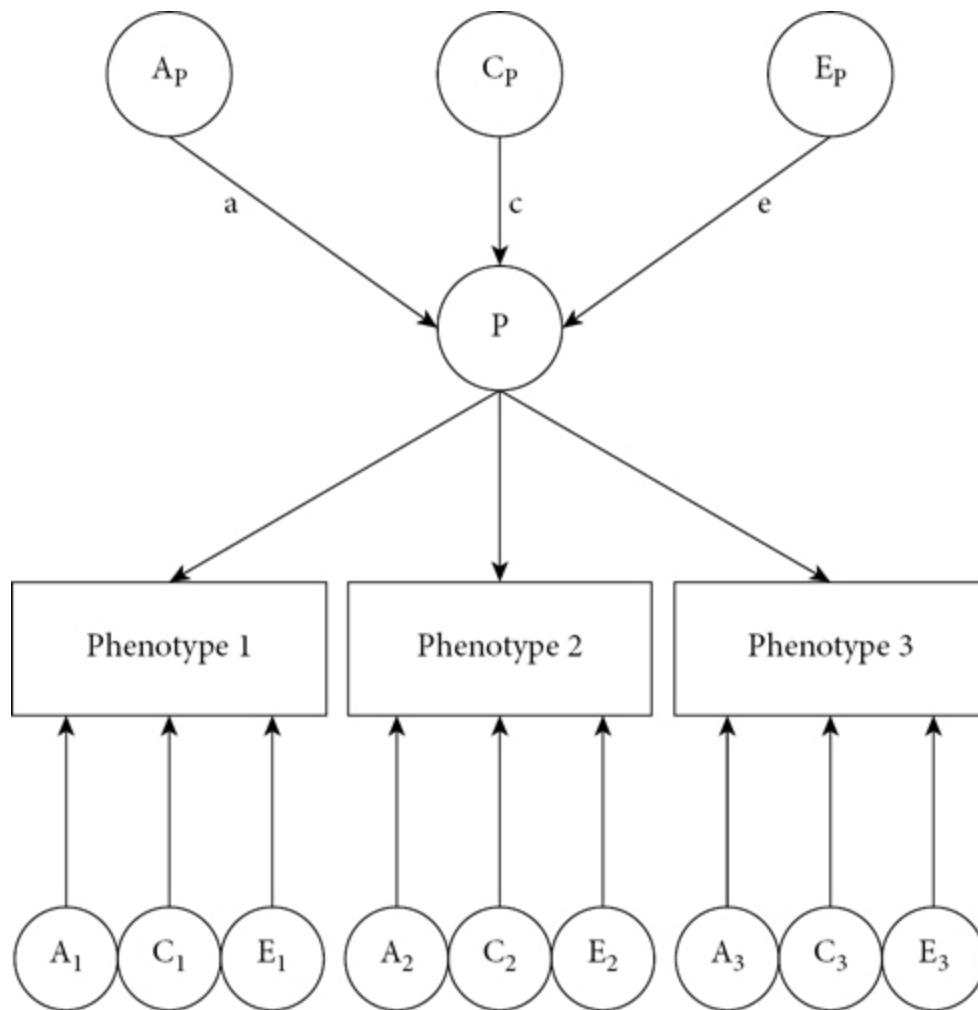


Figure 14.4. A common pathways model with a single latent construct, P, decomposed into additive genetic (A), shared environmental (C), and nonshared environmental (E) sources of variance. Shown for one twin in a pair.

If a moderate to large genetic correlation (r_A) was found, this would indicate that a personality trait and environmental variable are associated because common genetic influences contribute to both outcomes. Many variables of interest that are putatively environmental (e.g., parenting, marital satisfaction) are found to be heritable (Kandler & Baker, 2007), and some researchers are interested in examining the genetic and environmental associations between these environmental variables and personality. For instance, the FFM personality domains of neuroticism, agreeableness, and conscientiousness share some common genetic influences with parent-child relationship quality (Riemann, Kandler, & Bleidorn, 2012), and wives' personality traits of optimism and aggression share common genetic

influences with their reports of marital satisfaction as well as their husbands' reports of marital satisfaction (Spotts et al., 2005). In another sample of adult twins, both self-report and peer-report ratings of NEO PI-R personality domains shared common genetic influences with retrospective reports of rearing environment (Kandler, Riemann, & Kämpfe, 2009); estimates for unique environmental influences shared between personality and rearing environment were small. This finding suggests that unique environmental experiences manifesting in the rearing environment have only a small to negligible influence on adult personality. In addition, this study found that genetic correlations were greater for self-reported, versus peer-reported, personality, indicating that genetic influences may affect an individual's perception of past environments and self.

Multivariate twin modeling: personality structure. Findings from multivariate biometric models have also informed the etiologic structure of personality. Just as factor analysis has been used to examine the phenotypic structure of personality, multivariate biometric modeling can determine whether the etiologic structure of the FFM domains mirrors that of the phenotypic. Studies examining the etiologic structure of personality thus far have suggested that the structure is complex. For example, in a combined sample of Canadian and German adult twins, Jang and colleagues (2002) found that lower-order facets of the NEO PI-R did not load as anticipated onto five genetic factors. For each FFM higher-order personality domain, two genetic and two nonshared environmental liabilities were found. This suggests that the higher-order FFM domains may not be truly coherent constructs.

Another study examined the etiologic structure of Big Five personality domains in the MIDUS study, which includes a nationwide sample of adult American twins who completed a measure of trait adjectives taken from existing inventories. The authors found that common factors accounted for the variance in extraversion and neuroticism (Johnson & Krueger, 2004). This suggests that these two FFM domains were unitary latent personality constructs. The same study found that the IP model provided the best fit for openness and conscientiousness and the Cholesky provided the best fit for agreeableness. These findings suggest that the openness, conscientiousness, and agreeableness domains may have an etiologic structure that is not as coherent as the extraversion and neuroticism domains.

Finally, another study found support for a robust etiologic structure of the FFM. This study utilized a cross-cultural sample of twins from Canada, Germany, and Japan and factor analyzed the genetic and environmental correlations among NEO PI-R facets (Yamagata et al., 2006). This procedure yielded five genetically robust domains that mirrored the FFM higher-order domains. This pattern was consistent across cultures, supporting the idea that the FFM is universal.

The findings from these studies appear somewhat inconsistent with one another. To explain this, it is possible that the FFM fails to reflect the nature of personality. Nevertheless, the FFM does present more unity in its etiologic and phenotypic structures than other models of personality, such as the Temperament and Character Inventory (TCI; Cloninger, Svarkic, & Przybeck, 1993) for which the genetic and phenotypic structures of the inventory yielded little agreement (Ando et al., 2004). An alternative interpretation is that personality is hierarchical and each facet-level trait of the FFM has its own genetic and environmental influences (Jang, McCrae, Angleitner, Riemann, & Livesley, 1998). If this is the case, current measures of personality may fail to capture etiologically coherent personality constructs. In the future, findings from biometric modeling research may help inform personality inventories to produce more etiologically robust personality domains.

Findings from multivariate twin modeling: development and stability. As mentioned above, multivariate models can be extended to examine genetic and environmental variance on personality over time. This type of modeling allows us to estimate the relative influence of genes and environment on personality stability at different points in time. Many studies using longitudinal biometric models have found that the same genetic influences contribute to personality traits at different ages. For example, one study examining withdrawn behavior in children aged 3 to 12 years found that a substantial proportion of variation was due to genetic effects at all ages, and that these genetic effects contributed to the stability of withdrawal across time (Hoekstra, Bartels, Hudziak, Van Beijsterveldt, & Boomsma, 2008). This investigation also found that shared environmental effects, though modest, explained the stability of withdrawal in girls but not boys. Estimates of nonshared environmental influences increased over time but the nonshared environmental correlation decreased, suggesting that different effects of the nonshared environment played a role at different

ages. Another study examining the stability of MPQ traits across two waves of data during late adulthood found that large genetic and nonshared environmental correlations explained the high stability in traits over time (Johnson, McGue, & Krueger, 2005).

More recently, researchers have extended these developmental models by using biometric latent growth curve models. In these models, the latent slope (change) and intercept (initial level) factors are estimated for at least three waves of personality data, and then the factors are decomposed into genetic and environmental components. A recent study examined MPQ higher-order personality traits across three waves, from late adolescence into adulthood. The authors found that changes in traits were greater from the first wave to the second than from the second to the third. In addition, it was found that genetic and nonshared environmental influences both contributed to personality change (e.g., the slope factor) (Hopwood et al., 2011). Genetic influences contributed to change and the stability of trait levels over time and nonshared environmental influences had an effect on changes in traits. Another recent study used this approach, looking at change and stability of NEO PI-R traits in a sample of German adults across three waves, each 5 years apart (Bleidorn, Kandler, Riemann, Spinath, & Angleitner, 2009). This study found that genetic and nonshared environmental influences each contributed to personality stability and change; however, the etiology of personality change differed by domain or facet. Strong genetic effects contributed to the change in neuroticism, conscientiousness, and agreeableness; however, nonshared environmental influences contributed to most of the change in extraversion and openness. In addition, the genetic and environmental influences on a given facet tended to vary compared to other facets within the same domain.

Findings from multivariate twin modeling: relationships with psychopathology and well-being. Multivariate biometric models are also useful for examining the shared etiology between personality and other relevant outcomes, such as psychopathology or physical health. One study looked at the association between subjective well-being and Big Five/FFM domains in the MIDUS twin sample. The authors found that an IP model with one additive genetic factor accounted for the covariance between subjective well-being and the five personality domains, suggesting that the genetic variance on happiness could be accounted for completely by the genetic variance on the Big Five/FFM domains (Weiss, Bates, & Luciano,

2008). In other research, multivariate models have examined the overlap between FFM and related traits and different forms of mental illness (e.g., Agrawal, Jacobson, Prescott, & Kendler, 2004; Kendler, Gatz, Gardner, & Pedersen, 2006). Most recently, researchers have incorporated personality dimensions into latent domains of internalizing (e.g., mood disorders, anxiety disorders) and externalizing (e.g., substance dependence, antisocial personality disorder) psychopathology; for instance, neuroticism fits well into the internalizing spectrum (e.g., Hettema, Neale, Myers, Prescott, & Kendler, 2006; South & Krueger, 2008).

Biometric Moderation Models

In the past 10 years, another form of biometric model has gained prominence in the field. *Biometric moderation models* have become popular for their ability to specifically model gene \times environment interaction (G \times E). This refers to the idea that genetic influences on a trait may vary depending on the presence or absence of an environmental *moderator* variable, often thought of as a risk or protective factor. For example, an individual may inherit a genetic predisposition to express a particular personality trait, but this trait may only manifest given a particular environment. Traditional univariate biometric models provide a heritability estimate that is constant and population specific, but G \times E can be tested in twins using biometric moderation models. These models allow the etiologic influences on a phenotype to differ by a person's standing in a given environment. One study utilizing these models found that the heritability of positive and negative emotionality varied as a function of parent-child relationship quality in a sample of adolescents (Krueger, South, Johnson, & Iacono, 2008). For instance, genetic influences on positive emotionality decreased (72% to 34%), shared environmental influences increased (1% to 46%), and nonshared environmental influences decreased (27% to 20%) from low to high parent-child conflict. From low to high levels of parental involvement, genetic influences on negative emotionality increased (31% to 59%), whereas shared environmental (36% to 21%) and nonshared environmental (33% to 19%) influences decreased. Another study found that etiologic influences on emotional instability (akin to neuroticism) varied by level of maternal indulgence and family conflict (Jang, Dick, Wolf, Livesley, & Paris, 2005). Heritability estimates differed as a function of family variables as did shared environmental variance. Considering the lack of shared

environment found in many twin studies, this introduces the possibility that shared environmental effects may be found only in the most extreme environments.

Biometric moderation models may not always explain variations in personality, however. Several studies have failed to find that environmental variables moderate the etiologic influences on personality; for example, one study found that the genetic and environmental influences on neuroticism did not vary by level of family environment ([Kandler, Aggen, Jacobson, & Neale, 2003](#)). Another possibility is that personality may act as the moderator; for instance, [South and Krueger \(2014\)](#) found that the genetic influences on alcohol use problems varied as a function of level of FFM/Big Five conscientiousness, with greater heritability of alcohol problems found at higher levels of conscientiousness. There is much room for work in this area, as biometric moderation models of personality and related variables (e.g., relationships, health) are relatively underutilized compared to other phenotypes (e.g., alcohol use disorders; see [Young-Wolff, Enoch, & Prescott, 2011](#)).

Adoption Studies and Extended Family Designs

Most of the behavior genetics work on personality has utilized twin samples to decompose the variance attributable to genetic and environmental effects. Families with one or more adopted children make up another genetically informative sample that may provide information about the relative influence of genes and environment on a phenotype like personality. Adopted, nonbiologically related children share 100% of their rearing environment and 0% of their genes. If the same parents also have one or more biological children, who share 100% of their rearing environment as well as the approximate 50% of their segregating genes, the known degrees of genetic and environmental relatedness between nonbiologically related siblings can be compared and used to calculate estimates of genetic and environmental influence on personality. Adoption studies are particularly powerful in examining the effect of the shared environment; however, they tend to be somewhat more difficult than twin studies as it is necessary to collect data on biological and/or adoptive parents, or find adoptive families that contain both biological and adopted siblings.

Like twin designs, adoption studies find substantial influence from the nonshared environment on personality traits and little to no influence from the shared environment. However, adoption studies tend to find smaller heritability estimates than twin studies (Loehlin, Willerman, & Horn, 1987; Plomin, Corley, Caspi, Fulker, & DeFries, 1998). There are two possibilities that might account for the difference in heritability estimates between twin and adoption studies. First, the EEA may be violated in twin samples. Identical twins reared in the same environment may be more alike because influences from the environment serve to make them more similar; however, studies of twins reared apart have reported heritability estimates equivalent to those found in samples of twins raised together (Bouchard, 1994; Pedersen, Plomin, McClearn, & Friberg, 1988), which supports the EEA. A second possibility to account for the difference in heritability estimates is that adoption studies may be better able to detect and account for the influence of nonadditive genetic effects. Twin studies that have attempted to test for dominant (nonadditive) genetic influence rarely find evidence of significant effects and may be limited in their ability to do so. In a twin-plus-sibling design, Keller and colleagues (2005) found evidence of nonadditive genetic effects for the Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1975) and TCI personality domains. Thus, extensions of twin-only or adopted-only family designs may be better at uncovering nonadditive genetic influences.

Extended adoption designs may also be better at identifying family influences on personality. In an adoption study that included a sample of families with parents and two adolescent siblings (biologically related siblings, two adopted siblings, or one adopted and one biologically related sibling), the authors reported that variation in negative emotionality was attributed mainly to genetic and nonshared environmental influences and the variation in disinhibition had a substantial shared environmental component (20%) (Buchanan, McGue, Keyes, & Iacono, 2009).

Molecular Genetics of Personality

Thus far in this chapter, *quantitative* methods of exploring the relative influence of nature and nurture have been discussed. In this section, more *qualitative* methods, that is, molecular genetics, will be considered. As noted above, molecular genetic methods allow researchers to identify

specific genetic markers that may contribute to a phenotype, such as personality. Uncovering these markers may be important in identifying biological processes that contribute to personality development. Here, several methods used in the rapidly developing field of molecular genetics will be reviewed, but interested readers are also referred to more in-depth explanations of these techniques (Neale, Ferreira, Medland, & Postuma, 2008; Yang, Lee, Goddard, & Visscher, 2011).

Candidate Gene Analysis

Candidate gene analysis is the earliest developed method in the molecular genetics field. This method identifies a polymorphism or allele (form of a gene) and examines its statistical relationship to a phenotype of interest. In personality research, the candidate gene is often hypothesized to be related to the phenotype and is chosen based on animal research or what is known about its mechanism of action. The first molecular genetic studies of personality appeared in the 1990s, reporting evidence that NEO Extraversion and Tridimensional Personality Questionnaire (TPQ; Cloninger et al., 1993) Novelty Seeking were associated with the dopaminergic gene *DRD4* (see Ebstein, 2006). Other studies have focused on a promoter region of serotonin transporter gene *5-HTTLPR*. One investigation suggested that *5-HTTLPR* may be related to TPQ Harm Avoidance. However, replications by independent research groups produced little additional support for this association (Ebstein, 2006). Discrepancies between studies may have been due, in part, to the measurement of personality traits.

More recently, meta-analyses have been used to address some of the limitations of candidate gene analyses conducted by independent researchers. For example, two of these meta-analyses suggest that *5-HTTLPR* is associated with avoidance-related traits (Munafò et al., 2003; Sen, Burmeister, & Ghosh, 2004). It has also been suggested that *5-HTTLPR* and aggressive traits are significantly associated, and dopaminergic genes (*DRD3* and *DRD4*) are related to approach and avoidance traits; however, these associations were reduced to nonsignificance when age, ethnicity, and sex were added as covariates (Munafò et al., 2003). Of note, some of the studies in this meta-analysis measured traits using NEO assessments, whereas others measured traits with different personality inventories such as the TPQ and TCI.

Gene × environment interactions and gene × gene interactions. It has been difficult for researchers to find strong main effects of specific genetic polymorphisms and personality domains. As a result, some molecular genetics studies have also incorporated the idea of G×E. Just as biometric moderation models were developed to investigate whether genetic influences on a trait depend on certain environmental conditions, molecular genetic investigations of G×E have examined interactions of specific alleles and environmental variables. One study found support for G×E examining the monoamine oxidase A (MAOA) candidate, childhood maltreatment, and antisocial behavior ([Caspi et al., 2002](#)). It was reported that one MAOA genotype was protective against the effects of maltreatment, as individuals with this genotype presented fewer antisocial behaviors. However, this finding has been difficult to replicate. A meta-analysis found that MAOA genotype status moderated the effect of maltreatment on mental health outcomes but moderation was not significant for antisocial behavior ([Kim-Cohen et al., 2006](#)).

Not only do genes and environment interact with one another, but there is also the possibility for gene–gene interactions and epistasis. Epistasis is the effect of one allele moderated by another, or multiple other, alleles. For example, the serotonin transporter gene, *SLC6A4*, is modulated by dopaminergic (e.g., *DRD4*) and gamma-aminobutyric acid (e.g., *GABA[A]*) genes ([Ebstein, 2006](#)). More complex interactions (e.g., *DRD4* × 5-*HTTPLR* × *COMT*) have been identified in the personality literature, as well. In a study examining genetic associations between serotonin-related genes and antisocial personality disorder (ASPD) in prison inmates, an interaction between tryptophan hydroxylase, *COMT*, and 5-*HTR2A* was found ([Arias et al., 2011](#)). This work elucidates the biological pathways involved in ASPD, suggesting that the epistatic interaction of these genes affects the dopamine pathway and moderates serotonin levels. Thus far, studies of gene–gene interactions have not incorporated FFM measures of personality. Work within this area should incorporate these measures in the future.

Linkage Analysis

Linkage analysis identifies regions of interest on the chromosome from data collected from family pedigrees. Because DNA is not copied exactly from the mother and father, but is rearranged to create a new pattern, it is

assumed that genes located closer to one another on the chromosome are linked and therefore have a higher probability of being transmitted together. One limitation of linkage analysis is that it is most appropriately used to identify genes of large effect size, and most complex human traits, including personality, are presumed to be influenced by many genes of small effect sizes. Despite this limitation, several linkage studies have been conducted linking chromosome regions to specific personality traits. One study found five loci (locations on chromosomes) associated with Neuroticism, as measured by the EPQ ([Fullerton et al., 2003](#)). Another found linkage to Neuroticism on several chromosomes, replicating some of the findings from the earlier study ([Kuo et al., 2007](#)). Only one study to date has conducted a linkage analysis for all of the FFM domains ([Amin et al., 2012](#)). The authors used a sample of 2,657 individuals from a genetically isolated region of the Netherlands and found that each of the NEO-FFI domains was associated with several loci for individuals in the top 10% of these traits. This suggested that there may be genes with moderate to large effect sizes that contribute to personality traits; however, replication of these findings is needed.

Genome-Wide Association Studies

Association studies attempt to determine if individuals who differ on the amount of a phenotype, such as personality, also differ on the allele of a gene. This involves measuring the polymorphism and determining whether it is significantly associated with the phenotype of interest. Of the molecular genetic methods covered thus far, these studies are the least driven by a priori hypotheses. Until recently, association analyses could examine only a few locations on the genome, but advances in technology and genome sequencing have allowed researchers to examine hundreds of thousands of locations at one time. This method is called genome-wide association study (GWAS). One strength of this method, as compared to linkage analysis, is that it is much better powered to detect genes of small effect. GWAS also has the ability to determine the exact location of the gene. GWAS centers on single base pair changes in DNA, referred to as single nucleotide polymorphisms (SNPs). The human genome contains approximately 3 billion base pairs, many of which are the same across all individuals; however, sometimes there is a change in a single base pair and this change may lead to some individuals presenting a less common minor

allele. At present, over a million SNPs can be examined at one time (e.g., [Li, Li, & Guan, 2008](#)). Although this enables researchers to examine a large portion of the genome, it also allows for the possibility of false positives. Typically, GWAS studies are corrected for the number of statistical tests, and a SNP has to be significant at the level of $p < 5 \times 10^{-8}$. This means that GWAS must require very large sample sizes.

To date, there has been one meta-analytic GWAS study of the FFM. The authors examined approximately 2.4 million SNPs from over 20,000 individuals across the world ([de Moor et al., 2012](#)). The analysis included 10 discovery samples and 5 replication samples, all of European ancestry. All participants completed the NEO-FFI. They did not find significant associations between any of the SNPs and the traits of Neuroticism, Extraversion, or Agreeableness. Significant associations were found between two SNPs on chromosome 5 and Openness and one SNP on chromosome 18 and Conscientiousness; however, these results did not replicate entirely across samples. Furthermore, the effect sizes were small and the authors could only theorize about the mechanism of effect between these SNPs and the related personality traits. Although this study showed some promise for identifying specific genetic mechanisms involved in personality, it appears that replication studies with much larger samples are needed. At present, a research group is currently combining personality data across an even larger number of samples in order to conduct additional analyses; as part of this effort, researchers are conducting intensive item response theory (IRT) analysis to determine the equivalency of the FFM measures across samples ([de Moor, van den Berg, & Boomsma, 2013](#)).

Other approaches. In recent years GWAS approaches have been combined with other methods in an attempt to expand the understanding of complex traits, such as personality. For example, imaging genomics combines functional neuroimaging with molecular genetics to determine how genetic variation is related to mechanisms within the brain (e.g., [Hariri & Holmes, 2006](#); [Munafò, Brown, & Hariri, 2008](#)). There has also been a movement to shift the focus from individual genes to gene systems. One study drew from a subset of participants from the Study of Addiction: Genetics and Environment (SAGE; [Bierut et al., 2010](#)) and pooled SNP information from eight dopaminergic genes to examine associations between these genes and sensation seeking as measured by Zuckerman's Sensation Seeking Scale Form V (SSS-V; [Derringer et al., 2010](#);

Zuckerman, Eysenck, & Eysenck, 1978). This investigation found that a number of SNPs within four dopaminergic genes were associated with sensation-seeking behavior. Another study used a summary score from SNPs that were presumed to be related to NEO PI-R personality domains in order to form “molecular personality scales” (MPSs; McCrae, Scally, Terracciano, Abecasis, & Costa, 2010). Researchers collected personality data and genomic scans of nearly 4,000 individuals from a genetically isolated province of Sardinia, and MPSs were assessed in a GWAS. This investigation found that MPSs were related to four of the five FFM domains (all but Extraversion). Of course, replication is needed, but these novel approaches show some promise for identifying genetic and biological mechanisms associated with personality.

Genome-Wide Complex Trait Analysis

The most recently developed molecular genetics method is genome-wide complex trait analysis (GCTA; see Yang, Lee, Goddard, & Visscher, 2011). GCTA uses very large samples to scan hundreds of thousands of SNPs across all chromosomes or the whole genome to determine whether similarity in a phenotype is associated with a large number of polymorphisms. Unlike GWAS, which attempts to identify specific genes associated with a phenotype, GCTA estimates the genetic variance that can be accounted for by shared SNPs. GCTA requires that individuals in a sample are unrelated. Critics of twin studies view this as an advantage of GCTA because it removes the possibility of inflated heritability estimates due to increased similarity of MZ twins (see Equal Environments Assumption, above). To date, there are no studies using GCTA to examine FFM personality traits. However, GCTA studies looking at other outcomes, such as callous-unemotional behavior (Viding et al., 2013) and cognitive ability in children (Plomin, Haworth, Meaburn, Price, & Davis, 2013), have in fact found that the proportion of variance explained by shared SNPs is lower than the heritability estimates found in twin studies. Using a combined sample of twins and their parents and adoptive families, one study gathered heritability estimates from a subsample of twins, used GCTA, and created genetic risk scores from SNPs to examine the associations between behavioral disinhibition and substance use (Vrieze, McGue, Miller, Hicks, & Iacono, 2013). Again, it was found that the estimates derived from GCTA were lower than the heritability estimates

from the biometric models, but both the twin analyses and the risk scores suggested genetic overlap between behavioral disinhibition and substance use.

GCTA is still a budding method. Although this method assumes that genetic variance is additive, it is anticipated that analysis will be extended in the future to include dominance and gene–gene interactions effects, as well as genetic correlations and G×E. This opens up the possibility of asking complex questions about gene–environment interplay that may not be captured using the twin method.

Summary and Future Directions

In this chapter, an overview of how behavior and molecular genetics methods can be used to uncover the nature of personality was discussed. Overall, these methods have played a pivotal role in demonstrating that genes and environment work in conjunction to manifest in individual differences and have helped us focus on specific genetic mechanisms that may be involved. Much more work on personality has been done within these fields, and much of it has focused on the FFM personality trait model. However, much more still needs to be done, specifically with regard to the FFM domains and facets.

Although it has been suggested that twin studies have outlived their usefulness, it is important to consider that this method can provide us with more than simple heritability estimates. As noted earlier, behavior genetics may help us understand the etiologic structure of personality. This may prove useful in understanding the phenotypic structure of personality as it emerges across time and culture, and how personality is related to the etiology of psychopathology, a concern of particular interest to the validity of the FFM. There is much that can still be done using the twin and adoption methods as applied to the FFM. For instance, work can be done to understand any potential sex differences in the FFM domains and traits, as this will have implications for molecular genetic investigations of these traits. Additionally, many researchers have conducted complex multivariate modeling of personality (e.g., [Markon, Krueger, & Watson, 2005](#)) and psychopathology (e.g., [Hettema et al., 2006](#); [Krueger, Markon, Patrick, & Iacono, 2005](#)), and this work needs to be extended to biometric modeling, specifically using measures of the FFM. For instance, a study could employ

a biometric multivariate modeling extension of the work done by Markon and colleagues to investigate whether the genetic structure of various personality measures, including the FFM, maps onto the phenotypic structure.

There are also behavior genetic methods that have never been used with the FFM domains and facets. For instance, the monozygotic twin differences design identifies MZ twin pairs, matched for their genetic material and shared environment, who are discordant on a particular environmental factor. This provides an opportunity to examine differences between twins that may be accounted for by their different standings on this environmental variable. In essence, the discordant MZ design tests the counterfactual, allowing researchers to see how one twin might have looked in the absence of the unique environmental experience (see [McGue, Osler, & Christensen, 2010](#) for a more thorough discussion of this topic).

The field of molecular genetics has also encountered a number of criticisms, primarily regarding the lack of replication across studies. Indeed, it has been very difficult to identify specific polymorphisms that are associated with any behavioral or health-related outcome, let alone personality. In addition, challenges in molecular genetics are magnified when we consider that most complex traits are believed to involve small effects of many genes and genes may interact with one another or their environment to manifest in specific traits. However, molecular genetics may be able to reliably identify genetic polymorphisms related to personality through large collaborative efforts. For example, in the largest GWAS meta-analysis to date, three SNPs were identified as being involved in educational attainment, and this finding did replicate ([Rietveld et al., 2013](#)). The large consortia that have been formed to address some of the limitations of GWAS studies provide hope that future endeavors will uncover specific genetic mechanisms involved in personality.

Personality Neuroscience and the Five Factor Model

Timothy A. Allen and Colin G. DeYoung

Abstract

Personality psychology seeks both to understand how individuals differ from one another in behavior, motivation, emotion, and cognition and to explain the causes of those differences. The goal of personality neuroscience is to identify the underlying sources of personality traits in neurobiological systems. This chapter reviews neuroscience research on the traits of the Five Factor Model (the Big Five: Extraversion, Neuroticism, Openness/Intellect, Conscientiousness, and Agreeableness). The review emphasizes the importance of theoretically informed neuroscience by framing results in light of a theory of the psychological functions underlying each of the Big Five. The chapter additionally reviews the various neuroscientific methods available for personality research and highlights pitfalls and best practices in personality neuroscience.

Key Words: personality, Five Factor Model, neuroscience, neurobiology, Cybernetic Big Five Theory, individual differences, traits

Personality psychologists pursue at least three fundamental questions regarding human nature: First, how do individuals meaningfully differ from one another? Second, what are the causes of these individual differences? And third, what are their consequences? In relation to the first question, a major problem historically was identification of the most important dimensions of variation in personality. The emergence of the Five Factor Model (FFM) or “Big Five” has gone a long way toward solving this problem (Costa & McCrae, 1992; Goldberg, 1990; John, Naumann, & Soto, 2008; Markon, Krueger, & Watson, 2005). The discovery of five consistent broad dimensions of covariation among specific traits, in both lexical and questionnaire assessments of personality, has allowed the field to begin moving beyond questions of taxonomy toward the systematic accumulation of evidence regarding the causes and consequences of trait differences. At this point, the consequences of variation in the Big Five have been studied extensively; the five factors—Extraversion, Neuroticism, Openness/Intellect,

Conscientiousness, and Agreeableness—matter for many life outcomes, in academic and industrial success, in relationships, in physical and mental health, etc. ([Ozer & Benet-Martinez, 2006](#)). Their causes are not as thoroughly researched, however, and this chapter reviews the progress that has been made in identifying the neurobiological basis of the Big Five.

Personality neuroscience rests on the premise that all reasonably persistent individual differences in thought, cognition, motivation, and emotion (that is, personality) must entail patterns of consistency in the functioning of the brain ([DeYoung, 2010b](#); [DeYoung & Gray, 2009](#)). From this perspective, the brain is the proximal source of all personality characteristics, and it is only by affecting the brain that more distal influences in the genome and environment are able to influence personality. As a result, two major goals of personality neuroscience are to identify the neural substrates of personality and to better understand how genetic and environmental forces, over the course of development, create the relatively stable patterns of brain function that produce personality. So far, more progress has been made on the first of these goals than on the second.

The rise of neuroscience technologies for brain imaging and molecular genetics has led to a rapid proliferation of empirical reports over the past decade. Research in personality neuroscience has employed many different personality measures, behavioral tasks, and neurobiological techniques to shed light on the workings of the human system, and it can be difficult to integrate all of these into a coherent understanding. Here, we take advantage of the fact that the FFM can categorize most personality trait measures in order to synthesize findings from personality neuroscience over the past several decades. We begin by describing the various tools available for personality neuroscience. Previous reviews have highlighted a number of methodological limitations in personality neuroscience research to date ([DeYoung, 2010b](#); [Yarkoni, 2015](#)). We echo many of these cautions and make a concerted effort, throughout the chapter, to highlight methodologically rigorous research and to provide caveats regarding findings that are suggestive but flawed.

After reviewing methods, we discuss theories of the psychological functions underlying each of the Big Five. Beyond brain scanners and gene-identification chips, theory is one of the most important tools in personality neuroscience. Atheoretical research is sometimes published in this field, examining associations of personality traits with brain structure or function

or genetic variation in a purely exploratory manner, but such an approach often makes it difficult to achieve sufficient statistical power, given the need to correct for multiple statistical tests when examining associations throughout large portions of the brain. It also increases the temptation to develop post hoc explanations of findings, even when they may be merely false positives. Theoretical approaches to the FFM can provide hypotheses to guide research in personality neuroscience.

Methodological Issues in Personality Neuroscience

Personality neuroscience, at the intersection of two fields, must contend with the limitations of measurement in both. Most measurement of personality relies on self-reports using questionnaires. Better questionnaire assessment can be achieved by collecting informant reports from knowledgeable peers, in addition to self-reports ([Connelly & Ones, 2010](#); [Vazire, 2010](#)). Still, questionnaires do not exhaust the possible methods of personality assessment. Various behavioral and cognitive tasks may also be used to assess stable personality traits. Because the FFM was discovered and established in questionnaire data, we focus primarily on such data in this chapter. Nonetheless, we believe nonquestionnaire methodologies are likely to grow in importance in personality neuroscience (and personality psychology more generally), as researchers attempt to capture consistencies in thought, behavior, emotion, and motivation in more diverse ways.

Whereas personality psychology is largely dominated by a single type of measure, neuroscience is a field burgeoning with technologies that allow researchers to explore previously inaccessible details of the structure and function of the human brain. Neurobiological methods in personality neuroscience mostly fall into five general categories:

1. *Neuroimaging techniques.* The most prominent and frequently used method in personality neuroscience is magnetic resonance imaging (MRI), which creates images of the brain based on the magnetic properties of different tissue types. MRI is popular not only because it is noninvasive but also because, in addition to measuring brain structure, it can also be used to measure brain function, by taking advantage of the fact that blood flow and oxygen use increase with neural activity. The blood-oxygen-level-dependent (BOLD) signal from functional MRI (fMRI), therefore, can be used to indicate when different regions of the brain are more or less active.

Researchers most often use fMRI while participants are engaged in some computerized task in the scanner. One limitation of task-based fMRI is that relative rather than absolute levels of neural activation must be studied;

activation during the task of interest (or during a particular type of event within a task) must be contrasted with activation during other parts of the scan (which could be a control task, a resting period, or other events within the same task). Increasingly, however, fMRI researchers are also investigating patterns of functional connectivity, rather than relative activation, which do not require a contrast between tasks. Functional connectivity refers to the patterns of temporal synchrony between different parts of the brain. If brain regions show a similar temporal pattern of activation and deactivation during some portion of a scan, they are said to be functionally connected. Analysis of functional connectivity during periods of rest in the scanner has demonstrated that brain networks that are spontaneously active closely resemble networks that are activated by specific tasks (Laird et al., 2011; Smith et al., 2009). This discovery has led to an effort to map the major networks of the brain using functional connectivity, and the resulting maps provide useful clues about the brain's large-scale functional organization (Choi, Yeo, & Buckner, 2012; Yeo et al., 2011).

One of these networks in particular is worth introducing briefly here because of its rather opaque label, the “default network” (also called the “default mode network”), and because of its importance for several personality traits. The default network received its label because it was discovered more or less by accident as a function of the fact that neural activation must be studied through contrasts (Buckner, Andrews-Hanna, & Schacter, 2008). In contrasts of task versus rest, it was noted that a particular set of brain regions was frequently more active during rest than during task. Hence, this pattern of activation was considered the brain’s default mode, what the brain is likely to do when participants are asked simply to rest and not to attend to external demands. Subsequent research has determined that the default network is responsible for simulating experience in a variety of contexts, including times when we remember events in the past, imagine the future (or any other hypothetical state), take on another person’s perspective, or evaluate ourselves (Andrews-Hanna, Smallwood, & Spreng, 2014). These are the kinds of things that people tend to do when they are not engaged by their immediate surroundings and their minds are free to wander, but these processes can also be engaged by specific tasks (e.g., memory or perspective-taking tasks). Here is a case in which the limitation that task-

based analysis of fMRI requires a contrast between two conditions led to an important discovery.

Another neuroimaging technique, positron emission tomography (PET), has also been used in personality neuroscience. It has the great advantage of allowing measurement of receptors for particular neurotransmitters but the disadvantage of being invasive, as it requires injection of radioactive tracers into the bloodstream. Both MRI and PET are valuable for their spatial resolution.

2. *Electrophysiological techniques.* Electroencephalography (EEG) measures neural activity by recording electrical activity along the scalp. It has a much higher temporal resolution than fMRI, capable of tracking differences in brain activity on the order of milliseconds (as opposed to seconds for fMRI), but has greatly reduced spatial resolution. Other electrophysiological techniques, such as electrocardiography and assessment of electrodermal activity, use peripheral nervous system activity to draw inferences about brain processes related to emotion and motivation.

3. *Molecular genetics.* Variation in the genes that build the brain can be measured through analysis of DNA. Commonly used molecular genetic techniques in personality neuroscience include candidate gene studies, in which particular genes are investigated because of their hypothesized relevance to personality, and genome-wide association studies (GWAS), in which the entire genome is scanned for variation associated with some trait or traits (see also the chapter by [Jarnecke and South](#)).

4. *Psychopharmacological manipulation.* Specific chemicals can be administered as drugs in an attempt to implicate a given neurotransmitter, receptor, or other brain molecule in the expression of a trait. Effects of the manipulation are examined either on behavior or on some neurobiological assay. If the effects of the manipulation are moderated by the trait, or vice versa, this implicates the targeted molecule in the trait.

5. *Assays of endogenous psychoactive substances.* Measurements of substances such as hormones or neurotransmitter metabolites, in blood, saliva, urine, or spinal fluid, can be used to implicate specific neurobiological systems in personality.

The expense of neuroimaging contributes to the largest methodological problem in the field: low statistical power. Many studies are published with samples that are far too small for good research on individual differences. A study of 461 structural MRI studies published between 2006 and 2009 found the median power to be only 8% ([Button et al., 2013](#); [Ioannidis, 2011](#)). Another study reported, in a random sample of 241 neuroimaging papers published after 2007, the median sample size was just 15 for one-group studies and 14.75 for each group in two-group studies ([Carp, 2012](#)). This trend undoubtedly accounts for some of the inconsistencies that exist in findings in personality neuroscience ([DeYoung, 2010b](#); [Yarkoni, 2009, 2015](#)). Fifteen is a small sample even for studying many of the within-person effects that are most commonly researched in neuroimaging, in which brain activity in one condition is compared to that in another. Fifteen (or even 30) is ridiculously small for the study of individual or group differences, and yet

many MRI papers have reported correlations of personality traits with neural variables in samples smaller than 20. Correlations in small samples are highly susceptible to outliers and to sampling variability more generally. Further, small sample sizes increase the likelihood that a given sample will fail to represent variation across the full distribution of the trait of interest, especially in the tails of the distribution (Mar, Spreng, & DeYoung, 2013). The likelihood of accurately assessing a correlation in a small sample is very low (Schonbrodt & Perugini, 2013). Whenever possible, therefore, we focus our review in this chapter on studies with larger sample sizes.

One method for increasing power in smaller samples is the use of extreme groups, in which participants very high and very low on the trait of interest are recruited based on a previous assessment of that trait. This is likely to yield a larger effect size (the difference between high and low groups on the biological variable of interest) than the correlation across the full range of the trait. This tactic has pitfalls, however. First, the degree to which the expected effect size increases is unpredictable, making power calculations difficult. Second, it prevents any meaningful analysis of variables other than the trait used for selection and may alter the effects of covariates in unpredictable ways. We recommend an extreme-groups design only in cases in which a single, clear hypothesis is being tested, funds are limited, and any covariates are handled at the time of recruitment rather than in analysis. Important covariates, such as gender and age, should be balanced when recruiting the extreme groups. Crucially, something that should never be done is to analyze a subset of a larger existing sample by identifying extreme groups within it and excluding the rest of the participants from the analysis even though they have all relevant variables assessed. Nor should a continuous variable ever be dichotomized (or trichotomized) and analyzed as if it were a categorical variable. These strategies entail an unacceptable loss of power compared to analyzing continuous variables in the whole sample (MacCallum, Zhang, Preacher, & Rucker, 2002).

Chronically low power in personality neuroscience has a number of important implications. Most obvious of these is increased Type II error rates—that is, failures to detect real effects as significant. Two-thirds of the significant effects reported in psychology are smaller than $r = .3$ (Hemphill, 2003), and there is no reason to assume that effects in personality neuroscience should be larger. An observed correlation of .3 will not be significant at $p < .05$ with a sample size less than 40, and, with a sample of

40, the power to detect a true correlation of .3 is only about 50%, meaning that a Type II error would result about half the time, as the observed correlation fluctuates due to sampling variability. Given that the middle third of effect sizes in psychology is between $r = .2$ and $.3$ (Hemphill, 2003) and that the average effect size in personality research has been estimated at $.21$ (Richard, Bond, & Stokes-Zoota, 2003), researchers should attempt to ensure that they have the power to detect effects of at least $r = .2$. To have 80% power to detect a correlation of $.2$ at $p < .05$ requires a sample of 194.

One promising strategy for acquiring sufficiently large samples in MRI is to aggregate across many smaller studies of different tasks by including standard structural scans or brief resting-state scans in each study. If a database of subjects' contact information is maintained, this method can be used to carry out new MRI studies of individual differences without collecting additional MRI data (Mar et al., 2013). Even with a large sample, however, the need to carry out large numbers of statistical tests to examine the whole brain can lead to problems with power. MRI studies typically divide the brain into a three-dimensional grid of small "voxels" and often involve testing whether an effect is present in thousands of individual voxels. In whole-brain analyses, researchers sometimes choose a stringent threshold for significance at the voxel level (e.g., $p < .001$) and then correct to $p < .05$ for the analysis as a whole based on the size of clusters (adjacent significant voxels). This can lead to Type II errors because the effect of interest may not be large enough to achieve significance at $p < .001$ in any voxel, even in a sample large enough to detect the same effect at a higher p -value. We recommend setting a voxel-level threshold that will be capable of detecting effects equivalent to $r = .2$ or larger, given one's sample size (then subsequently correcting to $p < .05$ for the whole analysis).

A less well-known but perhaps even more troubling result of low power is that it increases the proportion of significant results that are Type I errors, false positives (Green et al., 2008; Yarkoni, 2009, 2015). As the sample size decreases, sampling variability increases and precision decreases. Even if the true effect is zero, in small samples it is more likely to be sufficiently misestimated as to appear significant. Testing effects in many small samples and publishing only those that are large enough to achieve significance is a recipe for the publication of many false positives, which then distort the literature and are likely to mislead other researchers (Button et al., 2013). When the true effect is not zero, low power still has the pernicious effect of

artificially inflating significant effect sizes, a problem that is exacerbated in MRI and other methods that involve making many statistical tests in the same study. Estimates of the effect will vary across voxels, and in small samples it is likely that only voxels that greatly overestimate the effect will be significant (Yarkoni, 2009). This leads not only to overestimated effect sizes, but also to the false impression that effects are localized to very narrow regions of the brain, when the true effects are likely to be much weaker but to be present in much broader swathes of brain tissue (Yarkoni, 2015). The situation is made even worse when researchers identify voxels of interest using a significance test (a threshold) with some neural variable and then aggregate across those voxels before inappropriately carrying out another, nonindependent significance test involving that variable (Vul, Harris, Winkielman, & Pashler, 2009).

Beyond small samples, another potential cause of inconsistencies within the neuroimaging literature is the wide variability in the methods that researchers employ. Carp's (2012) review of recent neuroimaging studies indicated that nearly all (223 of 241) of the reviewed studies reported using different analytical techniques. Even using different versions of the same software package for MRI analysis or using the same version on different computers can lead to different results (Gronenschild et al., 2012). The wide range of methods available may contribute to the presence of excess significance bias within the neuroimaging literature—and the psychological literature more generally (Ioannidis, 2011; Jennings & Van Horn, 2012). One reason for the disproportionate number of significant findings may be selective reporting bias, in which researchers try multiple analytical methods and choose one that yields the most statistically significant results, or those best matching their hypotheses, even when other analytical methods may not support such a conclusion (Ioannidis, 2011). These practices increase Type I error. Of course, the great variety of methods available can lead to Type II errors as well, if methods are chosen that obscure effects of interest (Henley et al., 2010).

A related issue is simply that some methods are better than others, but their relative quality is not always clear or widely known. In the area of structural MRI, for example, the most common method for assessing the relative volume of different brain structures is voxel-based morphometry (VBM). In VBM, structural brain images are spatially normalized (deformed) to match a template brain, partitioned into gray and white matter,

and smoothed so that each voxel reflects the average percentage of gray matter within itself and the voxels surrounding it (Ashburner & Friston, 2000). VBM has been criticized on several grounds. First, it has been noted that if registration to the template were perfect, there would be no individual differences for VBM to detect; thus, the method relies problematically on imperfections in processing the data (Bookstein, 2001). Further, because VBM relies on the density of gray matter in each voxel, it may accurately detect differences in structure only near the gray–white matter boundary and, even there, only when the differences are not expressed on an axis parallel to the boundary (Bookstein, 2001; Davatzikos, 2004). Finally, VBM is poor at detecting nonlinear differences in brain morphology, which are likely to be common (Davatzikos, 2004). A better approach to structural MRI may be deformation- or tensor-based morphometry (TBM), using the nonlinear portion of the transformation that aligns each brain image to the template brain as the index of relative local volume (e.g., DeYoung et al., 2010). Newer versions of the VBM toolbox in the software program SPM integrate this TBM method as an option under the label “modulation” (see <http://dbm.neuro.unijena.de/vbm/segmentation/modulation/>), and we recommend selecting modulation for nonlinear effects in any VBM study of personality. The fact that many structural MRI studies of the FFM have used VBM without modulation may account for some of their inconsistency.

Neuroimaging is not the only area of personality neuroscience in which low power and inconsistent findings are problems. In molecular genetics, well-replicated findings are rare. The first candidate gene studies of personality were published 20 years ago (Benjamin et al., 1996; Ebstein et al., 1996), linking a particular polymorphism of the dopamine D4 receptor gene (*DRD4*) to both Extraversion and Novelty Seeking (a complex trait reflecting primarily low Conscientiousness but also high Extraversion and potentially also low Agreeableness and high Openness/Intellect; DeYoung & Gray, 2009). A later meta-analysis of 36 studies found both effects to be nonsignificant, although a different polymorphism in the same gene appeared to be associated with Novelty Seeking but not Extraversion (Munafo, Yalcin, Willis-Owen, & Flint, 2008). Such failures to replicate are typical of candidate gene studies, which is perhaps not surprising given that well-powered GWAS studies in much larger samples have also largely failed to identify genetic variants associated with the Big Five (de Moor et al., 2012; Terracciano et al., 2008). These failures do not indicate a lack of

genetic influences on personality (the Big Five are substantially heritable; [Johnson & Krueger, 2004](#); [Loehlin, McCrae, Costa, & John, 1998](#); [Riemann, Angleitner, & Strelau, 1997](#)); rather, they are indicative of the fact that complex traits are massively polygenic—that is, influenced by many thousands of variations in the genome—with most having only a minuscule effect on the trait in question ([Munafo & Flint, 2011](#)). Superficially, candidate gene studies of personality may seem to have reasonably large sample sizes, often in the hundreds, but these are probably often nowhere near large enough given the tiny effects of interest. It seems likely that the situation with the FFM will resemble that with schizophrenia: once sample sizes for GWAS exceeded 30,000, many genes began to be robustly implicated ([Need & Goldstein, 2014](#)). Because GWAS studies of the FFM are still not that large, the current review will largely ignore molecular genetic findings and will usually provide caveats when they are cited.

Theories of Psychological Function in the FFM

The FFM has long been criticized for being descriptive rather than explanatory (e.g., [Block, 1995](#)). We would argue that the establishment of an accurate descriptive model is not a flaw but rather a prerequisite for good science. Nonetheless, having identified the major dimensions of personality, the field must next strive to explain them. Personality neuroscience is aimed at neurobiological explanations, but in order to develop neurobiological hypotheses it is very helpful to begin with theories of the psychological functions underlying each of the Big Five. Based on what is known about how different psychological functions are carried out by the brain, it is possible to derive corresponding neurobiological hypotheses.

Decades of behavioral and biological research on personality have led to the development of a number of theories specifying the psychological functions associated with each of the Big Five ([Denissen & Penke, 2008](#); [DeYoung, 2015a](#); [MacDonald, 1995](#); [Nettle, 2006, 2007](#); [Van Egeren, 2009](#)). These theories come to very similar conclusions about each of the five dimensions, and this level of agreement suggests that the available data point fairly clearly toward some broad conclusions. For the purposes of this chapter, we will adopt the perspective of the most thoroughly elaborated of these theories, Cybernetic Big Five Theory (CB5T; [DeYoung, 2015a](#)).

Cybernetics is the study of goal-directed, self-regulating systems ([Carver & Scheier, 1998](#); [Wiener, 1965](#)). It is a useful and perhaps even necessary

approach for understanding living systems (Gray, 2004). CB5T defines personality traits as “probabilistic descriptions of relatively stable patterns of emotion, motivation, cognition, and behavior, in response to classes of stimuli that have been present in human cultures over evolutionary time” and attributes the existence of traits to variations in the parameters of evolved cybernetic mechanisms (DeYoung, 2015a). (Importantly, CB5T recognizes that these parameters are influenced by both genetic and environmental forces; the substantial heritability of the Big Five does not render them impervious to life experience.) The cybernetic mechanisms that underlie traits allow people to identify goals, to be motivated to attain goals, to select and carry out appropriate actions to move toward their goals, to interpret feedback about the current state of the world (including the organism itself), and to detect whether the current state matches their goal state.

CB5T adopts a MIMIC (multiple indicators, multiple causes) approach (cf. Kievit et al., 2012), which posits that a shared psychological function causes covariance among the specific traits (the multiple indicators) that are encompassed by each of the Big Five, but that this psychological function is instantiated by complex brain systems with many parameters (the multiple causes) that vary to create individual differences in that function. In other words, CB5T does not attempt to identify just a single biological parameter responsible for a given trait because it recognizes that various biological mechanisms with many parameters contribute to any given psychological function.

One advantage of CB5T over the other, similar theories cited above is that it specifies mechanisms for traits at three levels of the personality hierarchy, not just the Big Five (Figure 15.1 and Table 15.1). The fact that personality is structured hierarchically means that the Big Five are not the only traits of interest in personality psychology or neuroscience. They are merely the most prominent major dimensions of covariation among more specific traits. The variance of those more specific traits, below the Big Five in the hierarchy, is not fully explained by the Big Five, in either phenotypic or genotypic analysis (Jang et al., 1998, 2002). This means that, in addition to investigating mechanisms for the Big Five, personality neuroscience should also investigate mechanisms that differentiate specific traits within each of the Big Five domains.

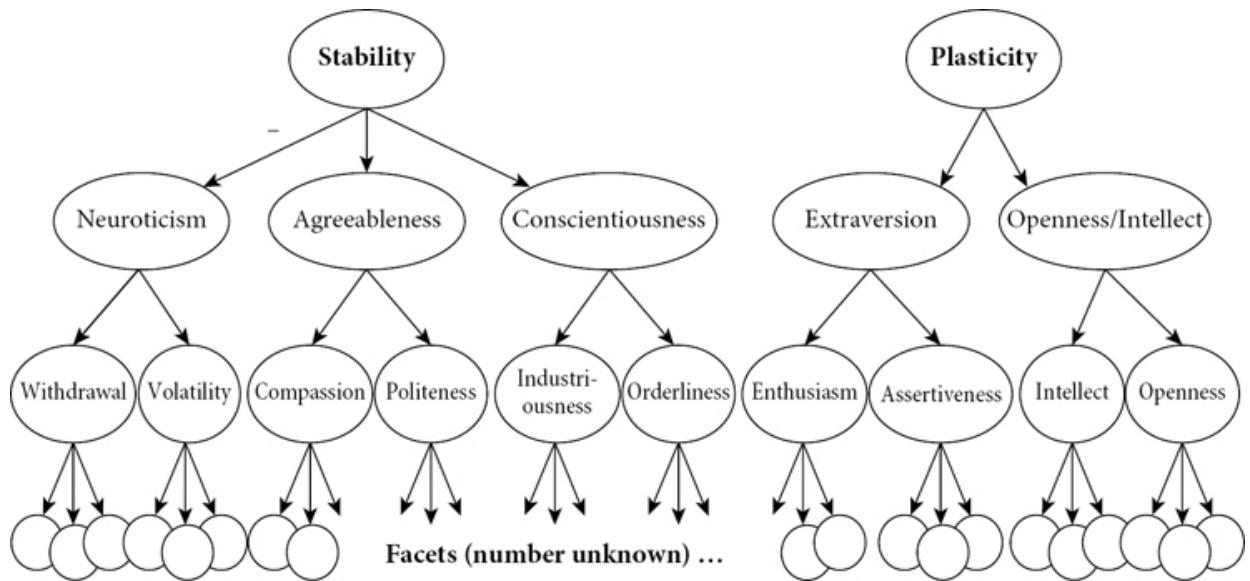


Figure 15.1. A personality trait hierarchy based on the Five Factor Model. First (top) level: metatraits. Second level: Big Five domains. Third level: aspects. Fourth level: facets. The minus sign indicates that Neuroticism is negatively related to Stability.

Additionally, the Big Five themselves are not entirely independent; they show relatively weak but consistent correlations with each other. Based on these correlations, a considerable body of research demonstrates the existence of two higher-order factors above the Big Five in the trait hierarchy, called metatraits (DeYoung, 2006; Digman, 1997; McCrae et al., 2008). When modeled using ratings from multiple informants, the correlation between the metatraits is near zero, suggesting that there is no nonartifactual “general factor of personality” above them (Chang, Connelly, & Geeza, 2012; DeYoung, 2006; Revelle & Wilt, 2013). CB5T includes hypotheses regarding the mechanisms associated with the metatraits, as well as a level of traits below the Big Five, in addition to the Big Five themselves.

The metatraits, Stability and Plasticity, are not given a separate section in this chapter because most of the evidence for their biological basis comes from studies of the Big Five considered individually, rather than in terms of their shared variance, and these studies will be reviewed in the sections on each of the Big Five. This evidence suggests that serotonin influences Stability and dopamine influences Plasticity (DeYoung, 2006, 2010b, 2013). Serotonin stabilizes information processing in many brain systems, helping to maintain ongoing cybernetic function by facilitating both resistance to disruption by impulses and focus on ongoing goals (Carver et al., 2008; Gray

& McNaughton, 2000; Spoont, 1992). Stability represents the shared variance of Conscientiousness, Agreeableness, and low Neuroticism. Each of these traits reflects a different kind of stability: low Neuroticism reflects emotional stability, Conscientiousness reflects motivational stability, and Agreeableness reflects social stability (maintaining social harmony). Serotonergic neurons project from the raphe nuclei in the brainstem to innervate most cortical and subcortical brain structures, making serotonin well poised to influence the broad range of personality traits implicated in Stability.

Dopamine facilitates exploration, approach, learning, and cognitive flexibility in response to unexpected rewards and cues indicative of the possibility of reward (Bromberg-Martin, Matsumoto, & Hikosaka, 2010; DeYoung, 2013). Though not as widespread in the brain as serotonin, it nonetheless influences most subcortical and frontal cortical structures. Plasticity represents the shared variance of Extraversion and Openness/Intellect, and CB5T posits that it reflects a general tendency toward exploration (DeYoung, 2013, 2015a). Whereas Extraversion reflects behavioral exploration and sensitivity to specific rewards, Openness/Intellect reflects cognitive exploration and sensitivity to the reward value of information. The metatraits are important from a cybernetic perspective because they represent variation in the prioritization of two of the broadest needs of any cybernetic system that must survive in a complex and changing environment: (1) to move toward goals consistently (Stability) and (2) to generate new interpretations, strategies, and goals in order to adapt to the environment (Plasticity) (DeYoung, 2006, 2015a).

Table 15.1. Psychological Functions Hypothesized to Be Associated with Each of the Traits Labeled in Figure 15.1

Trait	Cybernetic Function
<i>Metatraits</i>	
Stability	Protection of goals, interpretations, and strategies from disruption by impulses.
Plasticity	Exploration: creation of new goals, interpretations, and strategies.
<i>Big Five</i>	
Extraversion	Behavioral exploration and engagement with specific rewards (i.e., goals to approach).
Neuroticism	Defensive responses to uncertainty, threat, and punishment.
Openness/Intellect	Cognitive exploration and engagement with information.
Conscientiousness	Protection of nonimmediate or abstract goals and strategies from disruption.
Agreeableness	Altruism and cooperation; coordination of goals, interpretations, and strategies with those of others.
<i>Aspects</i>	
Assertiveness	Incentive reward sensitivity: drive toward goals.
Enthusiasm	Consummatory reward sensitivity: enjoyment of actual or imagined goal attainment.
Volatility	Active defense to avoid or eliminate threats.
Withdrawal (anxiety, depression)	Passive avoidance: inhibition of goals, interpretations, and strategies, in response to uncertainty or error.
Intellect	Detection of logical or causal patterns in abstract and semantic information.
Openness to Experience	Detection of spatial and temporal correlational patterns in sensory and perceptual information.
Industriousness	Prioritization of nonimmediate goals.
Orderliness	Avoidance of entropy by following rules set by self or others.
Compassion	Emotional attachment to and concern for others.
Politeness	Suppression and avoidance of aggressive or norm-violating impulses and strategies.

Adapted with permission from [DeYoung \(2015a\)](#).

The third level of traits labeled in [Figure 15.1](#) is described as *aspects* of the Big Five, whereas the unlabeled traits at the lowest level of the hierarchy are known as *facets* ([DeYoung, Quilty, & Peterson, 2007](#)). No consensus exists regarding the number and identity of facets within each Big Five dimension. Although the NEO Personality Inventory-Revised (PI-R), a popular measure of the FFM, identifies six facets for each, its 30 facets were derived rationally through a review of the personality literature, rather than empirically ([Costa & McCrae, 1992](#)), and other instruments assess different FFM facets (e.g., [Goldberg, 1999](#)). CB5T focuses on the aspect level of the trait hierarchy, between the Big Five and their facets, because this level was empirically derived and, thus, is likely to capture the most important

distinctions within each of the Big Five (DeYoung et al., 2007). This level of the trait hierarchy was first detected in a behavioral genetic analysis of twins, in which two genetic factors were needed to model the covariance of the six NEO PI-R facets in each domain (Jang et al., 2002). If the Big Five were the next level of the hierarchy above the facets, only a single genetic factor should have been necessary for each domain. In a different sample, similar factors were subsequently found in nongenetic factor analysis, using 15 facet scales for each domain, rather than six (DeYoung et al., 2007). The resulting 10 factors were characterized empirically, based on their correlations with over 2000 items from the International Personality Item Pool (Goldberg, 1999), and a public-domain instrument, the Big Five Aspect Scales (BFAS), was created to measure them (DeYoung et al., 2007). Whenever possible in the following review, we distinguish between the two aspects in terms of their neurobiological correlates.

Table 15.1 lists the cybernetic functions hypothesized by CB5T to be associated with each of the labeled traits in Figure 15.1. An important caveat is that even the functions associated with the aspects may themselves be broken down into various interacting psychological mechanisms, each of which is likely to be instantiated within the brain in different ways (Yarkoni, 2015). Some of these mechanisms will be associated with specific facets, but even these are likely to be further decomposable into multiple mechanisms. For example, the passive avoidance mechanisms associated with the Anxiety facet of the Withdrawal aspect of Neuroticism involve increased vigilance (attention to both the external environment and information in memory), involuntary inhibition of behavior, and increased arousal of the sympathetic nervous system, all of which have distinct, identifiable neural circuits (Gray & McNaughton, 2000). Further, specific mechanisms may be involved in multiple traits, so that the mapping of traits to brain systems will be many-to-many (Yarkoni, 2015; Zuckerman, 2005).

Another caveat is that the hierarchy depicted in Figure 15.1 is oversimplified in one important way: it depicts personality as having a simple hierarchical structure, with no cross-loadings. If the diagram were entirely accurate as is, traits beneath Stability could not be related to traits beneath Plasticity, but this is not the case at the levels below the Big Five (Costa & McCrae, 1992; DeYoung, 2010b; Hofstee, de Raad, & Goldberg, 1992). For example, Politeness is negatively related to Assertiveness, and Compassion is positively related to Enthusiasm (DeYoung, Weisberg, Quilty,

& Peterson, 2013). These cross-connections are potentially important for biological models of personality. In relation to the example just mentioned, testosterone may be at least partly responsible for the covariation of Assertiveness and Politeness, given that it is related to both of these dimensions (DeYoung et al., 2013; Turan, Guo, Boggiano, & Bedgood, 2014).

The cybernetic perspective on the FFM has a number of advantages for personality neuroscience. First, the hypothesized functions for each trait provide a ready jumping-off point for hypotheses about brain function. Second, it describes traits as the product of variation in a set of integrated mechanisms, which is consistent with the fact that the brain is a single complex adaptive system with many interacting subsystems. Considering the interactions among these mechanisms may help to explain the relations among traits as well as their manifestation in behavior. Third, by focusing on the psychological functions underlying the Big Five, rather than just their superficial manifestation in behavior and experience, we can more easily connect research on personality in childhood and adulthood. All five factors appear to be present relatively early in childhood, even though their exact manifestations in behavior shift with age (Shiner & DeYoung, 2013). For example, a 4-year-old child high in Openness/Intellect is unlikely to be interested in poetry or philosophy but is nonetheless likely to express the tendency toward cognitive exploration through curiosity and imaginative play. By using the FFM in developmental research, personality neuroscience can shed light on the ontogeny of personality. Finally, this perspective helps to link human research with the wealth of knowledge from neuroscience research in other species, in which the brain can be observed and manipulated more directly. The Big Five can be used to describe individual differences in other species (Gosling & John, 1999), and, despite important evolutionary change, much of the anatomy and cybernetic function of the brain has been conserved by evolution, especially across mammalian species.

Extraversion

CB5T posits that sensitivity to reward is the core function underlying Extraversion, enabling the individual to be energized by goals (DeYoung, 2013, 2015a). Here CB5T builds on the work of Depue and Collins (1999), who argued that sensitivity to incentive reward mediated by the

dopaminergic system is the primary driver of Extraversion. Depue and Collins were themselves influenced by Gray's Reinforcement Sensitivity Theory, which posited a Behavioral Approach System (BAS) that mediates the relation between sensitivity to incentive reward and ensuing approach behavior (Gray, 1982; Gray & McNaughton, 2000; Pickering & Gray, 1999). Although Gray initially hypothesized that impulsivity was the personality trait most closely reflecting BAS sensitivity, evidence has accumulated that Extraversion is a better candidate, and the questionnaire most commonly used to measure BAS sensitivity shows reasonable convergent validity with Extraversion (Carver & White, 1994; Pickering, 2004; Quilty, DeYoung, Oakman, & Bagby, 2014; Smillie, Pickering, & Jackson, 2006; Wacker, Mueller, Hennig, & Stemmler, 2012). All of these theories highlight the central role of the neurotransmitter dopamine in the brain's reward system. (Depue & Collins, 1999; DeYoung, 2013; Pickering & Gray, 1999; Smillie, 2008).

The association of variation in dopaminergic function with Extraversion is one of the best established findings in personality neuroscience (see also the chapter by Wilt and Revelle). A number of empirical studies have demonstrated that Extraversion moderates the effects of pharmacological manipulation of the dopaminergic system (Chavanon, Wacker, & Stemmler, 2013; Depue, Luciana, Arbisi, Collins, & Leon, 1994; Mueller et al., 2014; Rammsayer, 1998; Rammsayer, Netter, & Vogel, 1993; Wacker, Chavanon, & Stemmler, 2006; Wacker, Mueller, Pizzagalli, Hennig, & Stemmler, 2013; Wacker & Stemmler, 2006). In a particularly impressive demonstration, a recent study by Depue and Fu (2013) used Pavlovian conditioning in human participants to show that high Extraversion was associated with greater sensitivity to the rewarding effects of dopamine. To understand the meaning of this association, we must understand the difference between incentive and consummatory reward (DeYoung, 2013). An incentive reward is a cue that one is moving toward a goal, whereas a consummatory reward is the actual attainment of a goal. Dopamine is responsible for the drive to attain rewards in response to incentive cues but not for the hedonic enjoyment of reward; this distinction has been described in terms of "wanting" versus "liking" (Berridge, Robinson, & Aldridge, 2009). Whereas the dopaminergic system is responsible for wanting, the opiate system is responsible for liking (Peciña, Smith, & Berridge, 2006), and the association of Extraversion with

dopamine reflects only that Extraversion is linked to desire for reward, not enjoyment of reward.

Nonetheless, questionnaire and behavioral research indicates that Extraversion involves not only increased wanting, but also increased liking of rewards. Positive emotionality is a facet of Extraversion describing energized positive emotions such as excitement, enthusiasm, and elation that have a clear hedonic component, and research indicates that Extraversion predicts the amount of these positive emotions that people experience in response to incentively rewarding stimuli ([Smillie, Cooper, Wilt, & Revelle, 2012](#)). This suggests that Extraversion might be related to opiate function as well as to dopamine. CB5T posits that the two aspects of Extraversion, Assertiveness and Enthusiasm, reflect the difference between wanting and liking, with Assertiveness reflecting wanting rather than liking and Enthusiasm reflecting primarily liking and only secondarily wanting ([DeYoung, 2015a](#)). Enthusiasm appears to reflect liking in an incentive context, with opiate release providing the positive hedonic feelings that accompany dopaminergic activity ([DeYoung, 2013](#)). Research on dopamine is consistent with this hypothesis, as measures of Assertiveness (usually called “agentic Extraversion” in this literature) appear to be more strongly related to dopaminergic variables than do measures of Enthusiasm (often called “affiliative Extraversion”) ([Mueller et al., 2014](#); [Wacker et al., 2012](#)). Further, one study found that Social Closeness, a good marker of Enthusiasm, moderated the effects of an opiate manipulation ([Depue & Morrone-Strupinsky, 2005](#); [DeYoung et al., 2013](#)). Whereas Assertiveness encompasses traits such as drive, leadership, initiative, and activity, Enthusiasm encompasses both sociability or gregariousness and positive emotionality ([DeYoung et al., 2007](#)).

In sum, existing research strongly supports the hypothesis that dopamine is an important substrate of Extraversion, especially Assertiveness, and shows some preliminary support for the hypothesis that the opiate system is also important for Extraversion, particularly Enthusiasm. Note that the strong support for the dopamine hypothesis leaves much unknown about the specific parameters of the dopaminergic system that contribute to Extraversion (e.g., parameters related to the density of different dopamine receptors, mechanisms of neurotransmitter synthesis, or clearance from the synapse). This is indicative of the state of personality neuroscience in

general, in which even the best established findings are merely preliminary to a thorough mechanistic understanding.

Electroencephalographic (EEG) research on a phenomenon known as the “feedback-related negativity” (FRN) also supports the hypothesis that Extraversion reflects dopaminergically driven sensitivity to incentive reward. The FRN is an EEG waveform that appears 200–350 milliseconds after receiving feedback about an outcome and appears to be generated by the dorsal anterior cingulate cortex (ACC) in response to dopaminergic signaling of deviations from the expected value of the outcome (Sambrook & Goslin, 2015). Animal research has shown that one type of dopaminergic neuron encodes a prediction error learning signal by spiking in response to better-than-expected outcomes and dropping below baseline levels of activity in response to worse-than-expected outcomes (Bromberg-Martin, Matsumoto, & Hikosaka, 2010). The FRN shows the same pattern (becoming most negative for worse-than-expected outcomes and least negative for better-than-expected outcomes), indicating that it is a prediction error signal driven by dopamine (Proudfit, 2015; Sambrook & Goslin, 2015). Several studies have shown that Extraversion (sometimes measured with the BAS sensitivity scale) is correlated with FRN amplitude following reward (Bress & Hajcak, 2013; Cooper, Duke, Pickering, & Smillie, 2014; Lange, Leue, & Beauducel, 2012; Smillie, Cooper, & Pickering, 2011). Implicating dopamine more directly, Mueller et al. (2014) showed that agentic Extraversion was associated with FRN magnitude following failure (i.e., a worse-than-expected outcome), but only when the task was incentivized, and the association was eliminated by the administration of a dopamine D2 receptor antagonist (a drug that blocks one type of dopamine receptor).

Turning to neuroimaging research, and considering the brain as a whole, the most obvious hypothesis about Extraversion is that it should be associated with function and structure in regions of the brain that are part of the reward system, including the ventromedial prefrontal cortex (VMPFC; often called the orbitofrontal cortex, OFC), the nucleus accumbens (often described as the ventral striatum), the caudate nucleus (part of the dorsal striatum), the ACC, and the midbrain regions from which dopaminergic neurons project (substantia nigra and ventral tegmental area [SN/VTA]). That Extraversion should be associated with amygdala function is another important hypothesis for neuroimaging, stemming from the observation that the amygdala is crucial for processing emotional salience related to

rewarding as well as threatening stimuli (Stillman, Van Bavel, & Cunningham, 2015).

Several fMRI studies have supported these hypotheses, showing that Extraversion predicts neural activation in some or all of these structures in response to emotionally positive or rewarding stimuli (Canli, Sivers, Whitfield, Gotlib, & Gabrieli, 2002; Canli et al., 2001; Cohen, Young, Baek, Kessler, & Ranganath, 2005; Mobbs, Hagan, Azim, Menon, & Reiss, 2005; Schaefer, Knuth, & Rumpel, 2011). All of these studies, however, had samples smaller than 20, rendering their evidentiary value questionable at best. Well-powered, task-based, fMRI studies of the link between Extraversion and reward are needed. A recent study with a sample of 52 is a step in the right direction, showing that Extraversion predicted neural activity in the nucleus accumbens during anticipation of gaining five dollars (Wu, Samanez-Larkin, Katovich, & Knutson, 2014).

In contrast to the functional studies just mentioned, structural MRI studies with larger sample sizes are beginning to appear, and the most replicated finding for Extraversion is that it is associated positively with regional volume in VMPFC, a brain area that appears to be crucial for maintaining representations of the value of stimuli (Cremers et al., 2011; DeYoung et al., 2010; Omura, Constable, & Canli, 2005). One of the largest such studies, which used the BAS sensitivity scale rather than a more standard measure of Extraversion, found a positive association with VMPFC in women but found a significant negative association in men (Li et al., 2014). Other studies have not replicated the association at all (Bjørnebekk et al., 2013; Hu et al., 2011; Kapogiannis et al., 2013; Liu et al., 2013). Variation in the populations studied and methods employed could be at least partly responsible for differing results. Further, all of these studies reported whole brain analyses, rather than focusing on the VMPFC as a region of interest. Whole brain analyses require corrections for multiple tests that could have rendered even the larger studies underpowered to detect a true association. Additional large primary studies, targeted hypothesis testing, and meta-analyses will be needed to provide accurate estimates of this effect. Associations of Extraversion with volume in other brain regions have been even more inconsistent.

A recent PET study also provided some evidence of an association between Extraversion and VMPFC, showing that Positive Emotionality (PEM), as measured by the Multidimensional Personality Questionnaire

(MPQ), was positively associated with resting-state glucose metabolism in this region (Volkow et al., 2011). MPQ-PEM is a broader construct than its label would suggest, consisting of subscales measuring Social Potency and Social Closeness, which are good measures of Extraversion, but also subscales measuring Well-Being (Extraversion and Neuroticism) and Achievement (Assertiveness, Conscientiousness, and Openness/Intellect) (DeYoung, 2013; DeYoung et al., 2013; Markon, Krueger, & Watson, 2005). Although it is primarily a measure of Extraversion, some caution is warranted about whether findings will generalize to more traditional Extraversion measures. Another recent study that used this measure and found a positive association between PEM and left amygdala volume is worth mentioning here because of its sample size: $N = 486$ (Lewis et al., 2014).

Resting EEG hemispheric asymmetry, in which one frontal lobe of the brain is more active than the other, is another phenomenon that has been linked to Extraversion and to the motivation to approach that is characteristic of response to incentive reward. Considerable evidence suggests that the left hemisphere is biased toward information processing associated with approach motivation and behavior (Davidson, 1998; Harmon-Jones, Gable, & Peterson, 2010). For the left hemisphere to be chronically more active than the right, therefore, might reflect a general tendency toward approach that could be manifested in increased Extraversion. Indeed, a number of studies have found that Extraversion, or more specifically its Assertiveness aspect, is related to greater left-dominant asymmetry (Amodio, Master, Yee, & Taylor, 2008; Coan & Allen, 2003; De Pascalis, Cozzuto, Caprara, & Alessandri, 2013; Harmon-Jones & Allen, 1997; Schmidt, 1999; Sutton & Davidson, 1997). However, failures to replicate have been reported as well, and a meta-analysis found no evidence for the effect (Wacker, Chavanon, & Stemmler, 2010).

Should the idea of linking Extraversion to hemispheric asymmetry be abandoned, therefore? Perhaps not; a recent study of an all-male sample found that the BAS sensitivity scale predicted resting-state asymmetry only for participants interacting with a female experimenter whom they rated as attractive (Wacker et al., 2013). Another much smaller EEG study found an analogous effect; a trait measure of positive affect that is strongly linked to Extraversion was associated with asymmetry only in a condition of positive mood as opposed to negative or neutral mood (Coan, Allen, & McKnight,

2006). These studies suggest that the association of Extraversion with hemispheric asymmetry may be detectable only when positive emotional states related to incentive motivation are activated. This possibility is consistent with many trait theories, including CB5T, which posit that traits represent the tendency to respond in particular ways to particular classes of stimuli. Without the presence of a relevant stimulus, the trait may not be manifest, and individual differences in behavior or neural activity may not be apparent.

Interestingly, one EEG effect measured during rest appears to be more robustly associated with Extraversion than hemispheric asymmetry. Meta-analysis has shown that agentic Extraversion is associated with increased posterior versus anterior theta activity at centerline electrode sites (Koehler et al., 2011; Wacker et al., 2010). (Frequency bands in EEG are labeled with the names of Greek letters.) This finding has been extended to the delta frequency band as well, and this theta/delta anterior–posterior difference appears to reflect activity in the rostral ACC and to be associated with processing of reward and salience information (Chavanon, Wacker, & Stemmler, 2011; Knyazev, 2010; Wacker & Gatt, 2010; Wacker et al., 2010). The association of the anterior–posterior EEG index with Extraversion has been linked empirically to dopaminergic function. Several studies have shown that the association of Extraversion with increased posterior–anterior difference is either negated or reversed when subjects are administered a dopamine antagonist prior to the EEG recording (Chavanon et al., 2013; Wacker et al., 2006), and a study combining EEG with molecular genetics found that variation in the catechol-O-methyltransferase (*COMT*) gene (which produces an enzyme that metabolizes dopamine in the synapse and varies in efficiency depending on genotype) was associated with both agentic Extraversion and posterior versus frontal resting delta/theta activity (Wacker & Gatt, 2010).

Several fMRI studies with samples around $N = 40\text{--}50$ have reported associations of Extraversion with resting-state functional connectivity. Their results have not been very similar, but, then, neither have their methods: one examined connectivity only between the amygdala and other brain regions (Aghajani et al., 2014), one examined connectivity with nine seed regions on the medial surface of the cortex (Adelstein et al., 2011), one examined connectivity only within the default network (Sampaio, Soares, Coutinho, Sousa, & Goncalves, 2014), and one examined connectivity of the midbrain

dopaminergic SN/VTA with other brain regions (Passamonti et al., 2015). With such heterogeneous methods and small samples, it is hard to draw conclusions. The most compelling Extraversion findings, from these studies, were that it was positively associated with (1) connectivity between the amygdala and several other regions involved in basic emotional and motivational processes (Aghajani et al., 2014) and (2) connectivity between SN/VTA and the striatum, both key components of the dopaminergic reward system (Passamonti et al., 2015).

Neuroticism

CB5T posits that Neuroticism reflects individual differences in the sensitivity of defensive distress systems that become active in the face of threat, punishment, and uncertainty (DeYoung, 2015a). Uncertainty is innately threatening because the inability to predict the outcome of an action or perception may indicate that one does not understand the current situation sufficiently to be confident in the progress toward one's goals—sometimes including goals as fundamental as survival (Gray & McNaughton, 2000; Hirsh, Mar, & Peterson, 2012; Peterson & Flanders, 2002). Indeed, one EEG study found that for people high in Neuroticism, ambiguous feedback about task performance produced a more negative FRN even than negative feedback (whereas the opposite was true for people low in Neuroticism), consistent with the theory that Neuroticism is associated with aversion to uncertainty (Hirsh & Inzlicht, 2008).

Individuals high in Neuroticism are prone to emotional responses to stress that foster avoidant or defensive behavior, including anxiety, depression, anger, irritability, and panic (see also the chapter by Tackett and Lahey). Largely because Neuroticism is the major personality risk factor for psychopathology (Lahey, 2009), more neuroscientific research is being conducted on Neuroticism than on any other trait in the FFM. To parse this research, CB5T draws on Gray and McNaughton's (2000) theory that Neuroticism reflects the joint sensitivity of a behavioral inhibition system (BIS), which responds to threats in the form of conflicts between goals (e.g., approach–avoidance conflict or any other conflict that generates uncertainty), and a fight–flight–freeze system (FFFS), which responds to threats without conflict—that is, when the only motivation is to escape or eliminate the threat. Much is known about the neurobiology of the BIS and FFFS in the brainstem, hypothalamus, and limbic system, which can aid in

the interpretation of existing research on Neuroticism and inform hypotheses in future research.

CB5T posits that variations in the BIS and FFFS are likely to be reflected differentially in the two aspects of Neuroticism. Withdrawal (related to BIS) reflects the shared variance of traits related to anxiety and depression, which involve passive avoidance, the tendency to slow or inhibit behavior to avoid potential punishment or error. Volatility (related to FFFS) encompasses traits related to irritability, anger, emotional lability, and the tendency to get upset easily, which involve active defensive responses. In research on children, similar factors have been described as anxious distress and irritable distress (Rothbart & Bates, 1998; Shiner & Caspi, 2003). Neuroticism is often studied using scales such as the BIS sensitivity scale (Carver & White, 1994), Cloninger's Harm Avoidance, and various measures of trait anxiety (most of which appear to measure something broader than just the anxiety facet). Most such scales measure either a combination of Withdrawal and Volatility or just Withdrawal. To identify existing neuroscience research specifically relevant to Volatility requires focusing on measures of anger or hostility as emotional traits (though not actual aggression, which is more strongly related to Agreeableness than Neuroticism).

The neurotransmitters serotonin and noradrenaline modulate both the BIS and the FFFS and, therefore, are likely candidates as contributors to Neuroticism (Gray & McNaughton, 2000). Several lines of evidence implicate serotonin in Neuroticism. Serotonergic drugs are used to treat many disorders with symptoms reflecting severe Neuroticism, including depression, anxiety and panic disorders, and intermittent explosive disorder. In clinical depression, selective serotonin reuptake inhibitors (SSRIs) have been shown to reduce Neuroticism, and this reduction appears to mediate the improvements in depressive symptoms caused by SSRIs (Du, Bakish, Ravindran, & Hrdina, 2002; Quilty, Meusel, & Bagby, 2008; Tang et al., 2009). A clinical trial has also shown that an SSRI can reduce irritability and anger (Kamarck et al., 2009). Three PET studies have found that Neuroticism predicts variation in serotonin receptor or transporter binding (Frokjaer et al., 2008; Takano et al., 2007; Tauscher et al., 2001), although only the most recent of these used a sample large enough to be of much interest. Two studies have shown that response to a fenfluramine pharmacological challenge (which assesses central serotonergic function) is associated with Neuroticism; however, gender differences in the effect were

apparent in both studies, and the direction of effect was not consistent for men (Brummett, Boyle, Kuhn, Siegler, & Williams, 2008; Manuck et al., 1998). Both studies were too small to assess effects separately by gender with much confidence. Molecular genetic studies implicating serotonergic genes in Neuroticism are inconclusive (Munafo et al., 2009). A small body of research exists to suggest an association of noradrenaline and Neuroticism, which may be more specific to fear and anxiety, and this hypothesis could use more research (Hennig, 2004; White & Depue, 1999; Zuckerman, 2005). Other understudied neurotransmitters involved in stress responses may influence Neuroticism as well. One extensive study using a variety of methods in neuroscience linked trait anxiety with a variation in levels of neuropeptide Y, which is released under stress and modulates anxiety and pain (Zhou et al., 2008).

Substantial evidence documents a link between Neuroticism and increased activation of the hypothalamic–pituitary–adrenal (HPA) axis, which regulates the body's stress response under the control of both BIS and FFFS (Zobel et al., 2004). Corticotropin-releasing hormone (CRH) is the proximal activator of the HPA axis, and several studies of variation in the CRH receptor 1 gene have linked it to depression or Neuroticism in individuals maltreated as children, though results are complex and may differ by race and type of maltreatment (Bradley et al., 2008; DeYoung, Cicchetti, & Rogosch, 2011; Grabe et al., 2010; Kranzler et al., 2011; Polanczyk et al., 2009). A better established link is between Neuroticism and levels of cortisol, the stress hormone released from the adrenal cortex at the culmination of the stress response initiated by CRH. Neuroticism is positively associated with baseline levels of cortisol (Garcia-Banda et al., 2014; Gerritsen et al., 2009; Miller, Cohen, Rabin, Skoner, & Doyle, 1999; Nater, Hoppmann, & Klumb, 2010; Polk et al., 2005) as well as with blunted cortisol responses to specific stressors (Netter, 2004; Oswald et al., 2006; Phillips, Carroll, Burns, & Drayson, 2005; but see Kirschbaum, Bartussek, & Strasburger, 1992; Schommer, Kudielka, Hellhammer, & Kirschbaum, 1999, for failures to replicate). This pattern suggests that people high in Neuroticism tend to be not only chronically stressed but also less able to engage the resources necessary to cope with specific stressful situations.

Interestingly, an overabundance of cortisol is known to potentiate excitotoxic cell death in neurons (Sapolsky, 1994), a fact that Knutson, Momenan, Rawlings, Fong, and Hommer (2001) suggested as a possible

explanation for their findings and those of others that Neuroticism is negatively related to global measures of brain volume, such as the volume of cerebral gray matter, the ratio of brain volume to intracranial volume, and total brain volume (Bjørnebekk et al., 2013; Jackson, Balota, & Head, 2011; Liu et al., 2013). The chronic stress associated with high Neuroticism may damage the brain as a whole.

The threat and punishment systems that control HPA activation are the obvious neural candidates to underlie Neuroticism, and evidence from both functional and structural MRI supports this broad hypothesis. Until recently, most fMRI studies reporting that Neuroticism predicts neural responses to aversive stimuli used samples so small as to preclude confidence in their results. Of 21 samples in a recent meta-analysis of these effects (Servaas et al., 2013b), only seven of them were larger than 25, and only one was larger than 60. Meta-analysis cannot solve the problems created by underpowered samples because meta-analytic conclusions are likely to be biased by their inclusion. One study not included in this meta-analysis, with a sample of 52, found that Neuroticism predicted right insula activation in anticipation of a loss of five dollars, and that this insula activation showed trait-like stability over a period of 2.5 years (Wu et al., 2014).

Many theoretical accounts of the neurobiology of Neuroticism highlight a role for the amygdala, given its central role in BIS, FFFS, and mobilization of negative affect and stress responses. Although the meta-analysis by Servaas et al. (2013b) did not implicate the amygdala, some larger fMRI studies have found associations between Neuroticism and amygdala response to aversive stimuli, although methods have differed and the findings cannot be easily integrated. One study reported that Neuroticism predicted a slower decrease in amygdala activity after viewing aversive images ($N = 120$; Schuyler et al., 2014), and another reported that Neuroticism was positively correlated with amygdala activity in response to aversive images, but only in participants generally lacking in social support ($N = 103$; Hyde, Gorka, Manuck, & Hariri, 2011). A region considered part of the “extended amygdala,” known as the bed nucleus of the stria terminalis (BNST), has been specifically linked to anxious vigilance, and its activation to a persistent threat cue was predicted by Neuroticism (Somerville, Whalen, & Kelley, 2010; $N = 50$).

Structural neuroimaging studies linking Neuroticism to amygdala volume have been inconsistent, much like studies of Extraversion and VMPFC

volume. Several studies have found a positive correlation (Barros-Loscertales et al., 2006; Iidaka et al., 2006; Koelsch, Skouras, & Jentschke, 2013), but several others have not (Cherbuin et al., 2008; DeYoung et al., 2010; Fuentes et al., 2012; Liu et al., 2013). Luckily, in this case, a nearly definitive study has been carried out in a sample of over 1000 people that found that Neuroticism scores based on the average of several commonly used questionnaire measures were indeed correlated with amygdala volume (controlling for total brain volume), albeit weakly ($r = .1$; Holmes et al., 2012). Only one other subcortical structure, the hippocampus, was also significantly correlated with Neuroticism ($r = .1$), which is salient both because the hippocampus is a core component of the BIS and because resting-state hippocampal activity has previously been linked to Neuroticism using PET (Gray & McNaughton, 2000; Sutin, Beason-Held, Dotson, Resnick, & Costa, 2010).

Given the small effects detected by Holmes et al. (2012), previous inconsistencies are likely to reflect a lack of statistical power. Another possibility is that the amygdala effect is suppressed because it differs for different subfactors of Neuroticism. One study found that a measure of trait anger was associated negatively with left amygdala volume (Reuter, Weber, Fiebach, Elger, & Montag, 2009). Although this study was small ($N = 47$) and, therefore, may have misestimated the correlation of anger with amygdala volume, it does raise the possibility that facets encompassed by Volatility might show a different association with amygdala volume than those encompassed by Withdrawal.

In addition to the volume of subcortical structures, Holmes et al. (2012) also examined cortical thickness and found that Neuroticism was negatively associated with the thickness of a region of left rostral ACC and adjacent medial PFC ($r = -.1$). Interestingly, in a subset of 206 members of their sample who completed additional questionnaire measures, Holmes et al. (2012) found that the thickness of this region was correlated ($r = -.2$) with measures of social dysfunction that appear to assess low Extraversion (perhaps blended with Neuroticism). This finding represents a notable parallel to the findings described above of positive correlations between Extraversion and nearby regions of the VMPFC. Another study that examined cortical area as well as thickness found that Neuroticism was associated negatively with cortical area in a very similar region of ACC and medial PFC in the right hemisphere (Bjørnebekk et al., 2013).

Given the size of the sample of Holmes et al. (2012), this is likely to be the only region of the cortex in which thickness is associated with Neuroticism; however, other types of structural measures may nonetheless implicate additional cortical regions. Two studies of volume instead of thickness, with samples over 100, have found that Neuroticism was negatively associated with other regions of the PFC (DeYoung et al., 2010; Fuentes et al., 2012). Reduced volume and thickness in the medial PFC may be linked to the low self-esteem and poor regulation of emotion that are characteristic of Neuroticism, as this region is part of the default network crucially involved in self-evaluation and regulation of emotion (Andrews-Hanna et al., 2014). Three fMRI studies are consistent with this hypothesis: Lemogne et al. (2011) found that Neuroticism was associated with increased activation of both the medial PFC and the posterior cingulate cortex and adjacent precuneus (another core hub of the default network) when participants judged whether negative pictures were related to themselves. Williams et al. (2006) found that Neuroticism predicted age-related decreases in medial PFC responses to happy faces and increases in responses in that region to fear faces. And Haas, Constable, and Canli (2008) found that Neuroticism was associated with activity in medial PFC when viewing blocks of sad facial expressions, but not fearful or happy facial expressions (though in a small sample; $N = 29$).

The emotion regulation hypothesis is also consistent with a number of studies of both functional and structural connectivity, which have found that Neuroticism predicts reduced connectivity between frontal cortical regions and the amygdala (sometimes in conjunction with increased connectivity of the amygdala with other limbic regions). In functional studies, methods vary and results are hard to integrate; larger samples would be helpful. Mujica-Parodi et al. (2009) reported reduced synchrony between the amygdala and PFC regions while viewing neutral, fearful, and happy faces. Servaas et al. (2013a) found that Neuroticism was negatively correlated with the synchrony of amygdala and hippocampus with dorsomedial and dorsolateral PFC during a scan preceded by criticism from the experimenter (prerecorded to ensure standardization) relative to a standard resting-state scan. In a more typical resting-state study by the same group, Neuroticism was associated with weaker functional connections throughout the brain, including connections in frontoparietal, sensory, and default mode networks, but with stronger connectivity between affective regions, including the amygdala,

hippocampus, and insula (Servaas et al., 2015). This is not entirely consistent with smaller resting-state studies that found that Neuroticism was negatively associated with connectivity of the amygdala with temporal lobe regions and the insula (Aghajani et al., 2014) and positively associated with connectivity in the default network (between dorsomedial PFC and the precuneus; Adelstein et al., 2011). Finally, a larger resting-state study ($N = 178$) found that Neuroticism was positively associated with connectivity between the amygdala and fusiform gyrus (a region crucial for visual processing of faces), which may be related to the fact that Neuroticism is associated with greater neural reactivity to negative facial expressions (Cremers et al., 2010).

Structural studies have found a more consistent pattern of reduced connectivity associated with Neuroticism. Structural connectivity is measured in MRI using diffusion tensor imaging (DTI) to assess the integrity of the white matter (axon) tracts that connect different parts of the brain. Neuroticism is associated with reductions in white matter integrity in tracts connecting cortical and subcortical regions (Bjørnebekk et al., 2013; Taddei, Tettamanti, Zanoni, Cappa, & Battaglia, 2012; Westlye, Bjørnebekk, Grydeland, Fjell, & Walhovd, 2011; Xu & Potenza, 2012).

Interestingly, although Holmes et al. (2012) did not examine structural or functional connectivity, they did find that in individuals scoring highest in Neuroticism (more than one standard deviation above the mean), cortical thickness in the ACC and medial PFC region was negatively correlated with amygdala volume (whereas they were unrelated in the rest of the sample). In sum, the evidence suggests that Neuroticism is associated with an imbalance between control of behavior and experience by subcortical negative emotional systems versus frontal cortical systems.

Another consistent finding regarding Neuroticism comes from EEG research demonstrating a pattern of greater activation in the right frontal lobe relative to the left when viewing stimuli and while at rest (Gale, Edwards, Morris, Moore, & Forrester, 2001; Shackman, McMenamin, Maxwell, Greischar, & Davidson, 2009; Sutton & Davidson, 1997), and this has been confirmed by meta-analysis (Wacker et al., 2010). Similarly, near-infrared reflection spectroscopy (a technique that uses light to measure regional cerebral oxygenated hemoglobin) has shown that cerebral blood flow in the right frontal lobe is positively correlated with Neuroticism during anticipation of a shock (Morinaga et al., 2007). A lesion study, comparing

199 brain-damaged patients to 50 healthy controls using MRI, found that focal damage to the left dorsolateral prefrontal cortex was associated with higher scores on Neuroticism, especially the anxiety facet (Forbes et al., 2014). Lesions of the left hemisphere lead to dominance of right hemisphere function. Whereas most evidence suggests that the association of Neuroticism with lateralization is driven by differences in frontal activation, one large EEG study found a similar effect in posterior portions of the right hemisphere (Schmidtke & Heller, 2004).

Importantly, not all components of Neuroticism show the same association with hemispheric asymmetry. The right-dominant asymmetry appears to apply only to traits in the Withdrawal subfactor, such as anxiety and depression, which are linked to passive avoidance. In contrast, traits in the Volatility subfactor, such as anger-proneness and hostility, which involve active defense, are associated with greater left-dominant frontal asymmetry (Everhart, Demaree, & Harrison, 2008; Harmon-Jones, 2004; Harmon-Jones & Allen, 1998).

Bearing in mind the caveat that different aspects of Neuroticism may show different relations to hemispheric asymmetry, it is worth considering two non-EEG studies that found that Neuroticism predicted hemispheric asymmetry in connectivity. (Importantly, most global measures of Neuroticism—including those used in these two studies—emphasize Withdrawal more than Volatility.) Madsen et al. (2012) found that Neuroticism was associated with higher right, relative to left, white matter integrity in the major white matter tract (the cingulum) connecting limbic regions. Cremers et al. (2010) found that Neuroticism predicted reduced synchrony between the left amygdala and medial PFC when viewing negative versus neutral emotion faces, but increased synchrony between these structures in the right hemisphere.

We conclude this section with a call for more studies that explicitly distinguish between Withdrawal and Volatility. One otherwise exemplary study unfortunately used a sample of only 18 (Cunningham et al., 2010), but its innovative methodology is worth describing, in the hope of encouraging replication attempts in larger samples. Participants in fMRI viewed positive, negative, and neutral images and were required either to approach them (by pressing a button that enlarged the image, creating the illusion of approach) or to avoid them (by pressing a button that shrank the image). Withdrawal was found to predict amygdala reactivity to approach relative to avoidance

(independently of stimulus valence), whereas Volatility was found to predict amygdala reactivity to negative stimuli relative to neutral and positive stimuli (independently of behavioral direction). These findings, if replicated, would support the hypothesis that Withdrawal reflects sensitivity to conflict (especially approach–avoidance conflict), thus leading to increased vigilance and behavioral inhibition when approaching any stimulus, whereas Volatility reflects sensitivity to all negatively valenced proximal stimuli.

Openness/Intellect

CB5T posits that Openness/Intellect reflects individual differences in the cognitive exploration that generates new interpretations of experience in terms of causal and correlational patterns and connections. Cognition here is conceived broadly to include both reasoning and perceptual processes (DeYoung, 2015b). People high in Openness/Intellect are imaginative, curious, innovative, perceptive, thoughtful, and creative. The trait's compound label stems from the debate about whether to label it "Openness to Experience" or "Intellect" (Costa & McCrae, 1992; Goldberg, 1990). This debate has been resolved by the recognition that these two labels capture two major distinct subfactors of the trait, with Intellect reflecting cognitive engagement with abstract information and ideas (intellectual interests) and Openness reflecting cognitive engagement with perceptual and sensory information (artistic and aesthetic interests) (DeYoung et al., 2007; DeYoung, Grazioplene, & Peterson, 2012; Johnson, 1994; Saucier, 1992). When we refer to "Openness/Intellect," we are referring to the broad FFM dimension; when we refer to either "Intellect" or "Openness" alone, we are referring to just one aspect of Openness/Intellect (see also the chapter by Sutin).

The curiosity and innovation that are common to both Openness and Intellect are likely to be driven by dopamine—specifically, a type of dopaminergic neuron that codes for salience instead of value, is activated by both positive and negative information, and innervates different brain regions than do the value-coding neurons implicated in Extraversion (Bromberg-Martin et al., 2010; DeYoung, 2013). The evidence for dopaminergic involvement in Openness/Intellect is more circumstantial than the evidence for Extraversion, although there have been two molecular genetic studies showing associations with the *DRD4* and *COMT* genes in three samples (DeYoung, Cicchetti, Rogosch, Gray, & Grigorenko, 2011;

[Harris et al., 2005](#)). The adult sample investigated by [DeYoung et al. \(2011\)](#) exhibited an interaction effect between *DRD4* and *COMT*, which, if replicated, could explain the failure of these genes to be identified in larger GWAS studies of the FFM.

The original hypothesis that dopamine is involved in the biological substrate of Openness/Intellect was based on several lines of indirect evidence ([DeYoung, Peterson, & Higgins, 2002, 2005](#)): (1) the involvement of dopamine in curiosity and exploratory behavior is well-established in animal research ([Panksepp, 1998](#)); (2) dopamine is involved in the working-memory attentional mechanisms that allow maintenance and manipulation of information in short-term memory, and Openness/Intellect (specifically its Intellect aspect) is the only FFM trait positively associated with working memory ability ([DeYoung et al., 2005, 2009](#)); and (3) Openness/Intellect is associated with reduced latent inhibition, an automatic preconscious process that blocks stimuli previously categorized as irrelevant from entering awareness ([Peterson & Carson, 2000](#); [Peterson, Smith, & Carson, 2002](#)). Dopamine is the primary neuromodulator of latent inhibition, with increased dopaminergic activity producing reduced latent inhibition ([Kumari et al., 1999](#)), and Openness/Intellect may reflect individual differences in the automatic tendency to perceive salient information in everyday experience.

One fMRI study tested hypotheses derived explicitly from the dopamine theory of Openness/Intellect. Although dopaminergic activity cannot be studied directly in fMRI, neural activity can be assessed in regions that are core to the dopaminergic system, with the inference that activation there is probably reflective of dopaminergic function (much like the FRN in EEG). [Passamonti et al. \(2015\)](#) examined functional connectivity between the midbrain SN/VTA, where the dopaminergic system originates, and other brain regions, not only during resting state but also in two tasks involving sensory experience. In the first, participants were presented with pleasant food odors through a special apparatus, contrasted with smelling pure air. In the second, participants viewed appealing pictures of food, contrasted with viewing a fixation cross. In all three tasks, Openness/Intellect positively predicted connectivity of SN/VTA with dorsolateral PFC, a region crucial for voluntary control of attention and working memory. This circuit may help to explain why people high in Openness/Intellect find sensory experiences interesting and rewarding.

The association of Intellect with working memory has been demonstrated neurally as well as behaviorally. An fMRI study using the Ideas facet of the NEO PI-R as a measure of Intellect found that it was the only facet associated with brain activity predicting accurate working memory performance in the scanner (DeYoung et al., 2009). Associations were found in two regions of the PFC, the left frontal pole of the lateral PFC and a posterior region of the medial PFC. The frontal pole is crucial for integrating the outputs of various simpler cognitive operations and for making abstract analogies (Gilbert et al., 2006; Green, Fugelsang, Kraemer, Shamosh, & Dunbar, 2006; Ramnani & Owen, 2004). The medial PFC region in question is known to be involved in monitoring goal-directed performance, which might be particularly important for those high in Intellect, who are motivated to do well in cognitive tasks (Brown & Braver, 2005; Ridderinkhof, Ullsperger, Crone, & Nieuwenhuis, 2004). A PET study, which did not separate Intellect from Openness, found that Openness/Intellect was associated with neural activity while participants were at rest, in brain areas not identical to but near the two areas just described, in regions of lateral PFC and anterior cingulate cortex associated with working memory and error detection (Sutin, Beason-Held, Resnick, & Costa, 2009).

Given the centrality of imagination for Openness/Intellect (“Imagination” was even suggested as an alternative label for the whole dimension; Saucier, 1992), we might expect that the default network would be an important substrate of the trait, especially the Openness aspect, which encompasses fantasy-proneness as one of its facets (DeYoung, 2015b). Two relatively small functional connectivity studies offer some tentative preliminary support for this hypothesis. One found that Openness/Intellect was associated with increased connectivity between the main midline hubs of the default network, in medial PFC and precuneus (Adelstein et al., 2011), whereas the other found that Openness/Intellect was associated with connectivity in more parietal components of the default network instead (Sampaio et al., 2014).

Studies of the association of Openness/Intellect with the volume of regions throughout the brain have been inconsistent, often finding no significant effects despite samples larger than 100 (Bjørnebekk et al., 2013; DeYoung et al., 2010; Hu et al., 2011; Kapogiannis et al., 2013; Li et al., 2014; Liu et al., 2013). An MRI study of change in brain structure in 274 adults ($M = 51$, $SD = 12$ years) over a period of 6–9 years found that

Openness/Intellect was negatively correlated with an age-related decline in gray matter volume in the right inferior parietal lobule, a region linked to intelligence and creativity (Taki et al., 2013). The volume of this area was previously found to be associated positively with Openness/Intellect, though in a region too small to be significant after correction for multiple tests (DeYoung et al., 2010). Clearly, this area would be a sensible region of interest for future research.

Two DTI studies have found apparently contradictory findings for Openness/Intellect, which may be reconcilable through consideration of the differences between Openness and Intellect in their associations with IQ and positive schizotypy or psychoticism (comprising magical ideation and perceptual aberrations). The first study found a negative association between Openness/Intellect and white matter integrity in the frontal lobes (Jung, Grazioplene, Caprihan, Chavez, & Haier, 2010), whereas the second study found a positive association (Xu & Potenza, 2012). The major difference between the two studies appears to be that the first controlled for IQ whereas the second did not. Importantly, frontal white matter integrity is positively associated with IQ but negatively related to psychoticism (Chiang et al., 2009; Nelson et al., 2011). Intellect is independently associated with IQ, whereas Openness is not (DeYoung, Quilty, Peterson, & Gray, 2014), so controlling for IQ should render the residual Openness/Intellect scores closer to Openness. Further, Openness is positively related to psychoticism, whereas Intellect is negatively related to it (Chmielewski et al., 2014; DeYoung et al., 2012). In combination, these pieces of evidence suggest that Openness and Intellect might be differentially related to frontal white matter integrity, and future research should measure them separately.

We close this section by noting the possibility that serotonin may play some role in Openness/Intellect. A PET study of 50 people (Kalbitzer et al., 2009) found that Openness/Intellect predicted serotonin transporter binding in the midbrain (whereas Neuroticism did not). In a sample that small, this finding might simply be a false positive. However, the involvement of serotonin in Openness/Intellect is rendered more plausible by the fact that most hallucinogenic drugs act directly on the serotonergic system. A longitudinal study of 52 hallucinogen-naïve adults who received doses of psilocybin (the active serotonergic agent in hallucinogenic mushrooms) or an active placebo (methylphenidate) found that participants showed increases in Openness/Intellect following psilocybin but not placebo

([MacLean, Johnson, & Griffiths, 2011](#)). Even more dramatically, Openness/Intellect remained elevated over a year later for the 30 participants who had had mystical experiences while on psilocybin. No other FFM traits were affected. Of course, it is possible that dramatic disruptions of the serotonergic system by hallucinogens might influence Openness/Intellect even if normal variation in that system does not. Nonetheless, people high in Openness (especially when also low in Intellect) appear to be susceptible to cognitive and perceptual distortions of the kind that are greatly exaggerated in hallucination (i.e., to psychoticism), and these might be associated with reduced serotonergic function ([Chmielewski et al., 2014](#); [DeYoung et al., 2012](#)).

Conscientiousness

CB5T posits that the function of Conscientiousness is to facilitate the pursuit of nonimmediate goals and rule-based behavior ([DeYoung, 2015a](#)). This function is critical to the successful navigation of human culture, and, indeed, Conscientiousness is typically the best psychological predictor, after intelligence, of academic and occupational success, as well as health-promoting behaviors and longevity ([Ozer & Benet-Martinez, 2006](#); [Roberts, Lejuez, Krueger, Richards, & Hill, 2014](#)). The two aspects of Conscientiousness are Industriousness, reflecting the ability and tendency to suppress disruptive impulses and persist in working toward nonimmediate goals, and Orderliness, which involves a tendency to adopt and follow rules, whether these rules are self-generated or imposed by others ([DeYoung et al., 2007](#); see also the chapter by [Jackson and Roberts](#)).

The low pole of the Conscientiousness dimension is often described as “impulsivity,” but impulsivity is a complex construct, and multiple types of impulsivity can be identified, not all of which are equivalent to low Conscientiousness ([DeYoung, 2010a](#)). The UPPS model ([Whiteside & Lynam, 2001](#)) identifies four types of impulsivity, of which lack of Perseverance is the most clearly related to Conscientiousness, being essentially equivalent to low Industriousness. Lack of Premeditation, the tendency to act quickly without deliberation, is also clearly linked to Conscientiousness, but it appears to be a blend of low Conscientiousness and high Extraversion and may therefore have somewhat different biological substrates than other traits in the Conscientiousness domain. For example, one fMRI study found that reward-related activity in the ventral striatum was

positively associated with scores on the Barratt Impulsivity Scale, a commonly used measure that corresponds most closely to lack of Premeditation (Forbes et al., 2009; Whiteside & Lynam, 2001). This finding seems likely to have been driven by reward-related variance linked to Extraversion. The other two types of impulsivity in the UPPS system are Urgency, which reflects the broader Stability metatrait, and Sensation Seeking, most closely linked to Extraversion (DeYoung, 2010a).

Humans are highly unusual in their ability to follow explicit systems of rules and plan for the distant future, so it is perhaps not surprising that chimpanzees are the only other species in which a trait analogous to Conscientiousness has been identified (Freeman & Gosling, 2010; Gosling & John, 1999). Other species obviously need to inhibit disruptive impulses, but individual differences in impulse control may simply be reflected in dimensions analogous to Neuroticism and Agreeableness that are related to more immediate goals and are influenced by serotonin. As noted above, CB5T hypothesizes that the variance Conscientiousness shares with Neuroticism and Agreeableness is linked to serotonin. A fenfluramine challenge study found that Conscientiousness was positively associated with central serotonergic function in men (Manuck et al., 1998). Another study failed to replicate this effect, but its sample was only half as large (Brummett et al., 2008). In a study of 75 men, Manuck, Flory, Ferrell, Mann, and Muldoon (2000) used a fenfluramine challenge to show that central serotonergic function was negatively associated with a combined measure of Hostility, Aggression, and lack of Premeditation (the latter assessed by the Barratt Impulsivity Scale), a composite that is probably a good indicator of low Stability. Serotonin remains a plausible component of the substrate of Conscientiousness, but more research is needed.

Considerable evidence exists to implicate the PFC in Conscientiousness, which is sensible given the central role of PFC in following rules and maintaining goal representations (Bunge & Zelazo, 2006; Miller & Cohen, 2001). The PFC is the brain region most expanded in human evolution (Deacon, 1997; Hill et al., 2010), so this association is consistent with the fact that only humans and their closest evolutionary relatives appear to have a distinct trait of Conscientiousness. Multiple MRI studies have found that Conscientiousness was positively associated with the volume of regions in the dorsolateral PFC (DeYoung et al., 2010; Jackson et al., 2011; Kapogiannis et al., 2013), though other studies have not replicated these

findings (Bjørnebekk et al., 2013; Hu et al., 2011; Liu et al., 2013). An MRI study comparing 199 brain-damaged patients to 50 healthy controls found that focal damage to the left dorsolateral prefrontal cortex was associated with lower scores on Conscientiousness, especially the self-discipline facet, which is a marker of Industriousness (Forbes et al., 2014).

The association of Conscientiousness with dorsolateral PFC raises an interesting question about the differentiation of Conscientiousness from other traits that have been linked to dorsolateral PFC, particularly Intellect, intelligence, and working memory capacity. The latter three traits are all related and can be grouped together in the Intellect dimension (DeYoung, 2015b; DeYoung et al., 2009, 2012), whereas Conscientiousness is not related to either intelligence or working memory (except for a possible weak negative correlation with intelligence; DeYoung, 2011; DeYoung et al., 2014). We propose that Intellect and Conscientiousness may reflect variations in two different large-scale neural networks, both of which involve dorsolateral PFC.

Functional connectivity maps have identified two strongly interdigitated networks in the lateral PFC, anterior insula, putamen, ACC and adjacent medial PFC, lateral parietal cortex, and posterior temporal cortex (Choi et al., 2012; Yeo et al., 2011). The first, known as the *frontoparietal* or *cognitive control* network, is the major substrate of working memory and intelligence, and parts of it have been associated with both Openness/Intellect in general and Intellect in particular (DeYoung et al., 2009, 2010; Taki et al., 2013). The second, known as the *ventral attention* or *salience* network, is a good candidate as a substrate of Conscientiousness (DeYoung, 2015a). Its broad function appears to entail reorienting attention away from distractions and toward stimuli important for goal pursuit (Fox, Corbetta, Snyder, Vincent, & Raichle, 2006). It is often called “ventral” due to research focusing on two important nodes of the network, in the right inferior frontal gyrus and the temperoparietal junction, but it nonetheless incorporates regions of the dorsal PFC as well, including the region of the middle frontal gyrus where Conscientiousness has been found to correlate positively with volume (DeYoung et al., 2010; Kapogiannis et al., 2013; Yeo et al., 2011). Not only that, but other regions in which Conscientiousness has been linked to brain structure and function fall within this network, as we will now review.

Several studies have linked Conscientiousness or the Barratt Impulsivity Scale to variations in the anterior insula (in what follows, we describe the impulsivity findings in terms of “Premeditation,” so that they are keyed in the same direction as Conscientiousness). One structural MRI study found that Conscientiousness was negatively associated with white matter volume in the insula and adjacent putamen, caudate, and ACC ([Liu et al., 2013](#)), and another found that the cortical thickness of the anterior insula was negatively correlated with Premeditation ([Churchwell & Yurgelun-Todd, 2013](#)). In an fMRI study of response inhibition, Premeditation was positively associated with activation of the anterior insula and lateral frontal cortex on trials when inhibition was required. It was also associated during those trials with greater functional connectivity of the right anterior insula with regions of the PFC and visual cortex ([Farr et al., 2012](#)).

Several MRI studies have implicated the dorsal ACC and adjacent medial PFC in Conscientiousness. One structural study found that Premeditation was negatively related to volume in the left ACC ([Matsuo et al., 2009](#); this study also found positive associations with VMPFC volumes). Another found that a measure of Conscientiousness in adolescents (Effortful Control) predicted a leftward asymmetry in dorsal ACC anatomy ([Whittle et al., 2009](#)). In an fMRI study of response inhibition, Premeditation was negatively associated with activity in the dorsal ACC and caudate ([Brown, Manuck, Flory, & Hariri, 2006](#)). A resting-state fMRI study found that Conscientiousness was associated with functional connectivity in the ACC and adjacent medial PFC ([Adelstein et al., 2011](#)).

The overall pattern that emerges suggests that Conscientiousness is associated with greater volume in the lateral PFC but with reduced volume in other areas of the ventral attention network. This suggests the hypothesis that Conscientiousness depends in part on the balance between the portions of this network that generate signals of motivational salience and those that engage in attentional and behavioral control in response to those signals. This hypothesis is also reasonably consistent with the fMRI finding, mentioned above, that Premeditation predicted greater connectivity of the insula with the lateral PFC when response inhibition was required than when it was not ([Farr et al., 2012](#)). Some caution is needed moving forward, however, because Premeditation is a fairly peripheral Conscientiousness facet, not strongly linked to either Industriousness or Orderliness ([DeYoung,](#)

2010a), so findings may not generalize easily to the broader Conscientiousness dimension.

We close our discussion of Conscientiousness by noting one brain region that has been associated with Conscientiousness in multiple studies but has not been identified as part of the ventral attention network—namely, the fusiform gyrus. In one large structural MRI study, Conscientiousness was negatively correlated with white matter volume in the left fusiform gyrus (Liu et al., 2013). In another, which did not separate gray and white matter, Conscientiousness was also negatively associated with volume in the fusiform gyrus (DeYoung et al., 2010). Many studies of brain structure consider gray matter volume only, and future studies may benefit from considering both gray and white matter. Finally, a study of personality and neurological change in frontotemporal dementia found that declines in Conscientiousness were associated with relative preservation of gray matter in the fusiform gyrus (Mahoney, Rohrer, Omar, Rossor, & Warren, 2011); this study was quite small ($N = 30$), but we mention it because of the interesting parallel with structural studies of healthy adults.

Agreeableness

CBST posits that cooperation and altruism—that is, the processes of coordinating our own goals with those of others—are the core functions underlying Agreeableness (see also the chapter by Graziano and Tobin). This entails that Agreeableness should be associated with the ability and tendency to understand the perspectives of others and to adjust our own behavior to accommodate them (Nettle & Liddle, 2008). The most obvious candidates as a neural substrate for Agreeableness are the many parts of the default network that are involved in decoding the mental states of others (Andrews-Hanna et al., 2014). Two resting-state fMRI studies have reported that Agreeableness is positively associated with functional connectivity among major hubs of the default network (Adelstein et al., 2011; Sampaio et al., 2014).

Two reasonably large structural MRI studies have found no association of regional brain volumes with Agreeableness (Bjørnebekk et al., 2013; Liu et al., 2013), and others have found associations that were not consistent (DeYoung et al., 2010; Hu et al., 2011; Kapogiannis et al., 2013). Two of the latter studies reported a negative correlation of Agreeableness with a region of the posterior superior temporal gyrus and sulcus that is part of the default

network and is important for interpreting the actions and intentions of others by decoding biological motion, but one study found the effect in the left hemisphere and one in the right (DeYoung et al., 2010; Kapogiannis et al., 2013). Clearly, further research is necessary on this brain region's relation to Agreeableness.

The two aspects of Agreeableness are Compassion, reflecting empathy and sympathy (the tendency to care about others emotionally), and Politeness, the tendency to conform to social norms and to refrain from belligerence and exploitation of others. In surveying the relatively sparse neuroscience research on Agreeableness, it is important to note that measures of empathy reflect Compassion, whereas measures of aggression reflect low Politeness (DeYoung et al., 2007, 2013). Compassion scales include the Empathic Concern subscale (and potentially the Perspective Taking subscale) of the Interpersonal Reactivity Index (IRI; Davis, 1983), the Balanced Emotional Empathy Scale (Mehrabian & Epstein, 1972), and the Empathy Quotient (Baron-Cohen & Wheelwright, 2004).

MRI research suggests two general types of neural processes involved in empathy. The first involves the default network and the ability to simulate the mental states of others. The second involves what can be called “mirroring”—neural activation that occurs, while observing someone else, in the same sensory networks that would be active if the observer were having an experience similar to that of the observed person. The most studied form of empathy in fMRI is empathy for pain, and here regions of the anterior insula (involved in integrating emotional and sensory information with cognitive processes) and the mid-cingulate cortex appear to constitute the circuit that is active in mirroring (i.e., they are active for both one's own pain and the pain of others), whereas default network regions are involved in recruiting those pain-related regions by decoding the experience of others (Lamm, Decety, & Singer, 2011). A number of fMRI studies of empathy for pain have reported an association between trait levels of empathy and neural responses, with inconsistent results. As with many traits, however, most of these studies have been too small to detect individual differences adequately. In a recent meta-analysis, for example, none of the 15 studies that examined trait effects had a sample larger than 30 (Lamm et al., 2011, Appendix B).

Social or emotional pain has been found to activate brain systems similar to physical pain, and one larger fMRI study found that trait empathy predicted greater functional connectivity of the anterior insula with the PFC

and limbic regions while watching videos of the suffering of others (Bernhardt, Klimecki, Leiberg, & Singer, 2014). (The default network, like the ventral attention and frontoparietal networks, includes regions of anterior insula; Yeo et al., 2011.) Two structural MRI studies found empathy to be positively associated with regional volume in the anterior insula (Mutschler, Reinbold, Wankerl, Seifritz, & Ball, 2013; Sassa et al., 2012), but one found no association (Takeuchi et al., 2014). Another study, with a sample of 118, found a negative correlation of empathy with anterior insula volume; however, this study used all four subscales of the IRI as simultaneous predictors, and the process of residualization may have shifted the meaning of the Empathic Concern subscale (Banissy, Kanai, Walsh, & Rees, 2012). We would not recommend partialling out shared variance from the IRI subscales without a clear theoretical justification. One DTI study found that empathy was widely positively correlated with white matter integrity in tracts connecting affective, perceptual, and action-oriented brain regions, which is potentially consistent with the sophisticated integration of different types of information necessary for both understanding and sharing the emotional experience of others (Parkinson & Wheatley, 2014).

Agreeableness in general, and Politeness specifically, are likely to be associated with emotion regulation. Agreeableness predicts suppression of aggressive impulses and other socially disruptive emotions (Meier, Robinson, & Wilkowski, 2006), and one fairly small fMRI study found that Agreeableness predicted greater right lateral PFC activation in response to fearful compared to neutral faces (Haas, Omura, Constable, & Canli, 2007), which the authors argued might reflect automatic engagement of emotion regulation when facing stimuli signaling potential threat or conflict. In a structural MRI of 56 men drawn from a larger cohort studied since childhood, amygdala volume at age 26 was negatively associated with both current aggression and a history of aggression (Pardini, Raine, Erickson, & Loeber, 2014).

Inasmuch as Agreeableness involves the ability to suppress aggressive impulses, it is likely to be facilitated by serotonin (Montoya, Terberg, Bos, & Van Honk, 2012). An interview-based life history of aggression measure was negatively associated with serotonin function in men but not women (Manuck et al., 1998), whereas a 2-month trial on an SSRI significantly reduced aggression in women but not men (Kamarck et al., 2009). One twin study found that variation in the serotonin transporter gene accounted for

10% of the genetic correlation between Neuroticism and Agreeableness ([Jang et al., 2001](#)).

Other neurotransmitters likely to be involved in Agreeableness include testosterone and oxytocin. Testosterone levels appear to be negatively associated with Agreeableness, particularly Politeness versus Aggression ([DeYoung et al., 2013](#); [Montoya et al., 2012](#); [Turan et al., 2014](#)). Oxytocin is critically involved in processes of social bonding and attachment. Trait empathy has been found to moderate the effects of acute oxytocin administration ([Perry, Mankuta, & Shamay-Tsoory, 2015](#)). Difficulties in the assessment of oxytocin levels suggest the need for caution in research on their association with personality ([Christensen, Shiyamov, Estepp, & Schlager, 2014](#)).

Future Directions

Much new personality neuroscience research has appeared in recent years, as is evident when comparing this chapter with previous reviews of the field ([DeYoung, 2010b](#); [DeYoung & Gray, 2009](#); [Zuckerman, 2005](#)). Further, personality neuroscience research is improving in quality, allowing this review to be reasonably critical and to focus on larger studies. Still, because personality neuroscience is such a young field, its future is wide open. Very few findings about the neurobiological sources of the FFM are sufficiently well-supported to have the status of fact. Every trait needs much additional research before we begin to have anything like a clear picture of the many biological parameters that account for its variation.

We have two major recommendations for those interested in pursuing personality neuroscience. First, work with existing or new theories in order to develop specific testable hypotheses, rather than pursuing purely exploratory research. Readers should be able to glean from this chapter many hypotheses that can be tested by future research. In theory-driven research, it will often be advantageous to test associations with regions of interest in the brain specified *a priori*. Second, collect samples large enough for good research on individual differences—near 100 at a minimum, preferably over 200. We believe that existing theories of the psychological functions underlying the FFM, such as CB5T, are sufficiently well developed to allow rapid advancement of our understanding of the biological basis of traits, as long as rigorous methods are employed.

SECTION 3

Applications

Assessment of the Five Factor Model

Leonard J. Simms, Trevor F. Williams, and Ericka Nus¹

Abstract

We review the current state of the science with respect to the assessment of the Five Factor Model (FFM), a robust structural model of personality that emerged from two distinct traditions: The lexical and questionnaire traditions. The lexical tradition is predicated on the hypothesis that important individual differences in personality are encoded as single words in language. This bottom-up tradition has suggested that five broad factors account for much of the personality variation observed among individuals: Extraversion (or Surgency), Agreeableness, Conscientiousness (or Dependability), Neuroticism (vs. Emotional Stability), and Openness to Experience (or Intellect/Culture). The questionnaire tradition emphasizes the measurement of similar constructs, largely through top-down development of measures. We examine the strengths and limitations associated with existing measures of the FFM and related models, focusing on measures rooted in the lexical and questionnaire traditions. We also consider maladaptive FFM measures and conclude by analyzing important issues in the FFM assessment literature.

Key Words: assessment, Five Factor Model, personality, personality psychology, lexical tradition, questionnaire tradition, extraversion, agreeableness, conscientiousness, neuroticism

The primary purpose of this chapter is to describe the current state of the science with respect to the assessment of the Five Factor Model (FFM). First, however, some historical context and definitions of terms are needed to organize and unify the discussion. The FFM represents a robust structural model of personality that emerged from two distinct traditions in personality psychology. The earlier of these traditions is rooted in [Allport and Odber's \(1936\)](#) dictionary study of American English. This *lexical tradition*, as it is called, is predicated on the hypothesis that important individual differences in personality will come to be encoded as single words in language ([Goldberg, 1993](#)). Factor analytic studies of responses to such person descriptors have resulted in a robust literature showing that five broad factors account for much of the personality variation observed among individuals (e.g., [Goldberg, 1990, 1993; John & Srivastava, 1999](#); see also the chapter by [De Raad and Mlačić](#)). These "Big Five" traits include (I) Extraversion (or Surgency), (II) Agreeableness, (III) Conscientiousness (or Dependability), (IV) Neuroticism (vs. Emotional Stability), and (V) Openness to Experience (or Intellect/Culture). Thus, the Big Five is a bottom-up model derived from structural work with dictionary person descriptors. In contrast, the *questionnaire tradition* has contributed to our understanding and measurement of similar constructs, largely through top-down development of measures and models of these five broad constructs and their associated lower-order facets (e.g., [McCrae & Costa, 1997, 1999](#); see also the chapter by [Costa and McCrae](#)). Although differences among these approaches exist, the similarities in the resulting models far outweigh their differences. Thus, for our purposes we will organize our description of assessment practices in this domain around the FFM, broadly construed.

Notably, the FFM is well represented in the assessment research literature and the psychological research literature more generally. We conducted a search of *PsycINFO* to estimate the amount of assessment research that has been focused on the FFM. First focusing on peer-reviewed journals in which the "assessment" appears in the journal title, we counted the number of published papers identified with the search terms "five factor," "five factor," "big five," "FFM," or "NEO." This search returned 506 articles published since 1986. Of course, this search left out many FFM-related assessment papers that were published in other outlets focused more generally on psychopathology, personality, and personnel psychology. Broadening the search by crossing the above search terms with "assessment" across all peer-reviewed journals resulted in 1,932 published articles. Finally, searching the same terms without any connection to assessment resulted in 12,258 articles being identified. Taken together, these data demonstrate that assessment of the FFM (and research on the FFM more generally) is a robust activity in the modern psychological literature.

However, despite the robust study of the FFM in the psychological literature, it is curious to note that practicing psychologists and other mental health clinicians have not widely adopted measures of the FFM for use in clinical practice (e.g., [Peterson, Lomas, Neukrug, & Bonner, 2014; Piotrowski, 1999; Smith, Gorske, Wiggins, & Little, 2010; Watkins, Campbell, Nieberding, & Hallmark, 1995](#)). More on this point will be discussed in the final section of this chapter. However, regardless of the reasons for the gap between research and clinical practice, FFM-based

measures exist that are based on modern personality models and that exhibit good psychometric characteristics. To that end, the primary purpose of this chapter is to describe the strengths and limitations associated with existing measures of the FFM and related models. By doing so, we hope to contribute to the education of potential users of FFM measures for applied work and research, and highlight areas for further study and development in the FFM assessment literature. The chapter is arranged in several sections focused on (1) measures rooted in the questionnaire tradition (those in the “NEO” family of instruments; i.e., related to the NEO Personality Inventory-Revised of [Costa & McCrae, 1992](#)), (2) measures rooted in the lexical tradition, (3) maladaptive FFM measures, and (4) important issues in the FFM assessment literature (e.g., unipolarity vs. bipolarity, lack of a consensus facet structure, and building FFM measures with applied contexts in mind).

The content for this chapter was drawn from an extensive literature review. We surveyed the literature for instruments assessing the FFM and closely related models, and then summarized the primary measure features in [Table 16.1](#). The first column of the table provides the name and citation(s) for each measure’s most recent version. The second column lists the domains (i.e., higher-order factors) each measure assesses, as well as the number of facets within each domain. Many of the remaining columns provide basic information that may be of interest to test users (e.g., internal consistency); however, the facet derivation, polarity, and range columns provide somewhat more complex information that merits further description. For relevant measures, the facet derivation column lists whether the facet-level structure of an instrument was developed using a primarily “top-down” or “bottom-up” approach. These determinations were primarily based on whether an *a priori* facet-level structure was put forth during construction (i.e., top-down), as opposed to starting with a broad pool of specific traits without a predetermined structure (i.e., bottom-up). Although this dichotomy does not capture the full variability in facet development, we believe it still serves as a useful heuristic. Next, the range column indicates whether a measure was intended to measure normal-range or maladaptive personality traits. Here we describe whether a measure was *developed* (i.e., intended) to assess one or the other, recognizing that in many cases a respective instrument assesses traits with relevance to both normal and abnormal personality. Finally, the polarity column describes whether the instrument assesses traits that are considered unipolar (i.e., representing one construct vs. its absence) or bipolar (i.e., traits with meaningful constructs at either end). These determinations largely were based on statements made by test developers and are further discussed in the polarity section.

Questionnaire Tradition: The NEO and Its Derivatives

What is clear from the citation counts in [Table 16.1](#) and, indeed, from any casual or formal review of the personality assessment literature is that measures in the NEO family of instruments are the most widely known and used measures of the FFM. The initial goal was to develop a comprehensive measure of personality traits based on the state of the literature at that time. However, although the FFM enjoys a reasonable consensus today, at least at the higher-order domain level, no such consensus existed in the 1970s and 1980s. When McCrae and Costa began work on their measure, the literature showed the clearest consensus for neuroticism and extraversion as broad domains of personality, and initial scale and facet development focused on these domains. Through a rational/conceptual process, McCrae and Costa also identified openness to experience as a broad domain worthy of inclusion. Rational methods initially were used to map out the facet structure of these three domains and to develop item pools for each. Item factor analyses of these items were used to hone the resultant scales and finalize the first NEO Inventory (NEO-I; [McCrae & Costa, 1983](#)), which included six facet scales each to tap these three broad domains (18 scales total). Notably, the name of the measure is an acronym representing the first initials of the original domains included in the instrument.

Table 16.1. Summary of Five Factor Model Measures, Organized by Tradition

Measure	Availability	Facets	Items	Response Options	Alpha: Mdn (Range)	Purported Polarity	Citation
<i>Questionnaire Tradition Measures</i>							
NEO-Personality Inventory-3 (NEO-PI-3; McCrae, Costa, & Martin, 2005)	Psychological Assessment Resources	30, Top-down	240, Statements	5-point scale (strongly disagree to strongly agree)	Facets: .75 (.48–81) Domains: .89 (.87–92)	Facets: Bipolar Domains: Bipolar	6,208 total; R = 4,3 NEO-P = 1,689; I = 78)
<i>Interview Tradition Measures</i>							
NEO-Five Factor Inventory-3 (NEO-FFI-3; McCrae & Costa, 2007)	Psychological Assessment Resources	None	60, Statements	5-point scale (strongly disagree to strongly agree)	.79 (.78–86)	Domains: Bipolar	186 total (NEO-F = 17; N FFI-R = NEO-F = 143)
Structured Interview for the Five Factor Model of Personality (SIFFM; Trull & Widiger, 1997)	Psychological Assessment Resources	30, Top-down	120, Statements	0 = absent, 1 = present and does not result in significant dysfunction, 2 = present and may result in significant dysfunction ³	Facets: .56 ⁶ (.31–85) Domains: .80 (.72–89)	Facets: Bipolar Domains: Bipolar	64
International Personality Item Pool NEO (IPIP-NEO; Goldberg, 1999; Goldberg et al., 2006)	See http://ipip.ori.org/new_Multipleconstructs.htm	30, Top-down	300, Statements	5-point scale (very inaccurate to very accurate)	Facets: .81 (.71–88) Domains: .90 (.85–91)	Facets: Bipolar Domains: Bipolar	55 ¹⁵
Five Factor Model Rating Form (FFMRF; Mullins-Sweatt et al., 2006 ¹³)	See http://sampl.psych.purdue.edu/~dbsamuel/research.html	30, Top-down	30, Adjective rating scales ⁷	5-point scale (extremely low to extremely high)	Facets: N/A ⁵ Domains: .69 (.51–78)	Facets: Bipolar Domains: Bipolar	54 ¹³
Five Factor Model Score Sheet (FFMSS; Few et al., 2010 ⁸)	See Few et al. (2010)	30, Top-down	30, Adjective rating scales	7-point scale (problematic, very low on trait to problematic, very high on trait) ³	Facets: N/A ⁵ Domains: .87 (.61–92)	Facets: Bipolar Domains: Bipolar	9 ⁸
Faceted Inventory of the Five Factor Model (FI-FFM; Simms, 2009)	Contact nus@buffalo.edu	26, Bottom-up	247, Statements	5-point scale (strongly disagree to strongly agree)	Facets: .79 (.75–86)	Facets: Mixed Domains: Bipolar	1
Five Factor Form (FFF; Rojas & Widiger, 2014 ¹⁷)	Contact widiger@uky.edu	30, Top-down	30, Adjective rating scales	5-point scale (maladaptively low to maladaptively high) ³	Facets: N/A ⁵ Domains: .74 (.64–76)	Facets: Bipolar Domains: Bipolar	0 ¹⁷
<i>Lexical Tradition Measures:</i>							
Big Five Inventory (BFI)	See http://www.ocf.berkeley.edu/~johnlab/bfi.php	None	44, Statements	5-point scale (disagree to agree)	Domains: .80 (.75–	Domains: Bipolar	1,472 ¹⁴

John, Donahue, & Kentle, 1991;
John & Srivastava, 1999)

Goldberg's Synonym Clusters (Goldberg, 1990)	See article	100 clusters, Bottom-up	339, Adjectives	9-point scale (extremely inaccurate to extremely accurate)	Clusters: .68 (.45– 87)	Domains: Bipolar	1,422
Goldberg's Big Five Markers (Goldberg, 1992)	See article	None	100/50 ⁹ , Adjectives	9-point scale (extremely inaccurate to extremely accurate)	Domains: .94 (.88– 97)	Items: Both ⁹ Domains: Bipolar	1,379
Ten-Item Personality Inventory (TIPI; Gosling et al., 2003)	See article	None	10 Adjectives	7-point scale (disagree strongly to agree 73) strongly)	Domains: .50 (.40–	Domains: Bipolar	712
Saucier's Big Five Mini Markers (Saucier, 1994)	See article	None	40, Adjectives	9-point scale (extremely inaccurate to extremely accurate)	Domains: .81 (.78– 83)	Domains: Bipolar	508
Interpersonal Adjective Scales—Revised: Big Five Version (IASR-B5; Trapnell & Wiggins, 1990)	See http://paultrapnell.com/measures/	8, Top-down ⁴	124, Adjectives	8-point scale (extremely inaccurate to extremely accurate)	Facets ⁴ : .87 (.81–91) Domains: .90 (.87– 93)	Facets: Unipolar Domains: Bipolar	291
Big Five Aspect Scales (BFAS; DeYoung, Quilty, & Peterson, 2007)	See http://ipip.ori.org/BFASKeys.htm	10, Bottom-up	100, Adjectives	5-point scale (very inaccurate to very accurate)	.81 (.72– 91)	Facets: Unstated Domains: Bipolar	151
Big Five Questionnaire (BFQ; Caprara, Barbaranelli, Borgogni, & Perugini, 1993) ¹	Giunti O.S. Organizzazioni Speciali	10, Top-down	132, Statements	5-point scale (very false for me to very true for me)	Facets: .73 (.60–86) Domains: .81 (.75– 90)	Unstated Domains: Bipolar	135
Five Factor Personality Inventory (FFPI; Hendriks et al., 1999)	Swets Test Publishers. See article for details.	Calculable facets ¹²	100, Statements	5-point scale (not at all applicable to entirely applicable)	Domains: .85 (.81– 86)	Domains: Bipolar	124
Big Five Modular Markers (Saucier, 2002)	See article	36, Bottom-up	90, Adjectives	6-point scale (very inaccurate to very accurate)	Parcels: .67 (.43– 81) Domains: .82 (.77– 88)	Parcels: Bipolar Domains: Bipolar	53
International Personality Item Pool	See http://ipip.ori.org/newAB5CKey.htm	45, Bottom-up	484, Statements	5-point scale (very)	Facets: .78 (.66– 86)	Facets: Bipolar ²	5 ¹⁶

Abridged Big Five-Dimensional Circumplex Model (IPIP-AB5C; Goldberg, 1999 ¹¹ ; Goldberg et al., 2006)			<i>inaccurate to very accurate)</i>		Domains: Bipolar
<i>Maladaptive/PSY-5 Measures</i>					
MMPI-2-RF Personality Psychopathology ⁵ Scales (PSY-5-RF; Harkness et al., 2014)	University of Minnesota Press	None	104, Statements	True/False	Domains: .75 (.69–77) Domains: Unipolar 140 (PS RF-0, I 5-2–14(
<i>Personality Inventory for DSM-5 (PID-5; Knueger et al., 2012)</i>					
Computerized Adaptive Test of Personality Disorder (CAT-PD; Simms et al., 2011; Wright & Simms, 2014)	See http://www.psychiatry.org/practice/dsm/dsm5/online-assessment-measures#Personality	25, Bottom-up	220, Statements	5-point scale (<i>very false or often false to very true or often true</i>)	Facets: .86 (.72–96) Domains: .95 (.84–96) Facets: Unipolar Domains: Unipolar 58
<i>Computerized Adaptive Test of Personality Disorder (CAT-PD; Simms et al., 2011; Wright & Simms, 2014)</i>					
33, Bottom-up	188 adaptive/216 static, Statements	5-point scale (<i>very untrue of me to very true of me</i>)	Facets: .83 (.77–88)	Facets: Unipolar	20

Note: Measures are sorted within descending order of citation counts within the section.

¹ There is an updated version of the BFQ (i.e., BFQ-2; Caprara, Barbaranelli, Borgogni & Vecchione 2007) in Italian.

² Alternatively can be used as 90 unipolar facets.

³ Actual response anchors are tailored to each item (i.e., are item dependent).

⁴ IAS-BR has eight subscales related to Dominance and Love.

⁵ Single-item facets.

⁶ Mean alpha, rather than median; Trull et al. (1998).

⁷ Items consist of a rating scale with descriptive adjectives at the extremities.

⁸ Few et al. (2010) is the first article to focus on measure; Spitzer et al. (2008) represents the first usage of the measure and has been cited 48 times.

⁹ The measure is available as 100 adjectives or 50 bipolar rating scale items.

¹⁰ These measures use single items to measure facets.

¹¹ Represents the first instance of an AB5C measure; the model was proposed previously (Hofstee et al., 1992) and has been cited 374 times.

¹² Facets can be calculated as combinations of domain scores (e.g., De Fruyt, McCrae, Szirmák, & Nagy, 2004).

¹³ Based on Mullins-Sweatt et al. (2006), Lynam and Widger (2001) is the first use of FFMRF and has been cited 254 times.

¹⁴ Based on a combination of John et al. (1991) and John and Srivastava (1999).

¹⁵ Goldberg (1999) and Goldberg et al. (2006) focus on many measures; therefore articles citing both sources were searched for the term “NEO” and the resulting counts were combined.

¹⁶ Goldberg (1999) and Goldberg et al. (2006) focus on many measures; therefore articles citing both sources were searched for the term “AB5C” and the resulting counts were combined.

¹⁷ Rojas and Widger (2014) is the first article focused on this measure; Mullins-Sweatt et al. (2010) is first use of measure and was cited 52 times.

¹⁸ Web of Science, for English versions.

Further scouring of the literature identified two additional domains—agreeableness and conscientiousness—which were added to the instrument in the next revision, but only at the domain level (NEO-PI; Costa & McCrae, 1985). Following rational and factor analytic procedures similar to those employed for the original NEO facets, the

facet structure of agreeableness and conscientiousness later was elaborated and operationalized in the revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992). The NEO-PI-R thus included a complete FFM with exactly six facets for each of the five broad domains of the FFM—Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness—and it is this version of the NEO (and indeed the FFM more generally) that has predominated in the FFM literature over the past two decades. Finally, another minor revision was introduced in 2005 (NEO-PI-3; McCrae & Costa, 2010; McCrae, Costa, & Martin, 2005) in which 37 items were modified to reflect simpler, more readable language and to be more appropriate for use with adolescents in addition to adults. However, in all other respects, the NEO-PI-3 includes scales and structure identical to the NEO-PI-R. A summary of the facets associated with each NEO domain is provided in Table 16.2, along with the facets associated with several other normal-range and maladaptive FFM measure exemplars.

As noted above, the NEO instruments have been heavily used in research settings to represent the FFM across a wide range of disciplines, including clinical settings (e.g., Piedmont, 1998; Singer, 2005), personality disorder assessment (e.g., Widiger, Trull, Clarkin, Sanderson, & Costa, 2002), industrial–organizational psychology (Judge & Bono, 2000; LePine, 2003), behavioral medicine (Trobst, Herbst, Masters, & Costa, 2002; Weiss & Costa, 2005), educational psychology (e.g., Nofle & Robins, 2007), and behavioral genetics (e.g., Jang, McCrae, Angleitner, Riemann, & Livesley, 1998). In addition, the NEO measures have been translated into many other languages, including Spanish, Chinese, Croatian, Czech, Dutch, Estonian, French, Farsi, Japanese, Malay, Polish, Portuguese, Russian, Serbian, Slovakian, Korean, Thai, and Turkish. Moreover, etic cross-cultural studies of the NEO have demonstrated reasonably strong structural equivalence across cultures and language translations (McCrae & Costa, 1997).

However, despite the wide use of the NEO instruments, numerous limitations have been described in the literature. First, the rational approach to the development of facet constructs and scales likely resulted in a set of scales that does not cleanly carve personality structure at its joints, at least not at the lower-order facet level. Other faceted measures to be discussed later in this chapter show both points of overlap and distinctiveness with the NEO facets. Moreover, although the symmetry of the measure—i.e., exactly six facets for each of five domains and exactly eight items to represent each facet—is appealing on a number of levels, rigid adherence to this symmetry in the scale development process likely led to limitations in the measure’s structural validity and other psychometric characteristics (e.g., Church & Burke, 1994). For example, although all NEO facets correlate most highly with their respective domains, several facets correlate more highly with facets from another domain than they do with one or more of the within-domain facets (e.g., Warmth with both Extraversion and Agreeableness facets and Impulsivity with both Neuroticism and Conscientiousness facets; McCrae & Costa, 2010; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). Similarly, discriminant validity within domains has been noted as a concern, as some within-factor facet intercorrelations are higher than might be ideal, especially in the Neuroticism and Conscientiousness domains, suggesting that some of the facets could be collapsed into a smaller number of underlying dimensions (McCrae & Costa, 2010). Based on these considerations, it is quite likely that the FFM facet structure suggested by the NEO does not reflect personality truth per se, but rather an imperfect rational sampling of possible facets associated with each domain.

Table 16.2. Examples of Five Factor Model Facets across Normal-Range and Maladaptive Measures

Measure	Normal-Range Measures			Maladaptive Measures	
	NEO-PI-R/3 (McCrae & Costa, 2010)	Goldberg's AB5C Facets (Goldberg, 1999)	Big Five Modular Markers (Saucier, 2002)	FI-FFM (E. Simms, 2009)	PID-5 (Krueger et al., 2012)
Neuroticism vs. Emotional Stability	Anxiety	Stability	Fretfulness	Anxiety	Anxiousness
	Angry Hostility	Happiness	Anxiety	Depression	Emotional Labiality
	Depression	Calmness	Emotional Excitability	Anger Proneness	Hostility
	Self-Consciousness	Moderation	Jealousy/Envy	Somatic Complaints	Perseveration
	Impulsiveness	Toughness	Hyperdevotedness	Envy	Restricted Affectivity
	Vulnerability	Impulse Control			Separation Insecurity
		Imperturbability			Submissiveness
		Cool-headedness			Relationship Insecurity
		Tranquility			Cognitive Problems
					Health Anxiety
Extraversion vs. Detachment	Warmth	Gregariousness	Talkativeness	Positive Temperament	Anhedonia
	Gregariousness	Friendliness	Sociability	Sociability	Depressivity
	Assertiveness	Assertiveness	Assertiveness	Ascendance	Intimacy Avoidance
	Activity	Poise	Spontaneity	Venturesomeness	Suspiciousness
	Excitement-Seeking	Leadership	Adventurousness	Frankness	Withdrawal
	Positive Emotions	Provocativeness	Restraint		Romantic Disinterest
		Self-Disclosure	Shyness		
		Talkativeness			
		Sociability			
Openness/Oddity	Fantasy	Intellect	Analytical Inquiry	Intellectance	Eccentricity
	Aesthetics	Ingenuity	Reflectiveness	Novel Experience Seeking	Cognitive and Perceptual
	Feelings	Reflection	Intellectuality	Nontraditionalism	Dysregulation
	Actions	Competence	Unconventionality		Unusual Beliefs and
	Ideas	Quickness			Experiences
	Values	Introspection			Emotional Resonance
		Creativity			Unusual Experiences
		Imagination			Eccentric Beliefs
		Depth			
Agreeableness vs. Antagonism	Understanding	Kindness	Empathy	Attention Seeking	Callousness
	Straightforwardness	Warmth	Warmth	Trust vs. Cynicism	Manipulativeness
	Altruism	Morality	Sympathy	Straightness vs.	Deceitfulness
	Compliance	Pleasantness	Agreeableness	Manipulativeness	Grandiosity
	Modesty	Empathy	Sensitivity	Modesty	Manipulativeness
	Tender-Mindedness	Cooperation	Toughness		Hostile Aggression
		Sympathy	Slyness		Rudeness
		Tenderness	Criticalness		
		Nurturance	Demandingness		
Conscientiousness vs. Disinhibition	Competence	Conscientiousness	Efficiency	Self-Discipline	Distractibility
	Order	Efficiency	Organization	Dutifulness	Non- Perseverance
	Dutifulness	Dutifulness	Perfectionism	Deliberation vs.	Irresponsibility
					Risk Taking

				Impulsivity	
Achievement Striving	Purposefulness	Decisiveness	Achievement Striving	Rigid Perfectionism	Irresponsibility
Self-Discipline	Organization	Caution	Order	Risk Taking	Perfectionism
Deliberation	Cautiousness	Ambition			Workaholism
	Rationality	Forgetfulness			Rigidity
	Perfectionism				
	Orderliness				

Another concern likely rooted in the forced symmetry of the instrument is inconsistent support for internal consistency across the facet scales. Although data presented in the NEO manual (McCrae & Costa, 2010) indicate that the domains demonstrate strong internal consistency ($Mdn \alpha = .89$; range = .87 to .92), the same cannot generally be said of the facet scales ($Mdn \alpha = .75$; range = .48 to .81). Notably, only two facet scales reach .80, which is a common threshold suggested by some scale development experts (e.g., Clark & Watson, 1995), and 13 of 30 facets yield alpha coefficients below .70, a threshold deemed minimally adequate by some experts for exploratory research contexts (e.g., Nunnally & Bernstein, 1994). Notably, though, such low alphas will tend to attenuate validity effects in research settings and increase the size of confidence intervals in applied contexts. Especially in settings in which point estimates of traits are used to make important decisions about individuals, data such as these suggest that NEO domains will yield more trustworthy point estimates than will NEO facets.

Although the NEO initially was developed as a single measure, since its initial development, given its utility and popularity, a number of alternative versions and independent measures have been published that are based on the same domains and/or facets as the NEO. For example, the NEO instruments include not only the fully faceted NEO-PI-R and NEO-PI-3 as described above, but a brief 60-item form focused only on measurement of the FFM domains—the NEO Five Factor Inventory (NEO-FFI)—also is available. Similarly, the NEO authors recently published a 120-item short form of the measure that includes only the first four items from each facet—NEO-PI-3 First Half (NEO-PI-3FH; McCrae & Costa, 2007)—which balances the desire for efficient measurement with reasonable coverage of the lower-order facets. Notably, though, McCrae and Costa (2007) reported expectably lower internal consistencies for the shortened facet scales ($Mdn \alpha = .64$ in adult participants). However, they noted strong fidelity with the full-length facet scales ($Mdn r = .91$), good evidence of self–other agreement ($Mdn r = .44$), and structural similarity with the full-length scales (congruence coefficients ranged from .96 to .98 across the five domains).

An important limitation of the NEO measures is its proprietary nature, which makes using it more costly than some users can afford. To that end, Goldberg's (1999) International Personality Item Pool (IPIP), composed of a growing number of public domain personality items and scales, includes numerous scales that were designed to directly map the NEO domains and facets. The full IPIP-NEO parallels the NEO-PI-R/III scales and structure with 30 facets scales measured by 300 items rated on a standardized five-point IPIP response scale (1 = *very inaccurate* to 5 = *very accurate*). Goldberg (1999) reported that these alternative IPIP-NEO scales strongly relate to their NEO counterparts (M corrected convergent correlation = .94) and are slightly more internally consistent (M alphas for the IPIP-NEO and NEO scales = .80 and .75, respectively), likely owing to their longer length. Johnson (2011) also developed a 120-item short form of the IPIP-NEO facet scales, with alphas that generally exceed those of the same-sized NEO-PI-3FH measure described above. In addition to the faceted IPIP-NEO versions, the IPIP offers domain-only NEO scales in 50- and 100-item variations, with similarly favorable psychometric properties. Notably, all of these scales are in the public domain and are free to use.

Observer and Interview Measures of the FFM

In addition to the self-report versions of the NEO measures described above, measures have been developed to rate the same FFM domains and facets from the perspective of others. Given the dangers associated with single assessment methods and shared method variance (Campbell & Fiske, 1959; e.g., inflated validity coefficients, self-report biases, self-presentation strategies, and making inferences based on a single source of data), the availability of instruments to assess NEO domains and facets from multiple perspectives is a clear advantage and a testament to the large research base existing on the NEO/FFM-based domains and facets. In fact, the NEO authors themselves acknowledge the importance of considering non-self-report responses in both applied and research contexts; to that end, the standard NEO materials come with Form R, which is worded appropriately to rate others (as opposed to the self-rated Form S that is most commonly used and reported). Form R is available for both the full NEO-PI-3 and the nonfaceted NEO-FFI, and psychometric evidence presented in the manual suggests that it yields roughly equivalent internal consistency compared to Form S and generates evidence of self–other agreement

that is in line with the broader personality literature (Mdn self–other $rs = .44$ and $.51$ in adolescents and adults, respectively; [McCrae & Costa, 2010](#)).

In addition, [Trull and Widiger \(1997\)](#) published the Structured Interview for the Five Factor Model of Personality (SIFFM), which is a semistructured interview designed to provide researchers and applied practitioners with a tool to assess the presence or absence of the domains and facets of the FFM, largely rooted in the structure provided by the NEO measures. Similar to the rationale for developing Form R, [Trull and Widiger \(1997\)](#) noted that researchers would benefit from an interview measure of the FFM to the extent that multiple methods are useful to distinguish meaningful construct variance from that attributable to using shared methods across all measures. Similarly, they noted that applied practitioners often desire interview methods, especially when measures are used to support psychiatric diagnoses, treatment plans, or other important recommendations they might be asked to make for a given patient. To that end, the SIFFM is structured to assess the FFM across a wide range of each trait and includes items designed specifically to tap maladaptive levels of these traits.

The SIFFM interview includes 120 items that are proportionally distributed among the FFM domains and facets such that each facet is represented by four items and each domain is represented by 24 items. Given these features, expectably, the domain scores demonstrate stronger internal consistency (Mdn alpha = $.80$, range = $.72$ to $.89$) than do the facet scales (Mdn alphas = $.72$, $.75$, $.46$, $.49$, and $.54$ across the N, E, O, A, and C domains, respectively; [Trull & Widiger, 1997](#)), a feature that has implications, especially for the applied use of these scales. Despite these sometimes low internal consistencies, the facet (and domain) scores generally demonstrate strong test–retest reliability over a 2-week interval (Mdn $rs = .73$, $.83$, $.80$, $.75$, and $.74$ across the N, E, O, A, and C domains, respectively; [Trull & Widiger, 1997](#)). Moreover, the manual reports uniformly high interrater reliabilities across domains and facets based on a subset of independent ratings of audiotaped interviews.

Measures from the Lexical Tradition

Adjective-Based Measures

As noted above, the lexical tradition emerged from structural studies of dictionary person descriptors. Although the lexical hypothesis can be traced all the way back to Sir Francis Galton, most in the modern trait literature point to the seminal work of [Allport and Odbert \(1936\)](#) as the starting point for the studies that ultimately led to the Big Five model of personality.² Allport and Odbert scoured the second unabridged edition of *Webster's New International Dictionary* for terms describing personality and behavior, identifying nearly 18,000 such terms and sorting them into four categories: (1) 4,504 personal trait terms, (2) 4,541 temporary mood or state terms, (3) 5,226 social evaluation terms, and (4) 3,682 obscure and/or miscellaneous terms that could not be readily sorted into one of the previous three categories. Notably, [Allport and Odbert \(1936\)](#) believed that only the first group of terms represented genuine personality trait descriptors, and it is these terms—as well as an updated set identified by [Norman \(1967\)](#)—that have served as the foundation for much of the factor analytic work that followed, leading to the Big Five model and, later, the FFM.

In the decades that followed publication of these terms, numerous scholars—including Cattell ([1943, 1945](#)), [Tupes and Christal \(1961\)](#), and [Norman \(1963\)](#)—collected and factor analyzed responses to subsets of these terms, leading to converging lines of evidence for the Big Five model. Arguably, though, Lew Goldberg and his colleagues have done the most to solidify the Big Five traits as a ubiquitous structural model underlying the most basic individual differences in personality. Goldberg conducted a number of studies developing markers and measures of the Big Five model. [Goldberg \(1990\)](#) classified 479 trait adjectives into 133 synonym clusters with the use of dictionaries, synonym finders, and independent judgments of lexicographers. These then were pared down to 100 clusters measured by 339 trait adjectives. The 339 trait adjectives are rated on a nine-point scale ranging from 1 (*extremely inaccurate as a self-description*) to 9 (*extremely accurate as a self-description*), and scales can be scored for each of the 100 synonym clusters. Furthermore, as the mean number of adjectives included in each synonym cluster was 3.4, it is not surprising that the modal alphas were in the $.60$ range. Nonetheless, factor analyses of self-rated and peer-rated responses for these adjectives revealed strong evidence for the Big Five factors.

Although [Goldberg's \(1990\)](#) 339 trait adjectives provided good breadth of content, and the synonym clusters likely provide a reasonably inclusive set of possible facets underlying each of the Big Five domains, the measure is long and inefficient, especially if you wish to score only the higher-order domains. As such, [Goldberg \(1992\)](#) investigated several alternative sets of bipolar and unipolar trait adjective markers for the Big Five model in multiple samples. The strongest evidence emerged for a set of unipolar markers. Starting with 566 trait adjectives, Goldberg iteratively reduced them to a set of 100 adjectives that displayed a strong pattern of convergent and discriminant validity with respect to the Big Five factors. The resulting 100 unipolar markers include 20 for each

Big Five domain, largely are balanced in terms of positively and negatively keyed items, and demonstrate strong levels of internal consistency across multiple development samples (all alphas were greater than .80 across multiple data sets). The final measure includes all 100 adjectives, each rated on a nine-point scale ranging from 1 (*extremely inaccurate*) to 9 (*extremely accurate*).

Saucier (1994) extended Goldberg's work, reducing the 100 unipolar markers to 40 adjectives—the Big Five Mini-Markers—which exhibit reasonable psychometric characteristics despite shortening the scales to 40% of their original length. Moreover, Saucier has been quite active in elaborating the lexical Big Five personality space (and, indeed, the variable space of all person descriptors more generally) and developing variations on the measures previously described, such as the Big Five Modular Markers, Orthogonal-40 Markers, and Mini-Modular Markers, all of which were designed to maximize orthogonality (see Saucier, 2002, for a summary of these alternative Big Five marker sets). For comparison purposes, the parcels/facets associated with his modular markers appear in Table 16.2 alongside the facets of competing Big Five and FFM measures.

Statement-Based Measures

Notably, the lexical measures reviewed thus far, and indeed the lexical literature more generally, are based on single adjectives rather than more fully contextualized and/or behaviorally referent sentences or phrases. However, the use of single adjectives as items can cause reduced precision and clarity for the respondent relative to longer statements (e.g., Widiger & Trull, 1997). In particular, a single word may have variable meanings and be interpreted differently across individuals, whereas a longer phrase or sentence provides a greater opportunity for the test developer to clarify the intended meaning of the item. To that end, some lexically influenced measures have attempted to translate what we know from the trait adjective literature into measures composed of longer statements that are more contextually and behaviorally specific. Notably, Goldberg's (1999) IPIP has facilitated the translation of trait adjectives into longer statement-based items.

Among the most prominent of these lexically influenced measures is the IPIP version of Hofstee, de Raad, and Goldberg's (1992) Abridged Big Five-Dimensional Circumplex (AB5C), which is a circular model of the Big Five personality domain. In the AB5C model, the Big Five domains are crossed in an elegant series of 10 two-dimensional circumplex models, such that each circumplex includes two orthogonal axes representing two of the Big Five domains. Trait facets are then conceptualized as axes at 45-degree increments around each circle. In the IPIP incarnation of the AB5C model, for example, extraversion facets are represented by a single axis reflecting “pure” extraversion (gregariousness in the AB5C model) plus eight facets derived from crossing extraversion with high or low variants of the remaining four Big Five domains: Extraversion crossed with (1) high and low agreeableness = friendliness and provocativeness, respectively, (2) high and low neuroticism = talkativeness and poise, respectively, (3) high and low conscientiousness = assertiveness and self-disclosure, respectively, and (4) high and low openness/intellect = leadership and sociability, respectively. The full IPIP-AB5C measure includes 486 items tapping 45 facets. A summary of all IPIP-AB5C facets is presented in Table 16.2, organized by FFM domain. Like all IPIP-based scales, the items are rated on a five-point scale ranging from 1 (*very inaccurate*) to 5 (*very accurate*).

Based on responses from the Eugene-Springfield Community Sample, the IPIP-AB5C scales demonstrate adequate to good internal consistency (Goldberg, 1999; mean alpha = .78 across scales). Structural work on the IPIP-AB5C has supported its use as a faceted measure of the Big Five (e.g., Bäckström, Larsson, & Maddux, 2009); however, the facet scales often display significant cross-loadings, as would be expected given their circumplex origins, but only partially supporting the particular cross-loadings that would be expected given the original AB5C model proposed by Hofstee et al. (1992). In addition, the IPIP-AB5C scales include some item overlap, which will serve to artificially inflate interscale correlations and influence structural results. Finally, the measure is limited given its long length. Regardless, it serves as the most elaborated facet model of the Big Five model, and its circumplex underpinnings provide an elegant basis for modeling uniform coverage of the Big Five facet space.

Other Short Big Five Scales

In addition to scales mapping the AB5C and NEO-PI-R/III models, the IPIP also includes 50-item and 100-item public domain scales mapping the Big Five factors as operationalized by Goldberg's unipolar markers. Goldberg reported strong evidence of internal consistency for these scales (M alphas = .84 and .90 for the short and long versions, respectively) and strong convergence with the unipolar marker scales (M convergent correlations corrected for unreliability = .81 and .78 for the short and long scales, respectively). Others have developed

lexically informed measures tapping the Big Five domains. The most widely used of these is the Big Five Inventory (BFI; [John, Donahue, & Krentle, 1991](#); [John & Srivastava, 1999](#)), which was designed to be a brief statement-based measure of the broad Big Five factors. The BFI includes 44 items (8 to 10 items per domain) rated on a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items were developed to reflect elaborated versions of prototypic trait adjectives for each Big Five domain. For example, as noted by [John and Srivastava \(1999\)](#), the openness adjective “original” was elaborated for the BFI to read “is original, comes up with new ideas.” Strengths of the measure include strong evidence of internal consistency ($M\alpha = .83$ across scales), convergent validity with respect to several other domain-based measures (M corrected convergent correlations = .92 and .95 with matched NEO-FFI and unipolar marker scales, respectively), and strong traction in the research literature (see [Table 16.1](#)).

If the 44-item BFI or the other brief measures described above are too long for what is needed, other even briefer measures of the Big Five have been developed. [Donnellan, Oswald, Baird, and Lucas \(2006\)](#) reduced the IPIP Big Five scales to 20 items total, four for each Big Five factor (IPIP-20). [Gosling, Rentfrow, and Swann \(2003\)](#) went even further, developing 5-item and 10-item personality inventories (FIFI and TIPI, respectively) designed to briefly tap each Big Five domain. Although the psychometrics of these reduced scales clearly are less favorable than their longer counterparts, they may be minimally adequate for certain research designs in which there are pressures to reduce total test battery length. Of course, extremely short measures such as these come with huge caveats. The reduced measurement precision will attenuate validity correlations in research studies, which is a salient threat to internal validity. In applied settings in which psychological measures are used to help make important decisions about individuals’ lives, the reduced precision of such short measures likely confers an unacceptable degree of true score uncertainty. Thus, we do not advocate for the use of such short measures; however, they are presented here as a service to those who need quick tools for Big Five assessment and who are willing to tolerate the marked increase in statistical noise that accompanies them.

Related Lexical Models and Measures

As noted above, the lexical personality literature is rooted in dictionary studies such as that conducted by [Allport and Odber \(1936\)](#). However, most structural studies of such descriptors have focused solely on responses to their first category terms—personal trait terms—to the exclusion of descriptors reflecting states, evaluative terms, or other types of person description. Such exclusions have led some lexical scholars to speculate that additional personality-relevant factors might exist beyond the Big Five traits. To that end, a literature has developed examining the impact of using more inclusive sets of person descriptors as the basis of lexical personality structural work. Doing this has resulted in a range of models and measures that goes beyond the five broad traits of the Big Five model. In one strand of this literature, using an inclusive set of person descriptors led to a seven-factor structure—termed the Big Seven model by [Tellegen and Waller \(1987\)](#)—that includes factors corresponding closely to four of the Big Five traits, an unconventionality dimension that is related to but not isomorphic with traditional conceptualizations of openness/intellect, and positive and negative valence dimensions that reflect extremely positive (e.g., describing yourself as exceptional, important, smart) and negative (e.g., describing yourself as evil, immoral, disgusting) self-evaluations, respectively.

The Inventory of Personal Characteristics-7 (IPC-7; [Benet & Waller, 1995](#); [Tellegen, Grove, & Waller, 1991](#)) was developed to measure the Big Seven model, which has facilitated studies of this alternative lexical structure model. Notably, others have presented similar findings (e.g., [Saucier, 1997](#)), but such inclusive models are not without their critics (e.g., [Ashton & Lee, 2001](#); [McCrae & Costa, 1995](#); [Widiger, 1993](#); [Widiger & Trull, 1992](#)), who have argued that the valence dimensions may represent (1) response style dimensions, (2) artifactual factors due to highly skewed descriptive terms, (3) indices of positive and negative self-esteem processes, or (4) maladaptive or extreme variants of the existing Big Five factors, as opposed to personality traits independent of the Big Five. Research related to these critiques is relatively sparse, but some work has demonstrated that positive and negative valence can be measured reliably, can be consensually rated (i.e., moderate levels of self-peer agreement, especially for negative valence), and significantly improves the prediction of personality disorder after accounting for traditional Big Five markers ([Simms, 2007](#); [Simms, Yufik, & Gros, 2010](#); [Simms, Zelazny, Yam, & Gros, 2010](#)).

Similar to the Big Seven literature—but coming to different conclusions—is the HEXACO literature, which has supported a six-factor model and measure emerging from lexical studies in multiple languages (e.g., [Ashton & Lee, 2009](#); [Ashton et al., 2004](#); [Lee & Ashton, 2004](#)). Specifically, Ashton and Lee have conducted an impressive number of studies showing that structural analyses of an inclusive, representative set of personality descriptors result in six broad factors: Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A),

Conscientiousness (C), and Openness to Experience (O). The differences between the HEXACO and Big Five models largely are a matter of elaboration and factor analytic rotation. Three of the Big Five factors are similar to the extraversion, conscientiousness, and openness to experience factors of the HEXACO model. HEXACO agreeableness and emotional stability, however, represent rotated variants of their Big Five counterparts. For example, whereas anger and quick temper are associated with low emotional stability in the Big Five, these characteristics reflect low Agreeableness in the HEXACO model. In addition, the HEXACO factor of honesty-humility—which includes facets of sincerity, fairness, greed avoidance, and modesty—is not directly included among the Big Five domains (although some aspects are related to Big Five agreeableness). The HEXACO model can be measured using 60-, 100-, or 200-item questionnaires that are in the public domain; the 100- and 200-item versions include four facet scales for each of the six domains. Moreover, a growing body of research has supported the psychometric characteristic of the measures and their construct validity vis-à-vis the Big Five and other models of personality (e.g., [Ashton & Lee, 2009](#); [Ashton, Lee, & de Vries, 2014](#); [Lee & Ashton, 2004](#)).

Maladaptive FFM Measures

Although the NEO family of measures initially was developed with the intention to map and measure individual differences in normal-range personality traits, a robust literature has emerged showing the value of the NEO and its component domains and facets as a possible trait-dimensional framework for organizing and understanding personality disorder (PD). Much of this literature has focused on studying the NEO domain-level and facet-level profiles associated with each PD listed in various editions of the *Diagnostic and Statistical Manual of Mental Disorders* [DSM; American Psychiatric Association (APA), [1994](#), [2000](#), [2013](#)]. Expert consensus studies (e.g., [Lynam & Widiger, 2001](#)) and meta-analytic work ([Samuel & Widiger, 2008](#); [Saulsman & Page, 2004](#)) have summarized this literature and revealed clear patterns of relation among NEO-based FFM traits and DSM-based personality disorders, which resulted in numerous scholars calling for the FFM to serve as the basis for personality disorder classification in the recently revised *DSM-5* ([American Psychiatric Association, 2013](#)). Although a pathologically flavored version of the FFM [i.e., the Personality Psychopathology Five (PSY-5); [Harkness & McNulty, 1994](#)] ultimately emerged as the organizing scheme underlying the experimental PD trait system in *DSM-5*, there initially was resistance to using the FFM as a basis for the PD classification. This resistance was complex and multifaceted; for our purposes here, it is notable that some of this resistance likely was due to the conflation of the FFM with the NEO family of measures, which are both (1) proprietary in nature and (2) designed to measure normal-range personality variation. The latter point is particularly important, since the NEO scales largely lack enough maladaptive personality variance to serve as a clinically useful measure (e.g., [Haigler & Widiger, 2001](#)).

Maladaptive NEO-Based Measures

In response, scholars interested in advancing the links between the FFM and personality disorder have developed a series of measures designed to tap both normal-range and maladaptive personality variation within an FFM context. As noted above, the SIFFM ([Trull & Widiger, 1997](#)) is a semistructured interview designed to capture the full range of FFM variance. However, this measure has not been widely used since its initial publication, perhaps in part due to the time and clinician resources needed to complete it. Thus, Widiger and colleagues have also developed a series of brief self- and/or clinician-rated measures to assess the FFM domains and facets as structured in the NEO family of measures. The Five Factor Model Rating Form (FFMRF; [Mullins-Sweatt, Jamerson, Samuel, Olson, & Widiger, 2006](#)) is the most widely cited of these measures. The FFMRF is a one-page measure composed of 30 items, one for each facet of the NEO model. For each facet, the facet name is provided, along with several descriptors indicative of the high and low poles of each facet. For example, for the FFM facet of Angry Hostility, “angry, bitter” and “even-tempered” are provided to represent the high and low poles of the facet, respectively. Responses are provided on a five-point scale ranging from 1 (*extremely low*) to 5 (*extremely high*). Although the brevity of the measure is a huge advantage, especially for those desiring facet-level information regarding respondents, the measure has shown limitations in the assessment of maladaptive FFM variation given that the response format focuses on the degree of traitedness rather than maladaptivity per se.

To that end, two similarly brief alternatives have been developed. First, the Five Factor Model Score Sheet (FFMSS; [Few et al., 2010](#); [Widiger & Spitzer, 2002](#)) also is a one-page rating sheet consisting of 30 items representing each of the 30 facets of the NEO model. Identical to the FFMRF, each item includes the FFM trait name and several descriptors of those high and low on that trait. The difference between the measures largely is in the response format, which attempts to disentangle trait extremity from maladaptivity. Each item is rated on a

seven-point scale, with the extreme points focusing on problematically high or low manifestations of the trait and the middle options reflecting normal-range variation. However, this measure is limited to the extent that it leaves to the user's imagination what normal-range and problematic variants of the facets might look like. In response, the Five Factor Form (FFF; [Rojas & Widiger, 2014](#)) was developed to provide more clarity regarding the normal-range and maladaptive variants of each FFM facet. The FFF also consists of one item for each FFM facet, each rated on a five-point scale including the following options: 1 (*maladaptive low*), 2 (*normal low*), 3 (*neutral*), 4 (*normal high*), and 5 (*maladaptive high*). In addition, and in contrast to the FFMSS, each item also includes exemplar descriptors of both the maladaptive and normal-range options. For example, for the facet of Warmth, 1 = “*cold, distant*” and 2 = “*formal-reserved*” on the low end and 4 = “*affectionate, warm*” and 5 = “*intense attachments*” on the high end. Thus, options 1 and 5 reflect maladaptively low and high manifestations of warmth, respectively, whereas options 2 and 4 reflect normal-range variations in warmth.

Although promising as extensions of the FFM to reflect maladaptive variation, research on the FFMRF, FFMSS, and FFF measures remains relatively limited relative to research focused on the full NEO measures. Additional work is needed to evaluate the reliability and construct validity of these measures. In particular, research is needed to study the presumed bipolarity of the items within these measures. For example, to what extent do the two FFMRF and four FFF descriptors for each facet item statistically cohere to form a single dimension? We return to the issue of unipolarity vs. bipolarity of FFM traits and scales in a later section.

PSY-5 Measures

In contrast to the maladaptive FFM variants described above, all of which have remained wedded to the particular domain and facet conceptualizations of the NEO model, several measures have been developed from the ground up to reflect the related but maladaptively tinged PSY-5 model ([Harkness & McNulty 1994](#)). Until recently, direct measurement of this model was focused on higher-order scales developed using the item pool of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2; [Butcher et al., 2001](#); [Harkness, McNulty, & Ben-Porath, 1995](#)) and, more recently, its restructured form (MMPI-2-RF; [Ben-Porath & Tellegen, 2008](#); [Harkness et al., 2014](#)). In short, for the past two decades, Harkness and colleagues have argued that the PSY-5 model—composed of traits reflecting negative emotionality/neuroticism and introversion/low positive emotionality, aggressiveness, disconstraint, and psychotism—represents an important review of basic psychological and neurobehavioral systems useful for organizing both clinical data as well as the science underlying these traits ([Harkness, Reynolds, & Lilienfeld, 2014](#)). Interest in these dimensions has grown steadily in recent years. However, reliance on the MMPI tools and the lack of official facet scales³ likely have limited the potential value of these scales, especially in research settings in which the MMPI is not routinely part of test batteries.

To that end, two measures have been developed from the ground up to integrate across multiple models to better represent the maladaptive traits underlying PD. The first of these—the Personality Inventory for *DSM-5* (PID-5; [Krueger, Derringer, Markon, Watson, & Skodol, 2012](#))—was developed as part of the official revision for the *DSM-5*. Deliberations regarding the constructs thought to be central to PD, by members of the Personality and Personality Disorders workgroup and their consultants, led to an initial list of 37 lower-order traits hypothesized to be nested within six higher-order domains. Following data collection, these then were reduced to 25 traits that load on five higher-order domains—Negative Affectivity, Detachment, Antagonism, Disinhibition, and Psychoticism—that strongly resemble the PSY-5 model described above. Notably, the American Psychiatric Association opted against adopting these 25 traits as the basis for official PD classification in *DSM-5*; however, to spur additional research into trait-based alternatives, they included these traits in Section III of the manual, which is focused on “Emerging Measures and Models.” Thus, the PID-5 is a useful measure of maladaptive PD traits to the extent that it directly maps the alternative PD model in *DSM-5*.

Although a relatively new measure, the PID-5 has been the subject of a growing literature examining its construct validity and the Section III PD approach more generally. The measure includes 220 self-report items tapping the 25 lower-order traits (see [Table 16.2](#) for a listing of PID-5 facets, organized by domain). PID-5 items are rated on a four-point scale ranging from 0 (*very false or often false*) to 3 (*very true or often true*). [Krueger et al. \(2012\)](#) reported adequate to good internal consistencies based on a U.S. representative sample, *Mdn alpha* = .86; *range* = .72 to .96 across scales. Moreover, accumulating evidence supports the construct validity of the PID-5 as a broad measure of PD-relevant traits ([Anderson et al., 2013](#); [Hopwood et al., 2012, 2013](#); [Wright, Pincus, et al., 2012](#); [Wright, Thomas, et al., 2012](#)). However, some concern has been expressed regarding the adequacy of the measure’s coverage of the full universe of PD-relevant content (e.g., [Simms et al., 2011](#); [Evans & Simms, under review](#)). Moreover, although this goes beyond the psychometric features of the PID-5 per se, others have

questioned the adequacy of the trait-to-PD mappings elaborated in Section III of *DSM-5* (e.g., Yam & Simms, 2014). Nonetheless, the PID-5 represents a promising new measure of maladaptive traits relevant to FFM.

A second measure of PD traits—the Computerized Adaptive Test of Personality Disorder (CAT-PD; see Simms et al., 2011)—was developed concurrently to and independent of the PID-5. The CAT-PD project was funded by the National Institute of Mental Health, with the primary goals of building (1) an integrative measure of maladaptive traits and (2) an efficient measure to assess those traits. Similar to the PID-5, early efforts were focused on explicating the universe of PD-relevant constructs to be considered for the model and measure. These construct development details are described elsewhere (Simms et al., 2011). In brief, literature reviews and consultations with PD experts yielded 59 candidate traits, organized conceptually within a PSY-5 framework. These traits initially were measured by a total of 2,589 items, 1,570 items from the IPIP (Goldberg, 1999; Goldberg et al., 2006) as well as 1,019 new items written to fill construct and severity gaps in the IPIP. Responses to these items were collected in community ($N = 1,268$) and patient samples ($N = 628$). Iterative factor- and content-analytic procedures of these responses resulted in a final set of 33 traits and scales to tap each (see Table 16.2 for a listing of CAT-PD facets, organized by domain), including several potentially important PD-relevant traits not directly tapped by the PID-5 (e.g., self-harm, norm violation, and health anxiety).

In addition, the CAT-PD project resulted in an efficient form of measurement not utilized to date in the FFM literature: computerized adaptive testing (CAT). Rooted in item response theory, CAT permits tests to be individually tailored to individuals such that items selected for administration are based on responses to previous items in the session. That is, the computer algorithm, aided by known item characteristics, attempts to identify maximally informative items for a given person given their estimated trait level. For example, consider a hypothetical CAT to assess anger. On such a test, if a given individual endorses the item “I get into lots of fistfights,” then it likely is safe to assume that he or she also would endorse a less severe anger item such as “I get angry sometimes.” IRT provides a statistical foundation for grading items in terms of their severity and information value. CATs use this information, thereby permitting fewer items to be administered by not presenting items that essentially are irrelevant given what we iteratively learn about an individual’s trait level.

To facilitate CAT, the full CAT-PD scales are long by design—1,366 total items; M scale length = 44 items ($SD = 12$)—of which 188 are administered to any given examinee. In addition, a 216-item static form (CAT-PD-SF) was developed using a combination of statistical and content validity considerations to facilitate quick and standardized assessment across studies. Responses to items are made on a five-point scale ranging from 1 (*very untrue of me*) to 5 (*very true of me*). The static scales demonstrate good internal consistency, Mdn alphas = .83 and .85 in the community and patient samples, respectively. Only recently finalized, studies of the CAT-PD measure’s construct validity now are starting to emerge (e.g., Simms et al., 2011; Wright & Simms, 2014), with others at various stages of the publication pipeline. Nonetheless, the CAT-PD model offers an alternative representation of the PD trait space that should be useful as the literature evaluates the adequacy of the Section III trait model in preparation for future revisions to the official PD nosology.

Unresolved Issues in FFM Assessment

The measures reviewed thus far reflect the diversity found across the FFM and Big Five literatures. However, despite some of the conceptual and structural differences we highlighted across measures, an inescapable conclusion is that there is a reasonable degree of consensus regarding the broad structure of the basic individual differences in personality. That said, several important questions remain in the FFM assessment literature. Here we have elected to discuss several of these. First, what do we know about the unipolarity vs. bipolarity of FFM traits? And how well do existing FFM measures reflect these assumptions regarding polarity? Second, although there is reasonable consensus at the higher-order domain level, how close are we to a consensual lower-order facet structure? Finally, although FFM measures are relatively ubiquitous in the research literature, why have they failed to gain much traction in applied settings?

Trait and Scale Polarity

An interesting argument often made in the FFM assessment literature is that FFM domains and facets are inherently bipolar, meaning that both poles of each trait reflect meaningful but oppositely valenced variation. However, little has been written to describe exactly how scale bipolarity should be operationalized or how to study whether such bipolarity is present in a given scale. In our review of the FFM assessment literature, we attempted to classify extant measures with respect to their purported unipolarity or bipolarity. To that end, Table 16.1 includes a “Conceptual Polarity” column that refers to whether the scales generally are considered (e.g., stated by the

instrument authors) to measure bipolar or unipolar dimensions. However, in many cases what is meant by scale polarity is poorly defined and not thoroughly discussed. This is unfortunate, as polarity may have important implications for understanding constructs (e.g., Russell & Carroll, 1999; Wright & Simms, 2014), their measurement (e.g., Polak, de Rooj, & Heiser, 2012), and their use in applied settings (e.g., Krueger et al., 2011; Samuel, 2011). In this sense, the polarity of a latent dimension, and the extent to which a scale correctly represents this, represents an aspect of construct validity (Cronbach & Meehl, 1955).

At the most basic level, a dimension's polarity depends upon whether both ends of the continuum can be meaningfully defined and labeled. As such, a unipolar dimension would have one end representing the presence, or extremity, of a construct and another end representing the absence (i.e., low-level, or "zero") of the same construct. This is most apparent in measures that focus on pathological personality (Harkness et al., 2014; Krueger et al., 2012; Simms et al., 2011). In contrast, a bipolar dimension would involve two separate, but quantitatively linked constructs, with the poles representing the extreme presence of one construct and the middle of the scale representing the absence of either construct. For instance, as described above, the FFMRF uses response options that imply the extreme presence of a construct on each end (i.e., extremely high vs. low) and "Neither high nor low" in the middle (Lynam & Widiger, 2001). This basic definition provides a useful starting point for discussing polarity.

Going beyond a general definition of polarity, more explicit definitions can be examined that have implications for what evidence may be brought to bear upon the polarity of a dimension. One possible definition of polarity is that latent dimensions assessed by scales with positively and negatively keyed items (or lower-order scales that together represent a higher-order domain) are bipolar, and those with items keyed in one direction are unipolar. Thus, evidence for a bipolar dimension would be that it is measured by a scale with items correlated both positively and negatively with the scale total score. Many of the measures in Table 16.1 would be bipolar by this standard. However, such a view of bipolarity does not specify the constructs at either end of the dimension, requires inappropriate assumptions regarding item keying (e.g., disagreeing with an extreme low item implies agreement with an extreme high item; Spector, Van Katwyk, Brannick, & Chen, 1997), and does not necessarily lead to adequate measurement of the middle range of a bipolar dimension (i.e., absence of construct; Chernyshenko, Stark, Drasgow, & Roberts, 2007).

A more rigorous definition of bipolarity would be that both poles of an underlying trait dimension are theoretically definable, such that a nomological net can be established around each. In this definition, evidence involves examining the external correlates of a scale. For a pole to represent a meaningful construct, it should relate to the distinct presence of conceptually meaningful thoughts, feelings, and behaviors and not just the absence of such features related to the high end of the underlying dimension. For example, one possible manifestation of this definition is that the extremity of a given pole should relate to impairment and the absence of this extreme is adaptive; thus, bipolar dimensions would include extreme poles and also would include adaptively high and low variation in the middle range. Such a definition is relevant to a number of measures in Table 16.1 (Lynam & Widiger, 2001; Mullins-Sweatt et al., 2010; Trull & Widiger, 1997; Widiger & Spitzer, 2002) that emphasize maladaptivity (i.e., impairment) existing at both high and low levels of a trait, although not at moderate levels.

Despite the implied and/or explicit claims regarding the polarity of many FFM scales, such polarity claims generally go untested. To that end, research aiming to understand the polarity of FFM traits and measures is sorely needed. Creative research designs may be needed for this task. One approach would be to study whether the opposite poles of purportedly bipolar measures line up empirically as single dimensions. For example, consider the bipolar items/facets of the FFMRF described above. Recall that FFMRF items are composed of several adjectives reflecting opposite poles of a given FFM facet. As such, each item could be split into two separate items, each one reflecting the high and low ends of the dimension (e.g., for the warmth facet, the high and low items would be "cordial, affectionate, attached" and "cold, aloof, indifferent," respectively). This approach would lead to a 60-item measure composed of three-adjective clusters that measure the high and low poles of each facet. Correlational and structural analyses then could be conducted to determine the extent to which the poles line up as single scales (or organized accurately within domains) as would be predicted from the structure of the original measure. In addition, the external correlates of each pole could be examined independently to support construct validity (e.g., are opposite poles associated with psychosocial impairment to the same or different extent). Finally, more sophisticated psychometric models (e.g., dominance or ideal-point item response theory models) may serve as useful tools in the determination of a given scale's polarity or, perhaps more effectively, in the development of scales built from the ground up to be bipolar (e.g., Chernyshenko et al., 2007; Pettersson et al., 2014; Polak et al., 2012; Spector et al., 1997; van Schuur & Kiers, 1994).

Overall, the issues raised in this section suggest that researchers can, and should, consider the polarity of FFM personality traits as an aspect of construct validation. In particular, as multiple definitions of polarity were noted, researchers should indicate how they are defining polarity when they refer to this property of their scales. Doing so will assist other researchers in evaluating their work. Future research in this area has the potential to enrich our understanding of FFM domains and facets, increasing theoretical understanding of relations with external constructs (e.g., impairment), improving measurement scales, and potentially resolving debates in applied contexts (e.g., Krueger et al., 2011; Samuel, 2011).

Alternative FFM Facet Models and Measures

As noted above, [Table 16.2](#) lists the facets associated with several normal-range and maladaptive FFM measures. Although numerous points of convergence can be seen throughout the table (e.g., facets tapping anxiety or fear appear across all listed models in the neuroticism domain), other facets are relatively limited to fewer measures [e.g., the hyperdevotion facet in [Saucier's \(2002\) Big Five Modular Markers](#)] or are inconsistently located and operationalized across measures (e.g., warmth appears in the extraversion domain on the NEO, in the agreeableness domain in the lexical measures, and likely is represented only indirectly in the maladaptive measures). Some scholars have attempted conceptually and empirically to map the facets associated with numerous FFM domains, such as conscientiousness (e.g., [Roberts, Bogg, Walton, Chernyshenko, & Stark, 2004](#)) and openness (e.g., [Connelly, Ones, & Chernyshenko, 2014](#); [DeYoung, Quilty, & Peterson, 2007](#)). Others have developed alternative faceted models and measures of the FFM across all domains simultaneously, at various levels of abstraction. However, consensus remains elusive at the lower-order level of all FFM domains.

Intermediate facet measures. Notably, whereas measures such as the NEO PI-R, AB5C, PID-5, and CAT-PD typically include trait variables at two levels of abstraction—higher-order domains and lower-order facets assumed to reflect the same level of narrowness or generality—it is quite possible, perhaps even likely, that facets exist that vary with respect to their breadth or narrowness. To that end, several measures have been developed following conceptual and empirical work revealing facets at an intermediate level between higher-order domains and lower-order facets. The first of these is the Big Five Questionnaire (BFQ; [Barbaranelli & Caprara, 2002](#); [Caprara et al., 1993](#)), which was created as a rational bifurcation of each FFM domain. The BFQ includes 132 items assessing exactly two facets for each FFM domain: dynamism and dominance for the energy (i.e., extraversion) domain, cooperativeness and politeness for the friendliness (i.e., agreeableness) domain, scrupulousness and perseverance for the conscientiousness domain, emotion control and impulse control for the emotional stability (i.e., neuroticism) domain, and openness to culture and openness to experiences for the openness domain. These subscales were developed conceptually based on a literature review, and their appropriateness for assessing the proper FFM domain was verified through structural analyses. Notably, however, as each factor is composed of only two facets, multiple content subdomains appear to be compacted into a single facet in this instrument. For example, the scrupulousness facet assesses both order and dependability, and emotion control combines items reflecting both anxiety and depression. Moreover, the facets scales' internal consistencies often are lower than would be ideal (all but two of the 10 facet scales have alphas below .80 and four of the scales fall below .70), and the measure has not been widely studied (see [Table 16.1](#)).

[DeYoung et al. \(2007\)](#) also identified two intermediate facets within each of the FFM domains—labeled *aspects* by the authors—that are operationalized using the Big Five Aspect Scales (BFAS). The BFAS model was the product of structural studies of NEO and AB5C facets in the Eugene-Springfield data set, and scale development followed the results of those structural analyses. The final BFAS includes 100 items assessing two facets for each FFM domain: withdrawal and volatility for the neuroticism domain, compassion and politeness for the agreeableness domain, industriousness and orderliness for the conscientiousness domain, enthusiasm and assertiveness for the extraversion domain, and intellect and openness for the openness domain. The psychometric characteristics of the BFAS were extensively studied by [DeYoung et al. \(2007\)](#), who reported adequate to strong internal consistencies across aspect scales, good test-retest reliability, strong evidence of convergent and discriminant validity vis-à-vis other FFM measures, and promising connections with genetic FFM factors identified by [Jang et al. \(2002\)](#). Although a promising new measure of FFM facets, work is needed to validate the measure in independent samples and in connection with other faceted measures of the FFM. To that end, a recent structural study using a similar set of measures in the same Eugene-Springfield sample reported evidence for a more differentiated facet structure within each domain ([Naragon-Gainey & Watson, 2014](#)). Moreover, the utility of an intermediate level of facet extraction embodied by both the BFAS and BFQ remains unclear.

A fully faceted FFM alternative. As noted above, among the concerns raised regarding the NEO version of the FFM is that the particular facets included reflect a more rational/conceptual than empirical sampling of the facets

underlying each broad domain. Moreover, inconsistencies abound among the questionnaire-based and lexically-based measures of the FFM. To that end, the Faceted Inventory of the Five Factor Model (FI-FFM; [E. Simms, 2009](#)) was developed following an extensive literature review and data collection. The resulting measure includes 247 items assessing 26 lower-order traits organized within an FFM framework.⁴ Items are rated on a five-point scale ranging from *strongly disagree* to *strongly agree*. Final scale and item selection decisions were driven by factor analysis.

The FI-FFM includes five neuroticism facets (anxiety, depression, anger proneness, somatic complaints, and envy), five extraversion facets (positive temperament, sociability, ascendance, venturesomeness, and frankness), four agreeableness facets (empathy, trust vs. cynicism, straightforwardness vs. manipulativeness, and modesty), five conscientiousness facets (self-discipline, dutifulness, deliberation vs. impulsivity, achievement striving, and order), and three openness facets (intellectance, novel experience seeking, and nontraditionalism). Comparisons between these facets and those of other prominent FFM measures appear in [Table 16.2](#). In addition, the FI-FFM includes four interstitial scales that do not cleanly fit within any single FFM domain: dependency, emotional resonance, unusual experiences, and eccentric beliefs. [E. Simms \(2009\)](#) reported extensive evidence supporting the FI-FFM scales, including internal consistency, test-retest reliability, self-other agreement, convergent and discriminant validity vis-à-vis other measures of the FFM, and prediction of conceptually matched behaviors.

Taken together with the other faceted measures described in [Table 16.2](#) and elsewhere in this chapter, consensus regarding the nature and number of facets underlying the FFM remains elusive. Although some developments point to the emergence of some consensus in the field (e.g., the marked similarities across the maladaptive PID-5 and CAT-PD facets) much work remains in this regard. Notably, much of the facet work has been conducted at the level of the full FFM, often in the service of building measures. Given the large number of possible facets underlying the FFM (e.g., [Goldberg, 1990](#); [Widiger & Simonsen, 2005](#)), tackling this issue simultaneously across all FFM domains likely is too ambitious a task. Rather, the more profitable way forward likely is to study the lower-order structure of each domain individually and to reach consensus conceptually or meta-analytically across such domain-specific studies. As noted above, work such as this has begun in certain domains (e.g., [Connelly et al., 2014](#); [Roberts et al., 2004](#)), but much more is needed.

Clinical Utility

As noted above, an interesting duality exists for FFM assessment. Whereas the FFM and its measurement are hot topics in the research literature (see the citation counts listed in [Table 16.1](#)), the model's research traction has not translated into routine use of the model in applied contexts (e.g., clinical or industrial-organizational). For example, across surveys of assessment practices of practicing psychologists, even the NEO (i.e., the most widely known and used measure of the FFM) is not listed among the measures commonly used in clinical practice (e.g., [Peterson et al., 2014](#); [Piotrowski, 1999](#); [Smith et al., 2010](#); [Watkins et al., 1995](#)). The disconnect between measures used in clinical practice and those suggested by the modern empirical literature is notable, but the reasons for this gap are unclear. One possibility is inertia among psychologists who traditionally have been trained in the use of assessment methods rooted in the pre-FFM days, such as the MMPI, Rorschach Inkblot methods, Thematic Apperception Test, and various sentence completion tasks. Despite the roots of such measures in antiquated models of personality and psychopathology (and in some cases questionable construct validity and psychometric characteristics), it is likely that they enjoy favor among clinicians because these were the measures covered in their graduate school assessment training. To that end, exposing budding clinical psychologists to the potential applied benefits of the FFM is one possible way to close the usage gap.

Another possibility worth exploring is that existing FFM measures may not be amenable to the needs of practicing clinicians, who often desire measures that include methods for detecting unreliable or invalid response patterns (i.e., validity scales). However, across the measures described in this chapter, relatively few include methods to gauge test-takers' engagement in or approach toward the test. Notably, the NEO measures, which are the most widely studied and marketed of the FFM measures, do not include any official, dedicated scales to detect potentially problematic aspects of response distortion.⁵ And for the most part, the few FFM measures that do include such methods do so in a very limited way. For example, the BFQ includes a single "Lie" scale designed to detect positive impression management. In contrast, no established scales of the FFM include validity scales designed to detect a full range of possible response distortions. The MMPI-2 and MMPI-2-RF, in contrast, include a broad range of validity scales designed to detect inconsistent responding, acquiescence vs. denial, malingering, and impression management. The only FFM measure listed in [Table 16.1](#) to include a reasonably broad set of response distortions is the nascent CAT-PD measure—which includes optional scales to detect inconsistent

responding, positive impression management, and possible malingering—but these are new and relatively untested.

A final possible reason for the disconnect between research and applied use of the FFM is that clinical users may not readily see the connection between FFM constructs and the more idiosyncratic (and perhaps idiographic) constructs that their clients bring into the consulting room. Although studies show that clinicians favor the FFM approach when its features and advantages compared to other methods are described directly to them (e.g., [Lowe & Widiger, 2009](#); [Mullins-Sweatt & Widiger, 2011](#)), the usage gap has not been narrowed appreciably. The MMPI measures, again, provide a useful point of comparison here. Although it can be argued that these measures are based, at least partially, on antiquated notions of personality and psychopathology—and also include many scales with questionable psychometric characteristics—their continued popularity among clinicians cannot be ignored. Aside from the inertia explanation described above, it also is likely that clinicians favor the MMPI (and similar measures) because substantial didactic materials (e.g., test interpretation texts, computerized interpretations, workshops geared toward clinicians rather than researchers, etc.) have been developed to aide clinicians in translating test results into clinically useful case conceptualizations, treatment plans, and estimates of prognosis. Although the NEO PI-R's publisher, Psychological Assessment Resources, offers some such materials, they pale in comparison to the rich clinical materials offered in support of the MMPI and other popular clinical measures. Thus, if the FFM is to become the basis for applied practice, much more work will be needed from FFM measure authors to translate the mounds of supporting evidence into measures and materials that are maximally useful for applied users.

Concluding Remarks

As should be clear from this review, there is no shortage of measures designed to assess the FFM and related models. These measures share much in common, but also vary considerably in their origins, structure, length, literature support, and psychometric features. There is strong support for the FFM as a consensus structure to represent the broad individual differences in personality. Across the questionnaire, lexical, and maladaptive trait traditions, four traits in particular—neuroticism/negative emotionality vs. emotional stability, extraversion/positive emotionality vs. detachment, agreeableness vs. antagonism, disinhibition vs. constraint/conscientiousness—appear to reflect a core of broad traits upon which there is significant agreement. The fifth trait enjoys less consensus. Lexical work has focused on some combination of intellect, openness, creativity, and unconventionality as reflecting the fifth broad factor. The NEO-FFM literature has focused more squarely on open to experience as the core of the fifth factor. Finally, oddity/psychoticism is the fifth broad domain in maladaptive models and measures. Work evaluating the extent to which these different operational definitions of the fifth factor reflect the same or different constructs has revealed mixed evidence, especially for the relation between oddity and openness (e.g., [Chmielewski, Bagby, Markon, Ring, & Ryder, 2014](#); [Piedmont et al., 2009](#); [Samuel & Widiger, 2008](#); [Watson, Clark, & Chmielewski, 2008](#)). Moreover, studies of more inclusive sets of person descriptors have revealed the possibility that additional meaningful factors exist outside of the FFM (e.g., [Ashton et al., 2004](#); [Simms, 2007](#)).

Regardless of these debates around the edges of the FFM literature, this review demonstrates that the FFM is a vibrant, important organizing model of personality and that many options exist for assessing the FFM in both research and applied contexts. Increasing the clinical utility of and elaborating a consensus facet structure of the FFM are the most important targets for future work.

Notes

1. Ericka Nus formerly was Ericka Simms.
2. Although we elsewhere subsume models and measures of different origin under the “FFM” umbrella term, in this section we use “Big Five” as appropriate since that is the term most commonly used by lexical personality theorists.
3. Notably, attempts at post-hoc PSY-5 facet scales have appeared in the literature (e.g., [Bolinsky, Arnau, Archer, & Handel, 2004](#)), but these have been limited psychometrically, likely due to limitations with the MMPI-2 item pool ([Quilty & Bagby, 2007](#)).
4. Note that only 22 of 26 scales were deemed to be clean indicators of single FFM domains (i.e., some scales appear interstitial in nature).
5. Notably, experimental validity scales have been built from the NEO item pool ([Schinka, Kinder, & Kremer, 1997](#)), but these have not gathered much research support and are not included in the official scoring materials for the measure.

The Five Factor Model of Personality in Business and Industry

Scott E. Seibert and David S. DeGeest

Abstract

Personality traits have played a central role in industrial/organizational psychology, human resource management, and organizational behavior, the key fields in the application of psychology to business and industry. In the early years, excessive optimism led scholars to unrealistic expectations about the value of personality traits at work. This was followed by a period of profound pessimism regarding the value of personality as an explanatory variable when the unrealistic expectations were inevitably disappointed. More recently, advances in theory and methodology have led scholars to re-examine the role of personality with more realistic expectations. The Five Factor Model (FFM) has predominated as an integrative personality structure for conceptualizing and researching the relationship of personality to workplace outcomes. Five specific domains of research are considered herein: personnel selection; employee motivation, attitudes, and behavior; leadership; teams; and entrepreneurship. The chapter ends with open questions for future research in this domain.

Key Words: personality traits, Five Factor Model, industry, organizational behavior, human resources, personnel selection, leadership, teams, entrepreneurship

Individual differences have played a central role in industrial/organizational (I/O) psychology, human resource management, and organizational behavior, the key fields interested in the application of psychology to business and industry. Interest in personality variables has followed a recognizable pattern in each area, even if the initial dates and time frames over which the pattern unfolds vary. In the early years, scholars expected their research to provide an unambiguous personality profile that distinguishes those who will excel at the phenomenon of interest and those who will fail, whether it is job performance, leadership, entrepreneurship, or any other outcome. Pessimism regarding the value of personality as explanatory variables sets in when these unrealistic expectations are inevitably not fulfilled, leading to the neglect of personality variables as researchers move on to seemingly more promising theories and approaches.

Finally, some scholars return to reexamine the role of personality in the phenomenon of interest with realistic expectations, tempered perhaps by modest results from other research avenues, indicating that personality traits are a factor that contribute to effective functioning without providing a complete account of the phenomenon.

Several critical developments have encouraged the resurgence of interest in the study of individual differences, and more specifically personality, in workplace behavior and phenomena. First, personality psychologists verified the development of the Five Factor Model (FFM) of personality ([Costa & McCrae, 1992](#)). These developments will by now be familiar to readers of this text, so we will spend little time recounting them here. Second, scholars developed sophisticated methods of statistical analysis, such as meta-analysis ([Hunter & Schmidt, 2004](#)) and structural equation modeling ([Anderson & Gerbing, 1988](#)), that allow us to draw more accurate conclusions regarding the effects of variables, including personality variables. Often it is not the magnitude of the observed effect that has changed over time, but the consistency or reliability with which we can speak about the results with these new techniques. Third, empirical findings regarding within-person stability over long periods of time and multiple settings renewed theoretical interest in individual differences, rather than contextual variables as explanatory constructs ([Arvey, Bouchard, Segal, & Abraham, 1989](#); [Barrick & Mount, 1991](#); [Scarr, Webber, Weinberg, & Wittig, 1981](#); [Staw & Ross, 1985](#)). This paved the way for more rigorous investigations of how personality might influence workplace outcomes that continue today.

As this brief review suggests, developments in social and personality psychology have been a critical driver of developments in the role of personality in business and industry. The fields of industrial/organizational (I/O) psychology, organizational behavior (OB), and human resource management (HR) are rooted in the source disciplines of psychology (among others), and therefore it is not surprising that they have closely followed these developments. Five specific domains of research within the IO/OB/HR field have been most concerned with personality effects: personnel selection; employee motivation, attitudes, and behavior; leadership; teams; and entrepreneurship and careers. In the sections below, we provide a narrative review of trends and findings related to personality

research in each domain, then evaluate and develop critical questions that remain for future personality research in the IO/OB/HR domains.

Personnel Selection/Job Performance

Personnel selection is the process used to recruit, select, and hire individuals who have the knowledge, skills, and abilities and other characteristics to perform the jobs in which they are placed successfully ([Hough & Oswald, 2000](#)). The identification of factors that predict the likely job performance of the individual is the core of a personnel selection system. Selection tools typically include ability tests (e.g., cognitive, physical, and psychomotor), knowledge tests, structured interviews, biographical data, work samples, and personality tests ([Rynes, Brown, & Colbert, 2002](#)). There is a robust literature on the relationship between personality and job performance, and the utility of personality as a selection tool in industry has often been contested. Three significant phases can be identified in the evaluation of personality in selection contexts. The first phase ranges from the beginnings of modern psychology in the early 1900s, when a great deal of optimism for personality as a selection tool was first manifest, to the mid-1980s, when pessimism prevailed. The second phase, ranging from the mid-1980s to the late 2000s, saw a resurgence of interest in personality in no small part due to the development of the Big Five Model of personality and its application to the selection context. The third phase, beginning roughly in the new century and continuing to this day, involves a return to the critiques of the earlier era and the modern responses these critiques have engendered. Although there is little doubt now in the literature that personality, and in particular, conscientiousness, has a demonstrable, generalized, positive relationship with job performance (see also the chapter by [Jackson and Roberts](#), this volume), many questions still remain, and the influence of personality on work behaviors and job performance remains a robust area of research and debate.

One of the earliest and most persistent applications of differential psychology in industry was to problems of personnel selection and placement. These issues arose in relation to the needs of the Army to select and place soldiers during World War I ([Landy, 1997](#)), but the scale of the selection and placement problem only grew as veterans returned from World War II. Although the original focus was on mental measurements or

intelligence, by the 1950s personality testing for selection was a widespread practice in industry (Spiegel & Dale, 1953), reflecting a growing interest not only in individual ability (what the individual “can do”), but in individual motivation as well (what the individual “will do”) (Guion & Gottier, 1965). The first phase of the research literature on personality therefore focused on the need to identify valid personality instruments that could be used to predict employee performance. Typically, studies were conducted that estimated the relationship among individual scales from a number of different personality inventories and various dimensions and operationalizations of job performance (Barrick, Mount, & Judge, 2001). However, after years of hopeful searching, researchers drew the general conclusion that personality had little relationship to job performance. A narrative review of the literature by Guion and Gottier (1965) had a major impact on the direction of the field. Finding that only 12% of the studies they reviewed yielded a prediction of performance significantly different from zero, they concluded that no generalizable evidence existed to suggest that personality inventories could be used as good or practical tools for selection purposes. The reasons for this pessimistic conclusion arose from a number of factors, including poor research design in the primary studies, issues with construct deficiency and contamination in the measurement of personality traits, the lack of clear theoretical logic linking traits to performance or a general theory of work performance, little emphasis on replication, the lack of an organizing paradigm that might reveal consistent relationships of personality traits to performance, and the lack of a psychometrically sound way to quantitatively summarize the results of primary studies. These problems made it difficult to identify relationships and advance our understanding of the relationship between personality and work behavior. This conclusion led to a more widespread assumption in the I/O scholarly community that personality had little to do with workplace behavior and future research should focus on other types of selection tools.

Two major developments in the mid-1980s rose to challenge this assumption and opened new possibilities for research on personality in the work domain. The first development was the scholarly consensus that formed around the Five Factor Model (FFM) of personality as a useful way to organize the plethora of personality scales and inventories within a relatively parsimonious set of constructs (Costa & McCrae, 1980; Digman, 1990; McCrae & Costa, 1987). While debate continued over the lower-

order factors that should be included in such a higher-order model (Goldberg, 1993), research has consistently identified extraversion, agreeableness, conscientiousness, neuroticism, and openness as five key personality constructs under which we can organize the wide variety of lower-level facet measures. Most research in the OB/HR domain today uses measures of personality that either explicitly measure one of these higher-order constructs directly or uses the FFM framework to categorize scales (Barrick et al., 2001). The second major development was the widespread acceptance and use of psychometric meta-analytic techniques, which allowed researchers to address the relationship between personality and job performance in a way that no primary study could: by estimating the personality–performance relationship and account for both sampling error and statistical and measurement artifacts that biased correlations downward (DeGeest & Schmidt, 2010; Hunter & Schmidt, 2004). By combining the advances in statistical analysis with the development of the FFM, both Barrick and Mount (1991) and Tett, Jackson, and Rothstein (1991) were able to make significant strides in challenging the long-held assumption that personality had little to do with workplace behavior, reinvigorating research on personality in the field of organizational psychology.

Perhaps the two most significant studies of this time period were Barrick and Mount's (1991) meta-analysis, which showed that conscientiousness had a generalized, positive relationship to job performance, and the meta-analysis of Tett et al. (1991), which produced similar results. During the period from 1990 to 2006, 16 meta-analytic studies of the relationship between personality and job performance were conducted (Rothstein & Goffin, 2006), all of which used the FFM to organize studies and the personality traits. Barrick et al. (2001) conducted a second-order analysis of 11 unique meta-analyses and confirmed that personality, and in particular the conscientiousness trait, is significantly related to job performance with a corrected multiple correlation as high as .30. In addition, other meta-analyses showed that personality had relationships to other important job-related workplace behavior such as citizenship behaviors (LePine, Erez, & Johnson, 2002), counterproductive work behaviors (Berry, Ones, & Sackett, 2007; Salgado, 2002), and job performance in other non-U.S. contexts (Salgado, 1997). Finally, other studies showed that the validity of personality traits in different occupational contexts may change; for example, Mount, Barrick, and Stewart (1998) demonstrated that the meta-

analytic relationships of extraversion and agreeableness with job performance were relatively strong in service-oriented occupations but weaker in others. Finally, research on integrity, a compound personality trait consisting of conscientiousness, agreeableness, and emotional stability, showed considerable predictive validity for both job performance and counterproductive behaviors (Ones, Viswesvaran, & Schmidt, 1993, 2003). In general, meta-analyses during this time generally demonstrated a consistent if somewhat modest relationship between personality and job performance.

Although these meta-analytic reports generally show support for personality as a predictor of job performance, the results of both Barrick and Mount (1991) and Tett et al. (1991) showed substantial variability according to type of personality measure, occupational category, and validation strategies used. Therefore, during this period a number of primary studies were conducted that focused on identifying occupational and environmental characteristics that increase the validity of personality traits as a predictor of performance. For example, Hogan and Holland (2003) noted that extraversion, a trait associated with assertiveness, sociality, and gregariousness, was an important predictor of performance in jobs in which “getting ahead” of others was an important outcome of the job. Barrick et al. (2001) found that extraversion predicted job performance in sales ($\rho = .15$) and management jobs ($\rho = .18$). Similarly, in jobs in which working on a team is a significant component of performance, agreeableness has a positive relationship with performance (Bell, 2007; Mount et al., 1998; Peeters, Van Tuijl, Rutte, & Reymen, 2006). Limited evidence also supports the idea that when job performance requires you to learn new information or skills, openness can be a positive predictor of performance (LePine, Colquitt, & Erez, 2000; Pulakos et al., 2002).

Other primary studies in this era focused on addressing limitations in personality testing in high-stakes testing situations. These include laboratory and field studies that have investigated the role of faking in personality tests (Barrick & Mount, 1996; Ellingson, Sackett, & Connelly, 2007; Hogan, Barrett, & Hogan, 2007; Ones, Dilchert, Viswesvaran, & Judge, 2007; Schmitt & Oswald, 2006). These studies have generally shown that although impression management does not appear to have an effect on the predictive validity of personality tests, individuals in laboratory settings can clearly alter their scores to “fake good” on conventional self-report

personality inventories (Griffith & Peterson, 2006). Other studies investigated the degree to which social desirability may influence the predictive validity of the FFM traits (Tett et al., 2006; Viswesvaran, Ones, & Hough, 2001). A handful of studies also investigated the use of observer ratings of personality (e.g., Mount, Barrick, & Strauss, 1994). Overall, the studies during this period suggested that the relationship between personality and performance was contingent on a number of factors, but generally played a role in job performance and other workplace behaviors affecting the functioning of the organization.

A third phase in the research on the utility of personality in selection contexts began as a result of a series of critical papers published in *Personnel Psychology* over the past decade. Although the critical perspective questions the value of personality as a selection tool, these scholars rely on the FFM framework in making their critique, recognizing the FFM as the dominant paradigm for personality research in organizational psychology. For example, Morgeson et al. (2007a, 2007b) reviewed the meta-analytic and primary literature from the 1990s through 2006 using the FFM framework to draw conclusions regarding the relationship of personality to job performance. However, unlike previous scholars, they came to several relatively pessimistic conclusions regarding the use of self-report personality testing in selection contexts, which can be summarized around three points. First, the critique notes that the uncorrected validities of personality traits tended to be quite low and have not improved over time, with the uncorrected correlations ranging from .03 to .15 (Hurtz & Donovan, 2000). Rather, corrections for measurement error and other statistical artifacts have grown larger, causing corrected validities to increase to as high as .31 (Barrick et al., 2001). Morgeson et al. (2007b) note that when organizations use personality tests, they must use observed scores, not corrected scores, so corrections for lack of reliability in the personality variables are not appropriate. A fair consensus has emerged in the literature that corrections for unreliability in the dependent variable and corrections for range restriction when data are available indicating that such restriction has occurred are appropriate, rendering what is referred to as operational validity—the validity of the instrument as used in the practical context of selection. Following Barrick and Mount (1991), many meta-analyses have made corrections for construct invalidity—imperfect correlation between the lower order traits used in the primary studies and

the global FFM traits. A cleaner design, without the necessity of estimates, would examine the validity for direct measures of the FFM traits alone. [Hurtz and Donovan \(2000\)](#) conducted a meta-analysis using only direct measures of the FFM constructs and the corrections for sampling error, range restriction, and criterion reliability. They reported operational validities ranging from .06 to .20, with conscientiousness ($\rho = .20$) the strongest predictor and emotional stability ($\rho = .13$) also producing a small but reliable result. Note that there is little disagreement in the literature regarding the size of the personality effect ([Barrick et al., 2001](#); [Hurtz & Donovan, 2000](#)). Rather, the disagreement centers on whether effects of this size have practical utility in selection contexts.

A second critique raised by Morgeson et al. ([2007a, 2007b](#)) is that individuals clearly have the ability to fake (i.e., artificially inflate) their scores on self-report personality inventories. Although the effects of social desirability have long been a concern in the personality domain, intentional faking of responses may be much more likely and more problematic in high-stakes situations, such as applying for a job. However, the authors of the critique, chosen because of their roles as journal editors, did not come to a consensus on the degree to which faking is problematic in such high-stakes situations. The review also noted that although faking may not change the operational validity of the measures, it may change other characteristics of personality measures, such as the intercorrelations among the traits.

The third problem with the use of personality measures in selection contexts, including direct measures of the FFM, is that applicants tend to have negative reactions to personality tests ([Jayne & Rauschenberger, 2000](#)). This effect may occur due to low face validity and questionable content validity of some commercially available self-report personality measures. Because negative applicant reactions can drive away the very applicants an organization wishes to attract, the utility of personality scales in practice may be less than implied even by operational validity coefficients. Based on these considerations, these authors recommended using selection tools with at least as much validity but associated with less negative applicant reactions, such as cognitive tests, work samples, and assessments of past performance ([Rynes, Colbert, & Brown, 2002](#)). Fourth and finally, future research on personality in selection contexts should focus either on criteria that are more strongly related to personality (e.g., job

attitudes, leadership, counterproductive work behaviors, contextual performance) or develop alternative ways to operationalize personality constructs aside from self-report personality measures. The result of this somewhat pessimistic review of the value of personality testing in selection settings has changed the subsequent focus of research on personality to address the concerns raised in this review and critique.

Since the publications of Morgeson et al. (2007a, 2007b), a number of researchers have crafted responses to move the literature on personality in the workplace forward. For example, one of the recommendations to come out of the review and the discussion in Morgeson et al. (2007a, 2007b) concerned different operationalizations of personality, including observer ratings of the FFM traits. Oh, Wang, and Mount (2011) completed work on a meta-analysis of observer ratings of personality, finding that the predictive validities for observer ratings were significantly higher than those of self-reports and, in addition, showing that observer ratings provide incremental validity over self-reports of personality. In a similar vein, Morgeson et al. (2007a, 2007b) also discussed the use of situation-specific personality inventories. In these types of formats, question stems typically include a phrase such as “at work” to indicate a situation-specific manifestation of personality. A recent meta-analysis (Shaffer & Postlethwaite, 2012) showed that the use of contextualized, situation-specific FFM measures changed the mean validity across all traits from a corrected value of .11 to a corrected value of .24. Conscientiousness still had the largest effect, showing a corrected correlation of .30 with performance as opposed to the .22 of noncontextualized measures. The contextualized measures of emotional stability ($\rho = .27$, contextualized; $\rho = .11$, noncontextualized) and extraversion ($\rho = .25$, contextualized; $\rho = .08$, noncontextualized) also had much higher correlations. Finally, the recommendations of Morgeson et al. (2007a, 2007b) included focusing on domains other than overall measures of job performance, where personality traits may have more influence. Recent meta-analyses have done so, focusing on behaviors such as citizenship behaviors (Chiaburu, Oh, Berry, Li, & Gardner, 2011), adaptive performance (Huang, Ryan, Zabel, & Palmer, 2014), or on situational moderators that influence the relationship between conscientiousness and task performance (Meyer, Dalal, & Bonaccio, 2009). Most recently, Neal, Yeo, Koy, and Xiao (2012) demonstrated that although conscientiousness has relatively consistent effects on task, adaptive and proactive job

performance, characteristics such as openness and agreeableness have differential and sometimes countervailing effects on these different dimensions of performance. For example, in this study, openness had positive effects on proactivity ($\beta = .14$) whereas agreeableness had negative effects ($\beta = -.13$).

Although situation-specific and observer ratings show potential, they also raise questions about practicality. For example, it remains unclear how an organization would acquire a large number of observer ratings of applicant personality or workplace-based personality since job applicants would not be working in the organization at the time they apply. Such ratings might be used internally within an organization for the purpose of promotion decisions, but in this case it is unclear why an organization would rely on observer ratings of personality when supervisor and peer ratings of the employees' actual performance are available, are likely to have higher validities (Rynes et al., 2000), and are likely to generate less negative applicant reactions.

Other research responding to the critique has focused on the way the effects of personality on performance may change over time. For example, [Lievens, Ones, and Dilchert \(2009\)](#) showed that the relationship between conscientiousness and job performance for medical students changed over time, generally increasing as the students' responsibilities shifted from learning new knowledge to managing interpersonal relationships with co-workers and managing the care of patients. Similarly, a study conducted by [Thoresen, Bradley, Bliese, and Thoresen \(2004\)](#) showed in two samples of sales managers that although only conscientiousness and extraversion were associated with between-person differences in overall sales, both conscientiousness and other personality traits were associated with growth in sales over time. Future research can investigate the degree to which personality may be associated not simply with overall levels in performance, but with changes in performance trajectories over time. Organizations may care about these issues because time to proficiency in a position or increases in proficiency over time can matter to the overall productivity of an individual ([Levin & Stephan, 1991](#); [Zyphur, Chaturvedi, & Arvey, 2008](#)).

In conclusion, the FFM has made major contributions to the field of personnel selection and job performance. It has become the dominant personality framework for personnel selection ([Hurtz & Donovan, 2000](#)).

As an organizing framework, the FFM has made it possible to cumulate and communicate consistent conclusions from the literature regarding the validity of the personality traits as predictors of job performance and has changed previous conclusions in the field regarding the utility of traits for personnel selection. The most important substantive conclusion is that conscientiousness is the best predictor of what an employee “will do” at work in terms of job performance. At the same time, controversies remain regarding the utility of personality as a personnel selection tool for organizations. But even here, the FFM has framed the debate. Further investigation into when, how, and why personality influences work behavior remains a continued area of research.

Employee Job Attitudes, Motivation, and Behavior

Although the literature on personality and job performance is focused on the use of personality constructs for personnel selection purposes, there is also a significant literature on the relationship between personality and job attitudes and other work-related motivational states and behaviors. This literature is focused on a theoretical understanding of the behavior of employees at work and on explaining the way personality influences employee behavior, with the ultimate goal of managing employees to achieve organizational and personal goals. Again, the FFM plays an important role in providing a framework for theorizing as well as organizing and communicating accumulating results. The literature on the FFM and job attitudes has primarily focused on three principal areas: job satisfaction, organizational commitment, and work-related motivation. Typically, theoretical models link personality to a job attitude, which is in turn linked to behavioral intentions, which are then in turn linked to workplace behaviors such as performance or turnover. In these models, theoretical perspectives such as the theory of the planned behavior ([Ajzen, 1991](#)) often provide a theoretical framework, although new theories have begun to emerge.

The earliest research on the relationship between personality and job attitudes suggested there was at least a modest dispositional component to job attitudes (e.g., [Hoppock, 1935](#)). However, following the trends in the literature on personality and performance, research on the relationship between personality and job attitudes waned in the 1970s and 1980s. The

sources of job attitudes such as work satisfaction, organizational commitment, and work motivation were sought in aspects of an individuals' environment, such as the design of the job, the supervisor, the organizational climate, or the compensation, training, and other policies of the organization (Judge & Kammeyer-Mueller, 2012b).

But, again, following trends in the research on job performance, research on the relationship between personality and job attitudes experienced a resurgence following seminal studies by Staw and colleagues as well as Arvey and colleagues. Using archival data sources, Staw and Ross (1985) were able to follow employees' attitudes over the span of their working life. Their results showed that measures of job satisfactions were relatively stable over time, even after individuals changed employers and/or occupations. Staw, Bell, and Clausen (1986) went further in this respect and demonstrated that affective disposition measured in adolescence correlated relatively strongly ($r = .34$; $p < .05$) with job satisfaction assessed at ages 54–62 years. Arvey et al. (1989) provided further evidence for a nonenvironmental explanation of job attitudes by showing that there was a significant correlation between job satisfaction among monozygotic twins reared apart from early childhood. These studies helped to create an impetus to determine specific dispositional factors that influence job satisfaction and other work-related attitudes at a time when the research literature eschewed or otherwise discounted dispositional explanations of work-related behaviors and attitudes (Judge & Kammeyer-Mueller, 2012a).

Since then, a number of studies have used the FFM framework to investigate the relationship between personality and job satisfaction (Judge, Heller, & Mount, 2002; Ng, Eby, Sorensen, & Feldman, 2005). Meta-analytic results show that conscientiousness ($\rho = .26$), extraversion ($\rho = .25$), and emotional stability ($\rho = .29$) tend to have the strongest relationships with job satisfaction (Judge, Heller, et al., 2002). One study even showed that these traits assessed in adolescence (age 12–14 years) predicted adult job satisfaction (Judge, Higgins, Thoresen, & Barrick, 1999). Given that job satisfaction also has a relatively strong relationship with individual task performance (Judge, Thoresen, Bono, & Patton, 2001), some researchers argue that part of the relationship between personality and performance is driven through the effect of personality on job satisfaction (Barrick & Mount, 2012). Mount, Ilies, and Johnson (2006) showed that satisfaction mediated the relationship between different FFM dimensions

and counterproductive work behaviors. Similarly, [Zimmerman \(2008\)](#) showed that job satisfaction mediated the relationship between FFM dimensions and turnover. Overall, results suggest that the FFM traits, particularly conscientiousness, extraversion, and emotional stability, have positive, significant relationships with job satisfaction, and that satisfaction may be an attitudinal mechanism through which FFM traits influence workplace behavior.

Research has also investigated the relationship between FFM traits and organizational commitment. Organizational commitment generally refers to an individual's personal involvement with his or her employing organization, a feeling of obligation toward the organization, and the perceived costs associated with leaving that organization ([Mathieu & Zajac, 1990](#)). Current meta-analytic evidence suggests that conscientiousness ($\rho = .32$) and emotional stability ($\rho = .30$) have significant relationships with organizational commitment ([Choi, Oh, & Colbert, 2015](#)).

In addition to the literature on attitudes, meta-analytic research has also investigated the degree to which the FFM is related to work-related motivation. For example, [Judge and Ilies \(2002\)](#) conducted a meta-analysis to investigate the relationships of the FFM traits to constructs tied to three central theories of motivation—expectancy theory, goal-setting theory, and self-efficacy motivation. Results from this study showed that conscientiousness and emotional stability had consistent, generalizable relationships with all three motivational constructs. Extraversion also had consistent relationships, but the magnitude of the effects were weaker. These results indicate that being conscientious, emotionally stable, and extraverted is linked to the motivational tendencies to create rewards for yourself, set goals at work, and believe that you can complete your work effectively. These results are important because they show that conscientiousness and emotional stability and, to a lesser extent, extraversion, may be linked to job performance via their effects on work-related motivation. Additionally, this research addresses one of the key limitations often discussed in the literature on the personality–performance relationship: the lack of a theoretical framework linking personality to work-related behaviors ([Kanfer & Heggestad, 1997](#)). Other meta-analytic studies have shown that the FFM traits are related to work-related motivational states such as engagement and burnout ([Christian, Garza, & Slaughter, 2011](#); [Swider & Zimmerman, 2010](#)). In addition to meta-analytic

evidence, primary studies have also suggested that the FFM traits are related to proximal motivational characteristics that could link traits, especially conscientiousness and emotional stability, to performance. For example, Mount and Barrick (1995) show that conscientiousness is positively correlated with effort exerted at work. Similarly, Barrick, Mount, and Strauss (1993) show that conscientiousness is also related to the amount of time spent on a task.

Current research on the relationship between the FFM and work-related attitudes has attempted to bridge gaps across different literature in the OB/HR domain and, more specifically, to address common complaints about the FFM and its apparent lack of a precise theoretical specification. Two recent studies are notable in their attempts to provide a clearer theoretical link between personality traits and work-related motivation. First, the theory of purposeful work behavior (TPWB; Barrick, Mount, & Li, 2013) is a recent theoretical model developed to integrate the FFM traits with both the extensive literature on the job characteristics model and to research on motivational strivings. This article provides a systematic theoretical framework for when and how the FFM personality traits should be expected to relate to proximal work motivation. According to this theory, the FFM personality traits lead individuals to engage in motivational strivings linked to personality traits, which in turn lead individuals to develop proximal motivational states (i.e., self-efficacy, specific goals, expectancy motivation), which in turn lead to work-related behaviors and attitudes (e.g., job performance, satisfaction, citizenship behaviors). A key point of this model stipulates that situational job characteristics can modify the relationship between personality and proximal work motivation via the activation and stimulation of motivational strivings. For example, in the TWPB, extraversion is associated with status strivings, which in turn links to proximal work motivations. However, job characteristics such as the level of power in the position and task significance may alter the relationship between extraversion and subsequent proximal motivations. Although this model currently remains untested, use of its conceptual components is likely to determine future research on the relationship between personality and both work motivation and job attitudes.

In sum, substantial research evidence suggests that the FFM personality traits are linked to both job attitudes and proximal work motivation characteristics. Future research on the relationship between personality and

job attitudes and workplace motivation will likely focus on examining how different situational characteristics magnify or constrain the effects of FFM traits on attitudes and motivation, and how attitudes and motivation serve a theoretical link between FFM traits and work-related behaviors and outcomes.

Leadership

The FFM has also been useful for organizing the large and varied literature on personality and leadership effectiveness. More recently, it has led to theoretical and empirical work linking personality traits with effectiveness through their relationship with leadership behavior. As in other areas, a number of important debates continue to resonate, including issues of predictive validity, the theoretical mechanisms by which personality works, and the appropriate facet level at which to conduct future research. As business scholars have observed, *leadership* is a folk term rather than a technical term and so carries considerable ambiguity as a scientific construct ([Alvesson & Sveningsson, 2003](#); [Janda, 1960](#)). Nevertheless, most definitions of leadership suggest that it is a process of influencing or motivating others to agree about what needs to be done and how to do it, including actions that facilitate individual and collective efforts to accomplish shared objectives and satisfy the needs of important stakeholders (e.g., [Yukl, 2012](#)).

Personal traits and characteristics have been regarded as central to successful leadership at least since the “Great Man” view of history espoused by Thomas Carlyle in the nineteenth century. According to this view, heroic individuals shape history through the exercise of their exceptional personal attributes such as intelligence, wisdom, charisma, or political skill. Based on almost typological notions of greatness heavily influenced by evolutionary theory, the search for the set of enduring traits that distinguishes leaders from those who would not become leaders seemed justified. This perspective inspired hundreds of studies in the 1930s and 1940s designed to identify the individual leader traits associated with the emergence (who becomes the leader of a leaderless group?) or effectiveness (who performs well in the leader role?) of leaders across a wide range of contexts, from school children to military and industry settings. Researchers examined a broad range of characteristics, including

height, intelligence, and verbal fluency, as well as aspects of personality, such as adaptability, extroversion, dominance, initiative, persistence, responsibility, self-confidence, and emotional control (Stogdill, 1948). Enthusiasm for this approach was severely dampened when several influential reviews of the literature (Mann, 1959; Stogdill, 1948, 1974) found only weak and inconsistent relationships between traits and leadership emergence or effectiveness. For example, Mann (1959) reviewed the literature on leadership emergence in small groups and concluded that intelligence, adjustment, extroversion, dominance, masculinity, and interpersonal sensitivity are positively related, whereas conservatism is negatively related, to leadership emergence in small groups. However, he noted that situational conditions altered the relationships and that in no case were correlations higher than .25, with median correlations close to .15 (p. 266). Based on these reviews, prominent scholars over the ensuing years (e.g., House & Aditya, 1997; Landy, 1985; Muchinsky, 1983) regularly reported that traits had little to do with leader emergence or effectiveness, redirecting scholarly attention toward behavioral or situational theories of leadership.

Not until 2002 did the techniques of meta-analysis and the framework of the FFM come together on the topic of personality and leadership in the work of Judge, Bono, Ilies, and Gerhardt (2002). As these authors observed, “one reason for the inconsistent and disappointing results from previous reviews is that, until recently, we have lacked a taxonomic structure for classifying and organizing traits” (p. 766). They used the FFM to organize the multitude of traits studied in the leadership literature into the set of five consistent and coherent dimensions of personality. Judge, Bono, et al. (2002) found four of the Big Five personality dimensions related to leadership, defined as a broad construct including both emergence and effectiveness; extraversion ($\rho = .31$), conscientiousness ($\rho = .28$), neuroticism ($\rho = -.24$), and openness to experience ($\rho = .24$). Only agreeableness was unrelated to overall leadership. Judge, Bono, et al. (2002) also calculated a credibility interval to estimate the variability of individual correlations across a population of studies. Although the four personality dimensions that were related to leadership demonstrated credibility intervals indicating that 90% of the individual correlations would exclude zero, these intervals were nevertheless quite large, suggesting the presence of moderators. Judge, Bono, et al. (2002) did find evidence

suggesting both situational and methodological moderation. For example, the FFM traits predicted student perceptions of leadership better than leadership perceptions in business or government settings. They also predicted leadership emergence more strongly than leadership effectiveness. The multiple regression coefficient for all five FFM traits was .53 when predicting leadership emergence, but only .39 when predicting leadership effectiveness.

As valuable as the study of Judge, Bono, et al. (2002) was in documenting the role of the FFM traits in leadership, a number of important theoretical and empirical challenges remain unanswered. For example, Judge, Bono, et al. (2002) attempted to address the bandwidth-fidelity dilemma (Cronbach & Gleser, 1965; Ones & Viswesvaran, 1996) by examining the predictive validity of narrow traits relative to the five broad constructs identified by the FFM. Some scholars have argued that narrow traits might better account for variance that is situation specific or better predict narrowly defined outcomes than more broadly defined trait constructs (Hogan & Roberts, 1996; Paunonen, 1998). Judge, Bono, et al. (2002) sought to address this issue, but found what they described as mixed results. In fact, the data available to Judge, Bono, et al. (2002) may not have allowed an accurate comparison of broad versus narrow traits since few primary studies included direct measures of the broad FFM traits. A true examination of the validity of global FFM traits relative to their narrow domain counterparts remains to be conducted.

A second issue that remains unresolved concerns the theoretical process explaining the effect of personality on leadership. Judge, Bono, et al. (2002) provided behavioral, rather than attributional explanations linking personality to leader emergence or effectiveness. For example, they argued that extraverted individuals would be more active, energetic, and assertive and that conscientious individuals would show more initiative, persistence, and task competence, leading them to emerge as leaders or be more effective in a leadership role.

Although results were consistent with these explanations, they were in some ways better explained by implicit leadership theory (Lord, DeVader, & Alliger, 1986; Lord, Foti, & Phillips, 1982). This social cognitive perspective argues that lay people hold shared beliefs about the traits and behaviors of leaders that they use as cues to categorize individuals. People who possess characteristics that correspond to these implicit beliefs are

more likely to emerge as a leader in groups and teams, regardless of the extent to which these characteristics actually make someone a better leader. A common example would be height: naive observers might hold an implicit belief that leaders are tall, leading them to respond positively to the ideas and influence attempts of the tallest person in the group. The results of [Judge, Bono, et al. \(2002\)](#) tended to show the FFM traits are more strongly related to leader emergence than leader effectiveness, suggesting these traits are more strongly related to followers' perceptions of appropriate leader behavior than to actual performance as a leader. Likewise, the FFM traits were more strongly associated with leadership in student samples than in samples drawn from business or government/military contexts. Students may rely more on the automatic use of their implicit theories of leadership than do samples of business or government employees because classroom settings provide less motivation to form accurate perceptions of leader effectiveness and because students have less experience with effective leader behavior on which to draw, causing them to rely on preconceived cues to a greater extent.

Of course these two explanations for the relationship between traits and leadership effectiveness are not incompatible. As [Judge, Bono, et al. \(2002\)](#) note, peoples' implicit beliefs about the traits and behaviors of effective leaders may be correct in the sense that they truly reflect the traits that contribute to effectiveness in a leadership role. Thus, the difference in magnitude between the leader effectiveness (multiple $R = .39$) and leader emergence (multiple $R = .53$) ratings may provide us with an estimate of the upper limit of the size of the perceptual biases introduced by the implicit leadership effects. Conscientiousness and agreeableness have the most interesting pattern of results when the difference between leader emergence and leader effectiveness is examined. Although conscientiousness might be expected to be a stronger predictor of performance in a leader role, in fact it is much more strongly associated with emergence ($\rho = .33$) than it is with effectiveness ($\rho = .16$). On the other hand, agreeableness is not significantly related to leader emergence ($\rho = .05$), but is almost as strongly related to effectiveness ($\rho = .21$) as are any of the other traits. If the difference between leader emergence and effectiveness is regarded as an indicator of implicit theories, then these findings suggest that assumptions about desirable leadership traits are not completely consistent with the traits that predict effectiveness. The contribution of the FFM to the leadership field

could be made stronger if a clear theoretical link could be made between the FFM traits and behaviors clearly related to leadership effectiveness. Such connections would demonstrate that the FFM can provide theoretical insights into the leadership process, rather than serving merely as a structure for organizing previously examined traits. Furthermore, it would mitigate concerns that the contribution of personality to leadership is largely due to the implicit assumptions of the followers rather than to the concrete skills and behaviors of the individual in the leadership role.

The earliest behavioral leadership work was conducted by researchers at the Ohio State University (e.g., [Fleishman, 1953](#); [Stogdill & Coons, 1957](#)), who focused on two dimensions of leader behavior that they identified through factor analysis. *Initiation of structure* refers to leader behaviors directed toward the organization of effort toward completion of the group's task. Examples include assigning tasks to subordinates, emphasizing deadlines, and criticizing poor performance ([Yukl, 2012](#)). *Consideration* refers to leader behaviors that show concern for the needs and feelings of subordinates. Examples include listening to subordinates' problems, accepting suggestions from subordinates, and treating your subordinate as an equal ([Yukl, 2012](#)). More recently, leadership scholars have focused on inspirational and change-oriented leadership behaviors identified within transformational leadership theory ([Bass, 1985, 1996](#)). Transformational leader behaviors include articulation of a compelling vision, acting as a role model, increasing followers' awareness of problems, stimulating followers to view problems from a new perspective, and supporting the career and personal development of followers. This theory also identified a distinct but not mutually exclusive set of transactional leadership behaviors that are assumed to bring about follower compliance to the direction of the leader if not enthusiastic commitment. Transactional leader behaviors include the use of incentives and rewards for achieving work requirements (contingent reward behavior) and punishments to sanction deviations from acceptable performance standards (management by exception).

Based on previous meta-analyses ([Bono & Judge, 2004](#); [Judge, Bono, et al., 2002](#)) and new analyses of their own, [DeRue, Nahrgang, Wellman, and Humphrey \(2011\)](#) tested a meta-analytic path model to examine the extent to which leader behaviors mediate the relationship between leader traits and leader effectiveness. This study found that several FFM traits had reliable but small relationships to leadership behaviors. For example, the task-

accomplishment oriented trait of conscientiousness is related to initiation of structure ($\rho = .26$) whereas the interpersonally oriented trait of extraversion is related to consideration leadership behaviors ($\rho = .29$) and transformational leadership ($\rho = .20$). Agreeableness was also related to consideration behavior ($\rho = .21$), as the authors expected. As found in previous research (Judge & Piccolo, 2004; Judge, Piccolo, & Ilies, 2004), all of these leader behaviors are related to leadership effectiveness. However, subsequent analysis indicates that the relationship between the FFM traits and leadership effectiveness is mediated only partially by these leader behaviors. In fact, in all cases the direct effect of the traits on leadership effectiveness is stronger than the indirect effect through leader behavior (see DeRue et al., 2011, Table 7). This suggests that we do not fully understand the theoretical mechanisms linking the FFM traits to leadership. The effect of openness to experience is, in particular, poorly explained by the current leader behavior models. DeRue et al. (2011) expected openness to be related to transformational leadership behavior due to the association between both of these variables and a change-orientation, but this relationship failed to emerge.

Thus, although current leadership behavior theory can be used to link FFM traits to leadership effectiveness, there is more of this relationship still to be explained. Future leadership research might formulate leadership models that include behaviors more closely related to the personality traits themselves. For example, Judge, Bono, et al. (2002) speculated that open individuals might be better leaders because they are more creative, because they are more likely to take risks, or because they are more visionary as leaders. However, this returns us to the bandwidth-fidelity dilemma, because such narrow behaviors might be more closely related to narrow traits than they are to broad personality constructs. Other avenues for the further exploration of trait effects include the consideration of joint combinations of traits, whether in statistical interactions or profiles, and the search for curvilinear effects between traits and outcomes (Zaccaro, 2007). In sum, although future work is called for, it is clear that the FFM has made an important and lasting contribution to understanding leadership.

Teams

Teams have become an increasingly important area of research in the OB/HR domain ([Wageman, Gardner, & Mortensen, 2012](#)), and as such, research on the role of personality in teams has also greatly expanded and remains a relatively untapped area with significant potential for new insights. Much of the key focus has been on two areas: (1) how the composition of the team in terms of the personality traits of its members influences team-level processes and outcomes, and (2) how team-level processes and characteristics influence the relationship between individuals' personality traits and their subsequent motivation and behavior as team or organizational members. A typical question addressed in the first type of research might be, "How does the mean level of conscientiousness of team members influence the performance of the team?" A typical question addressed in the second type of research might be, "How does the relationship between conscientiousness and individual task performance change based on a person's given role in a team?" Both types of questions have merit and are the subject of both early and contemporary research.

Research on the role of personality in teams began as early as the 1950s and 1960s, when social psychologists examined the role of personality in small-group research ([LePine, Buckman, Crawford, & Methot, 2011](#)). [Mann's \(1959\)](#) review of the literature, predating the FFM taxonomy, focused on the role of personality traits and individual behaviors in the context of teams, rather than the role of personality composition on team processes and outcomes. [Heslin's \(1964\)](#) review focused more explicitly on the role of personality composition in team-level outcomes. His review noted substantial variability in terms of how personality was assessed at the team level, how team performance was assessed, and variations in the social and task structures for different types of teams. In line with the fallow period of research on personality's relationship to job performance and work attitudes, research on the role of personality in teams was largely dormant in the period from the early 1960s to the mid-1980s. Two trends contributed to a resurgence of interest in the role of personality in teams. First was the increasing interest in the late 1980s and early 1990s on the role of teams in organizational research ([Devine, Clayton, Philips, Dunford, & Melner, 1999](#); [Manz & Sims, 1993](#)). Second was the development of the FFM. The FFM framework provided a coherent set of constructs that helped researchers focus their efforts. In sum, research on the FFM

personality traits in teams since the 1990s has become increasingly important to understanding the contemporary literature on teams.

The majority of research on the role of the FFM traits in teams since the 1990s has focused on how team-level compositions of personality traits relate to team-level processes and outcomes. One of the key questions in these studies has been on ways to operationalize FFM traits at the team level. Three models of operationalization are most common: the mean of members' individual trait scores, the variance on team members' trait scores, or the score of one focal member (LePine et al., 2011). Two seminal studies systematically investigated issues of composition type (Barrick, Stewart, Neubert, & Mount, 1998; LePine, Hollenbeck, Ilgen, & Hedlund, 1997). LePine et al. (1997) studied different operationalizations of conscientiousness in laboratory teams with different task settings, finding that the lowest score among team members had the strongest relationship to overall team performance. The study concluded that, in general, teams were as strong as their weakest link. Barrick et al. (1998) tested all five FFM traits with all three operationalizations of personality traits across several different assessments of team performance in a field setting (e.g., decision-making accuracy, productivity, viability). Results from this study showed that teams with higher levels of conscientiousness (i.e., higher means and higher minimum scores) tended to perform better across all measures of team performance. In addition, the mean team agreeableness and emotional stability also predict job performance, whereas the mean team extraversion and emotional stability predicted team viability. These studies spurred a great deal of research, though many studies found conflicting, contradictory, or inconsistent results, even with similar types of teams or operationalizations of personality (e.g., Beersma et al., 2003; Ellis et al., 2003; English, Griffith, & Steelman, 2004; Neuman, Wagner, & Christiansen, 1999).

In an effort to clarify the literature, Bell (2007) conducted a meta-analysis of the existing research on the role of personality compositional variables in teams. Results from this meta-analysis found that overall relationships between personality traits and team performance were relatively modest (i.e., between values of $\rho = .02$ and $\rho = .10$). However, moderator analyses revealed a starkly different picture: the type of team and operationalization of personality mattered significantly. Studies in field settings showed that personality composition had moderate effects on team

performance (conscientiousness, $\rho = .30$; agreeableness, $\rho = .31$; extraversion, $\rho = .15$; openness to experience, $r = .20$), with the effects of personality on teams in laboratory settings being negligible. The results also showed that in general, personality traits had the strongest relationships to team performance when operationalized as the mean of the team members' individual scores; however, the effect of the minimum level of agreeableness on team performance was also quite large ($\rho = .37$), suggesting that operationalizations of personality beyond the mean also matter to team performance. [Prewett, Walvoord, Stilson, Rossi, and Brannick \(2009\)](#) conducted a similar meta-analysis with different categorical compositions and found similar but weaker results

Two conclusions can be drawn from these meta-analyses. First, the operationalization of personality in teams as the mean level of individuals' trait scores appears to provide the strongest relationship between team member personality and outcomes, though other operationalizations can also influence outcomes. Second, both meta-analyses suggested that team member personality matters more to team outcomes and processes when teams are highly interdependent. In many ways, this result is intuitive: the composition of the group in terms of personality and the resulting interpersonal interactions matter more to group outcomes when team members must continually interact with each other to achieve higher levels of performance.

In addition to research on the effects of team personality on team outcomes, models of the role of personality in teams has also addressed the effects of team personality on team processes ([Bell, 2007](#); [Hackman, 1987](#); [LePine et al., 2011](#); [Marks, Mathieu, & Zaccaro, 2001](#); [Marks, Zaccaro, & Mathieu, 2000](#)). Much like the individual-level model in which the effects of individual personality on work-related behavior are mediated through personality's effects on attitudes and work-related motivation, there is a growing consensus in teams research that team personality influences proximal team-level processes (e.g., cohesion, collective efficacy, helping behaviors), which in turn influence team level outcomes. However, most research on the role of personality in teams has focused on the personality–team outcome relationship at the expense of identifying theoretically derived process mechanisms ([LePine et al., 2011](#)). Of the studies that do address these concerns, most focus on the relationship between team personality and team cohesion. This focus is logical given the strong

relationship between cohesion and effective team functioning (Beal, Cohen, Burke, & McLendon, 2003; Gully, Devine, & Whitney, 1995; LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). For example, Van Vianen and De Dreu (2001) found that team extraversion and emotional stability were related to different types of team cohesion, which in turn had a positive relationship on task performance. Most recently, Colbert, Barrick, and Bradley (2014) demonstrated that mean conscientiousness and extraversion in top management teams had significant impacts on organizational effectiveness outcomes, suggesting that the effects of personality on teams can have far-reaching, organizational-level implications.

Although cohesion has been a consistent focus, a number of other individual studies have investigated other mediating processes. LePine (2003) found that characteristics such as the mean level of team member openness had indirect effects on task performance via a team's capacity to change the structure of individual roles among team members. Alternatively, Homan et al. (2008) found that mean team openness had indirect effects on team performance through team information elaboration processes. Other studies such as Barry and Stewart (1997) found that conscientiousness and extraversion were related to team processes such as focus on tasks, social cohesion, and open communication. Some studies also examined the mediating effects of specific team behaviors. For example, Porter et al. (2003) found that the effects of team conscientiousness and emotional stability were related to team performance via backing up behaviors, or the degree to which team members provided help and support to fellow teammates. Finally, recent research such as Bradley, Klotz, Postlethwaite, and Brown (2013) investigated how team member personality may moderate the relationship between team processes, such as conflict, and team outcomes. Overall, research on the role of personality in team-level outcomes continues to grow, with a need for future studies examining processes linking team personality to team-level outcomes.

Although the dominant perspective in the literature on team personality has focused on how team-level operationalizations of personality influence team-level processes and outcomes, other research has focused on the role of team personality on individual behaviors, or how team processes influence and impact the relationship between individual-level personality and work-related behavior. One common example of this is the relationship

between personality and team roles. [Stewart, Fulmer, and Barrick \(2005\)](#) found that individual personality traits were related to the type of roles individuals would take on in teams. In this study, [Stewart et al. \(2005\)](#) found that although agreeableness ($\beta = .27$) was related to an individual engaging in social role behaviors (i.e., facilitating interpersonal relationships among team members), conscientiousness ($\beta = .21$) and extraversion ($\beta = -.22$) were related to task role behaviors (i.e., setting deadlines for work, allocating tasks to team members). Research in this vein has also investigated the degree to which personality traits are related to the display of effective teamwork skills and behaviors, with meta-analytic results showing that agreeableness, conscientiousness, and emotional stability were all generalizable predictors of teamwork behaviors ([Hough, 1992](#)). Future research on this topic is most likely to focus on how these types of individual-level personality–behavior relationships translate to team-level effectiveness ([LePine et al., 2011](#)).

An additional issue in the relationship between team personality and team effectiveness is the role of cross-level relationships, or the way in which team-level processes may directly or indirectly influence individual-level behaviors and relationships. These types of studies typically seek to identify how team-level personality composition may moderate or alter the relationship between individual-level personality traits and behavior. An example of this type of research is [Peeters, Rutte, van Tuijl, and Reyman \(2006\)](#). This study showed that an individual member's conscientiousness and extraversion were not directly related to satisfaction with the team; rather, an individual's dissimilarity to their teammates was negatively linked to his or her satisfaction with the team. Team processes may also moderate the personality–behavior relationship. For example, [Tasa, Sears, and Schat \(2011\)](#) found that team collective efficacy moderated the relationship between agreeableness and teamwork behavior such that the relationship between these variables was strongest when collective efficacy was higher. In a similar vein, [Schmidt, Ogunfowora, and Bourdage \(2012\)](#) found that team-level processes, such as cohesion as well as the team's extraversion and conscientiousness composition, moderated the relationship between individual-level personality traits and behaviors in a sample of varsity athletic teams. However, only a handful of studies on cross-level effects exist, suggesting that these are topics ripe for future research.

In sum, the current research on the role of FFM personality traits in teams has a remarkable amount of variability, due in part to the substantial variability in the many different types of teams and different types of tasks those teams must complete. Nevertheless, we can draw several conclusions, based on the current literature. First, the relationship between mean team composition of the FFM traits and team performance appears to be significantly stronger than the relationship between individual personality traits and individual job performance (conscientiousness, ρ team versus individual = .30 versus .24; agreeableness, ρ team versus individual = .31 versus .11; openness, ρ team versus individual = .20 versus .07; extraversion, ρ team versus individual = .15 versus .15; [Bell, 2007](#)). Given these results, traits other than conscientiousness, including agreeableness and openness, clearly matter in understanding the effective functioning of teams. Second, although there are a number of studies that link personality to emergent team processes or behaviors that support team effectiveness, there is little research that provides evidence that these processes and behaviors are the link through which team personality is related to team outcome. Future research needs to develop models in which team personality is linked to performance via its effects on team processes and behaviors known to be associated with team effectiveness. Third, although there is evidence that personality traits are linked to effective team performance, almost no empirical research on staffing teams exists (e.g., [Humphrey, Hollenbeck, Meyer, & Ilgen, 2007](#)). Future research needs to investigate the degree to which the conclusions developed from the literature can be applied in such a way as to have a practical impact on how organizations choose to staff teams, and what sort of tradeoffs in terms of personality trait composition may positively impact a team. In conclusion, although there have been significant advances in research on personality in teams since [Heslin's \(1964\)](#) review, there is still a significant amount of untapped research potential in this area.

Entrepreneurship

The roots of scholarship on entrepreneurship lie in the theorizing of early twentieth-century economists, in particular [Schumpeter \(1911\)](#) and [Knight \(1921\)](#). These scholars emphasized the important role that individuals play in transforming new technologies into viable business products and

services, the individual acting as the instrument of “creative destruction,” the memorable phrase popularized by Schumpeter (1942). These scholars emphasized the personal characteristics of the archetypical entrepreneur, much in keeping with the “Great Man” theories of leadership espoused in the late nineteenth century. The entrepreneur was thought to have special personal qualities, such as judgment, perseverance and will, knowledge of the world, and the power to identify new technologies and bring them into commercial existence. Although these scholars did not attempt to empirically test their assertions, they left a lasting impression on the field of entrepreneurship.

Modern academic research on entrepreneurship began with a focus on personality, in the form of McClelland’s work on achievement motivation (Baum, Frese, Baron, & Katz, 2007). In *The Achieving Society* (1961), McClelland attempted to show that the level of achievement motivation embodied by the people of a society was associated with entrepreneurial activities, which in turn was associated with economic growth in that society. In *Motivating Economic Achievement* (1969), McClelland and his colleagues reported on field-based quasiexperiments they had designed to stimulate higher levels of achievement behavior in practicing entrepreneurs, most notably among a group of businessmen in India. This work became the theoretical basis for government and academic programs devised to train and support nascent entrepreneurs and inspired a deluge of research using the trait approach to identify potential entrepreneurs in the 1970s (Baum et al., 2007). Among the most frequently studies traits were need for achievement, need for autonomy or independence, creativity or openness, locus of control, and risk-taking preference.

In what should be a familiar theme by now, by the mid-1980s researchers in the entrepreneurship area became disillusioned with the value of trait-based research. To some extent this disillusionment was motivated by institutional issues, as entrepreneurship education and scholarship were increasingly housed in business rather than psychology programs and the pool of entrepreneurship researchers was increasingly composed of academics trained in economic and strategic management paradigms rather than in psychology (Katz, 2003). Still, many of the same issues plaguing trait research in other areas of business scholarship were the focus of criticism in the entrepreneurship domain: there are too many traits with unknown relationships to each other; traits were used in a “shotgun”

manner with no clear theoretical linkage between the trait and entrepreneurship articulated; and trait correlations with entrepreneurial status or performance were zero or inconsistent (Brockhaus & Horwitz, 1985). A 1988 article entitled “‘Who is an entrepreneur’ is the wrong question” by Gartner had a major impact in redirecting the field away from trait-based research. Although much of Gartner’s (1988) criticism focused on ambiguities in the definition used to identify samples of entrepreneurs, a criticism more of the field of entrepreneurship than of traits per se, the crux of his frustration was summarized as follows:

A startling number of traits and characteristics have been attributed to the entrepreneur, and a “psychological profile” of the entrepreneur assembled from these studies would portray someone larger than life, full of contradictions, and conversely, someone so full of traits that (s)he would have to be a sort of generic “Everyman.”

(Gartner, 1988, p. 21)

Although studies of the traits of entrepreneurs continued, they were often received with skepticism as the field focused more on firm strategies and contextual economic factors promoting entrepreneurship. This picture began to change with the introduction of meta-analytic methods to more accurately summarize the results of previous work, and more developed theories to link personality to entrepreneurial behavior and performance emerged (Baron & Markman, 2000; Rauch & Frese, 2007; Shane, Locke, & Collins, 2003; Zhao, Seibert, & Hills, 2005). Although early work continued to focus on the factors that distinguish entrepreneurs from others, similar to the leadership emergence paradigm reviewed above, later studies began to focus on the outcomes of entrepreneurial behavior defined in terms of the performance of the venture founded by the entrepreneur. For example, using meta-analytic techniques, Stewart and Roth (2001, 2004) found that entrepreneurs were higher in risk propensity and Collins, Hanges, and Locke (2004) and Stewart and Roth (2007) found that entrepreneurs were higher on achievement motivation than their manager counterparts.

The FFM was used to provide a more comprehensive summary of the effects of traits on entrepreneurial behavior in two studies conducted by Zhao, Seibert, and their colleagues. Zhao and Seibert (2006) organized dozens of personality variables used in the field of entrepreneurship within the framework of the FFM to examine their relationship to entrepreneurial

status. The general theoretical perspective of person–environment fit, and Schneider's (1987) attraction-selection-attrition (ASA) model in particular, was used to explain the proposed relationships. Adapting the ASA model to the context of entrepreneurship, Zhao and Seibert (2006) suggested that certain FFM traits would lead individuals to be more attracted to entrepreneurial work, more likely to be provided with financial and other support and thus “selected” by outside agents for entrepreneurial work, and more satisfied in the entrepreneurial role. They examined only studies that compared the traits of entrepreneurs with the traits of practicing managers, a rigorous comparison considering the similarity of managerial work to the work of founding and running a new business. Their results showed that entrepreneurs differed from their managerial counterparts on four of the five FFM traits. Entrepreneurs were more conscientious ($\rho = .22$), emotionally stable ($\rho = .18$), open to experience ($\rho = .18$), and slightly less agreeable ($\rho = .08$). Although these effects are small, the set of FFM traits together explained 14% of the variance in entrepreneurial status. The heterogeneity of effect sizes was considerable, suggesting the possibility of moderators of the relationship. Subsequent analysis showed that the achievement facet of conscientiousness was somewhat more strongly related to entrepreneurial status ($\rho = .28$) than was the effect for the full set of variables and significantly more strongly related than the dependability facet (.00, n.s.), which showed almost no relationship. Again, too few studies had been conducted that used direct measures of the FFM constructs, so no comparison could be made regarding the predictive validity of global constructs versus narrow subfactors.

Classically, scholars in the economic tradition had been concerned with the characteristics of those who undertake the formation of new ventures, almost equating firm formation with success. More recent scholarship in this field has taken a more nuanced approach to entrepreneurship and has focused on different specific aspects or phases of the entrepreneurial process (Baron & Shane, 2007; Venkataraman, 1997). Perhaps the earliest phase is the formation of the intention to someday found your own business (Bird, 1988; Krueger, Reilly, & Carsrud, 2000). Zhao, Seibert, and Lumpkin (2010) used the meta-analytic techniques and the FFM framework to examine the relationship of personality to entrepreneurial intentions among individuals, usually students or managers, who were not currently entrepreneurs. The logic relating personality to entrepreneurial intentions

was again built on Schneider's (1987) ASA theory. The results of Zhao et al. (2010) showed that openness to experience ($\rho = .24$) and emotional stability ($\rho = .22$) were the strongest trait predictors of entrepreneurial intentions, followed by conscientiousness ($\rho = .19$) and extraversion ($\rho = .16$). Agreeableness had no reliable relationship to entrepreneurial intentions.

Zhao et al. (2010) also examined the relationship between the FFM traits and the performance of the new firm founded by the entrepreneur. Their theorizing extended the logic linking personality to individual performance to the firm level, based on the view that the activities of the founder and principal manager of a new venture would have a major impact on the venture's success. For example, conscientiousness should be associated with the motivation to work long hours and set high goals for the firm; openness with the creativity needed for problem solving; emotional stability with the ability to deal with the stress and anxiety associated with running your own business; and extraversion with the interpersonal requirements associated with leading a business team. Their results again supported a role for all of the FFM traits except agreeableness in entrepreneurial firm performance. The largest effects were for openness to experience ($\rho = .21$), conscientiousness ($\rho = .19$), and emotional stability ($\rho = .18$). Extraversion again demonstrated a small but reliable relationship with firm performance ($\rho = .09$).

A comparison of the role of the FFM traits in entrepreneurship to the role they play in managerial job performance and leadership is instructive. Conscientiousness and emotional stability are consistently associated with managerial job performance (Barrick, et al., 2001; Hurtz & Donovan, 2000), leadership effectiveness (Judge, Bono, et al., 2002), and entrepreneurial firm performance (Zhao et al., 2010). However, openness is associated with performance only in the latter two domains. Apparently, leading an entrepreneurial firm is similar to leadership in other contexts with respect to the value of openness, a trait not related to performance in a managerial role within a traditional employment context. On the other hand, extraversion appears to make a larger contribution to leadership effectiveness than it does to either managerial job performance or entrepreneurial firm performance. In this way the FFM helps us to not only make sense of the role of traits within specific fields of study within the

business and industry, but to make comparisons across several contexts and job roles.

Conclusions

Several major themes run through our review of the use of the Five Factor Model of personality in business and industry. The first issue is the validity of personality variables as predictors of important attitudes, behaviors, or outcomes in work settings. The second issue is the extent to which the validity of personality variables generalizes across situations or is conditioned by situational variables. Finally, a third area of controversy is the bandwidth–fidelity issue. The FFM is central to all of these debates in each of the areas of application in the following review.

Debates regarding the level of predictive validity for the FFM traits, and methods to assess that validity, remain. Although this issue has its most important practical implications in the literature on selection, where hiring decisions are made based on personality traits, it also has theoretical importance for domains such as leadership and entrepreneurship. Have the operational validities of personality measures changed over time, or have scholars in the field simply become more accepting of small effect sizes? Have the techniques for correcting measurement error or source effects become more sophisticated and nuanced or more unrealistic? Future work might explore the literature on statistical versus practical significance to settle the debate regarding the importance of personality in work behavior ([Aguinis et al., 2010](#)).

Another question that remains for personality is the degree to which contextual and situational factors likely influence the effect size of the FFM traits across contexts. Although general effect sizes for personality tend to be small to modest, most meta-analytic studies included in this review suggest that moderators exist in the relationship between FFM traits and workplace behaviors and outcomes. Recent empirical research and theoretical models have suggested that situational cues and contextual factors may in fact play significant roles in the effects of personality on workplace behaviors and outcomes ([Barrick et al., 2013; Judge & Zapata, 2015](#)). Future research can and should continue to investigate this possibility, particularly in light of the limitations of current theory on person–situation interactions ([Barrick et al., 2013](#)).

A third debate in the literature has questioned whether personality should be assessed via narrow facets, broad traits, or larger, compound traits ([Ones & Viswesvaran, 1996](#); [Judge & Kammeyer-Mueller, 2012b](#)). Although the most recent meta-analytic research has suggested that facets do in fact contribute to the explanation of work behaviors and outcomes beyond the effects of broader traits ([Judge, Rodell, Klinger, Simon, & Crawford, 2013](#)), there remains significant future research possibilities regarding when and how these narrower facets and compound traits are likely to have an important incremental influence on outcomes beyond the broad FFM constructs.

In several research domains in our review, the FFM served as a useful framework around which to organize previous research, estimate construct-level relationships, and move forward. Several domains within the OB/HR area may yet benefit from this organizing framework for personality, such as performance management, recruitment, and top management teams, to mention a few. However, questions remain regarding the utility of the FFM as a theoretical framework capable of generating clear propositions linking traits to behaviors and outcomes. Future theoretical work is required to better integrate personality and personality processes into established theoretical models of work behavior. Taking another perspective, some efforts are being made to develop and test theoretically coherent models of workplace motivation and behavior built around the FFM (e.g., [Barrick et al., 2013](#)), but the utility of this model remains to be established.

Overall, the FFM has allowed scholars to organize findings regarding the role of personality in several important domains of research in the OB/HR field. Often the ability to organize the literature into a small, comprehensive and coherent framework has rendered conclusions that contradict previously held views regarding the role of personality traits. Furthermore, research on the FFM traits and their role in workplace behaviors and outcomes has proven to be one of the most productive areas in modern OB/HR studies ([Judge, Klinger, Simon, & Yang, 2008](#)). Although this organization has sometimes raised questions and presented limitations, it has also sparked significant research and suggested useful directions for research going forward. It is our hope that the FFM of personality can continue to inspire thoughtful work on the role of individual differences in workplace behaviors and outcomes.

Margaret L. Kern and Howard S. Friedman

Abstract

As research on personality and health has moved to developing multitrait, multioutcome models, the five factor approach has shown excellent utility for understanding health, including physical and mental health, longevity, cognitive function, social competence, and productivity. Drawing on a growing arsenal of advanced statistical techniques, studies are testing complex models to explain how personality influences health. Health behaviors, social situations, physiological changes, and various indirect and moderating factors are important pathways connecting personality and health, and reciprocally influence one another. Future personality research will benefit from interdisciplinary approaches, including integrative data analyses of archival data, big data analyses, neuroscientific approaches, and lifespan epidemiology. Bringing together different types of data, innovative methods, and well-specified theories offers the potential to understand the personality–health model in ways never before imagined. Identifying pathways and key factors in turn will inform effective intervention to help more people live healthier, more productive lives.

Key Words: health outcomes, longitudinal research, lifespan pathways, conscientiousness, disease-prone personality, self-healing, longevity

People have long dreamed of the fountain of youth. Young people believe they will live forever, scorning the wrinkles and pains of elders. People may have surgeries, wear makeup, run marathons, swallow supplements, and color their hair to make themselves look and feel younger. Older individuals fear the decline that often surrounds getting older, facing changes in their bodies and social circles, hoping to somehow be a healthy ager. Health psychology reveals that there are indeed paths to healthier aging. Some individuals thrive, but there is no simple route to a happy, healthy old age. Health unfolds over time, and individual histories, characteristics, and habitual patterns influence the processes and outcomes that occur. Research over the past three decades has discovered key reasons why personality is highly relevant to health.

Many factors are associated with health—but these correlations yield different advice about which patterns are healthy and which are unhealthy. It is impossible to randomly assign individuals to differing biopsychosocial life patterns, and so even many of the best studies on health involve disparate snapshots in time. Longitudinal studies provide the best windows into personality and health relationships. Dr. George Vaillant, after studying a group of Harvard men for over 40 years, noted: “No single interview, no single questionnaire, is ever adequate to reveal the complete man, but the mosaic of interviews produced by many observers over many years can be most revealing” ([Vaillant, 2012](#), p. 95). That is, when multiple images are brought together, a clearer picture appears. In health psychology, a panoramic portrait that has emerged over the past few decades from many snapshots is the importance of the Big Five factors for health outcomes.

In this article, we first briefly examine the historical roots of personality and health psychology. Personality became an important part of the field during a time when the concept of personality itself was questioned. The Five Factor Model (FFM) became an organizing model, providing a structure for understanding personality and health associations. Second, we review a growing body of literature relating the five factors to health outcomes, ranging from subjective perspectives to mortality. Of the five factors, considerable evidence suggests that Conscientiousness is particularly important for health (see also the chapter by [Jackson and Roberts](#)). Third, we examine how and why personality might relate to health outcomes, beginning with associations and moving to increasingly sophisticated models. Fourth, growing numbers of tools and strategies are now available that can be used to address the complex issues that personality and health raise. Finally, we examine the implications and applications of the FFM for health psychology.

Historical Perspectives

Links between personality and health have been noted for thousands of years. In the ancient Greek era, health was seen as the balance of four humors. It was generally believed that excessive black bile (melancholy) caused depression, cancer, and degenerative diseases, yellow bile (choler) caused hostility and fevers, phlegm (apathy) caused rheumatism, and balanced blood (sanguine) reflected the healthy individual ([Friedman, 2007](#)). To Plato, it was not only the well-balanced body, but also the balanced soul

and mind. These dispositions interacted with behaviors and life circumstances to either maintain a healthy balance or cause mental and physical problems. Cures aimed at restoring bodily imbalances.

Such notions of the influence of character on physical health persisted in various incarnations for the next two millennia. In the mid-twentieth century, personality characteristics and physical illness and disability were again linked together. Specific traits were believed to cause specific illnesses. A major emphasis was on the Type A behavior pattern, a composite of traits such as tension, hostility, aggression, hurrying, and competitiveness, which was seen as a primary risk factor for coronary heart disease. But in 1987, Friedman and Booth-Kewley conducted a meta-analysis and found evidence of a general “disease-prone personality,” rather than specific traits causing specific diseases. The findings challenged the field to simultaneously consider multiple traits or characteristics, as well as multiple health outcomes.

The Five Factors and Health Outcomes

Although early health psychology research focused on Type A behavior and related domains of hostility, over the past two decades the FFM has become the dominant organizing framework for integrating studies of personality and health ([Smith & Williams, 1992](#)). A large and growing number of articles have examined links between the five factors (or related traits) and various health outcomes. Generally speaking, the five factors have been related to consequential life outcomes at the intrapersonal, interpersonal, and community level, including physical, mental, and social well-being; relationships with peers, family, teachers, employers, and romantic partners; job performance; political attitudes; crime; and community involvement; with effect sizes equal to or greater than socioeconomic status and cognitive ability ([Heckman, Stixrud, & Urzua, 2006](#); [Ozer & Benet-Martínez, 2006](#); [Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007](#)).

Personality research in health psychology has used a variety of health metrics, ranging from self-reported health to mortality. In 1948, the World Health Organization defined *health* as “physical, mental, and social wellbeing, not simply the absence of disease.” Yet there are considerable inconsistencies in how the term is used, including discrepancies between lay and scientific definitions, disagreements within and across fields, whether

health is seen as a process or an outcome, multidimensionality, and poor measurement.

Here, we define health as an outcome, personality as an independent variable, and other factors as mediators, moderators, or confounding variables. Studies (including our own) suggest five to eight meaningful health outcomes: self-rated health, physical (medical) health, longevity, mental health and subjective well-being, cognitive function, social competence, and productive function ([Aldwin, Spiro, & Park, 2006](#); [Baltes & Baltes, 1990](#); [Friedman & Kern, 2014](#)). From a biopsychosocial perspective, the successful life minimizes morbidity until the final year or so, thus encouraging thriving and accomplishment, while placing the least social and economic strain on the system ([Fries, 1990](#)).

Physical (Biological or Medical) Health

Physical health is perhaps the most common use for the term “health.” Physical health involves physiological function, organic disease, and energy for completing daily tasks. On the negative side, it is defined by physician-diagnosed disease, disability, inability to complete daily activities of living, and failure to thrive. What health means in the absence of disease is not well understood. Some evidence suggests that health is marked by balance across physiological systems, harkening back to notions of humoral balance. For example, high blood pressure is associated with various diseases and thus is considered a marker of poor health, but low blood pressure can also indicate disease or physiological dysfunction. Similarly, a normal body weight is protective; disease is associated with too much weight (obesity) and too little weight (frailty, anorexia). However, deviations in blood pressure, weight, and other classic diagnostic tools of the medical examination may turn out to be healthy when other variables and circumstances are taken into consideration. In psychology, this balance idea has been extended to what [Friedman \(1991\)](#) termed the *self-healing personality*, but the phenomenon turns out to be a complex one.

Some studies have focused on biomarkers, which we define as processes, not final outcomes. Often, suspected biomarkers are not the causal links that they initially appear to be ([Friedman & Kern, 2014](#)). It is more important to focus directly on morbidity, illness, and physical functioning. Most consistently, Conscientiousness has been related to better physical health outcomes and Neuroticism has been related to poorer physical health

outcomes. For example, in a longitudinal study with elderly patients, higher levels of Neuroticism and lower levels of Conscientiousness were associated with greater physician-rated illness across a 4-year period (Chapman, Roberts, Lyness, & Duberstein, 2013). In a twin study with young adults, participants high in Neuroticism at baseline were more likely to report 13 different physical health conditions 25 years later, including chronic fatigue syndrome, ulcers, and coronary heart disease (Charles, Kato, Gatz, & Pedersen, 2008). In a panel study with nearly 7,000 British adults, child intelligence related to better health status at age 50 years, but this association was mediated by Emotional Stability and Conscientiousness (Cheng & Furnham, 2013). In a nationally representative sample of U.S. adults, Conscientiousness was associated with a significantly reduced likelihood of a wide range of mental and physical disorders among adults in the general population, and Neuroticism was associated with increased rates, ranging from stroke to sciatica, with other five factor traits also sometimes relevant (Goodwin & Friedman, 2006).

Self-Rated Health

Self-rated health is a component of subjective well-being, although it is often mistakenly treated as an objective physical health marker. Questions assessing self-rated health are typically face valid and easy to use (e.g., an item might ask “In general, how is your health”). Notably, self-rated health is a good predictor of mortality risk (Idler & Kasl, 1991), but this does not mean that it can be used as a proxy for objective physical health (Friedman & Kern, 2014); age, sex, socioeconomic status (SES) and certain personality traits are also good predictors of mortality risk and are obviously not substitutes for assessing physical health.

Neuroticism has consistently been linked to lower self-rated health (see also the chapter by Tackett and Lahey). It is unclear how much of this is a real association and how much is due to self-selection or measurement biases. Both stress and self-reported health scales often contain a large negative affect component, creating noisy measures (Costa & McCrae, 1987; Watson & Pennebaker, 1989). People high in Neuroticism feel more pain, report more illness, and seek more care. It is an open question as to whether Neuroticism is indeed related to worse health, or if links are superficially created through poor measurement.

The other four personality factors appear to be less susceptible to this measurement problem, although the subjective nature of the self-report assessment remains. Conscientiousness has been robustly related to better self-rated health, predicting better reports both cross-sectionally and longitudinally, with effects sizes stronger than intelligence and socioeconomic status (SES) (e.g., Hampson, Goldberg, Vogt, & Dubanoski, 2006; Roberts et al., 2007; Tam & Wi, 2014). A large-scale Internet study with over 450,000 people worldwide sponsored by the British Broadcasting Corporation found that low Conscientiousness related to lower reports of self-rated health, being overweight, and engaging in substance use; Neuroticism was related to lower self-reported health, and high Extraversion was related to more frequent substance use (Atherton, Robins, Rentfrow, & Lamb, 2014). Notably, for self-rated health, when items referring to stress and emotional problems were removed, associations with Neuroticism were much weaker, pointing back to the problem of overlapping predictors and outcomes.

Longevity

Length of life is the clearest measure of health, as it is valid and reliable, and has consistently been used as a key measure of health worldwide (Friedman & Kern, 2014). The best longevity studies require longitudinal analyses that track people over many years or a lifetime, providing a more complete picture of the trajectories that each person followed. Over the past two decades, there has been considerable work in personality–health research focused on links between personality and all-cause mortality. Some studies have also considered other causes of death such as heart disease and cancer mortality. A problem with single cause of death analyses is that they can superficially provide “good” short-term results but “poor” long-term results; if a person is saved from cancer but dies from heart disease (such that the overall length of life is the same), then it is not a particularly successful treatment.

Early work focused on Neuroticism/negative affectivity as a primary cause of early death, but Neuroticism has been inconsistently linked to mortality. Studies find no association with mortality (e.g., Almada et al., 1991; Iwasa et al., 2008; Taylor et al., 2009), a negative association (e.g., Korten et al., 1999; Taga, Friedman, & Martin, 2009; Weiss & Costa, 2005), and a positive association (e.g., Christensen et al., 2002; Denollet et al.,

1996; Shipley et al., 2007; Weiss, Gale, Batty, & Deary, 2009; Wilson, Mendes de Leon, Bienias, Evans, & Bennett, 2004). In the U.K. Health and Lifestyle Study, Neuroticism was related to higher risk, but was reduced to nonsignificance after controlling for SES, education, smoking, alcohol use, physical activity, and self-rated health (Shipley et al., 2007). It may be that some aspects of Neuroticism are protective and others are harmful (Chapman, Roberts, Duberstein, 2011), or it may depend upon interactions with other personality traits or the social environment (Smith, Baron, & Grover, 2014). A more complex approach is needed.

The strongest, most consistent findings for personality and longevity have appeared for Conscientiousness, with higher levels associated with lower mortality risk (Bogg & Roberts, 2013; Chapman et al., 2011; Friedman et al., 1993; Kern & Friedman, 2008; Roberts, Lejuez, Krueger, Richards, & Hill, 2014). A meta-analysis of 20 studies with diverse samples found that high levels of Conscientiousness are robustly predictive of lower risk (Kern & Friedman, 2008). Subsequent studies have consistently confirmed this finding (e.g., Iwasa et al., 2008; Taylor et al., 2009; Terracciano et al., 2008). Research has now shifted from establishing that the Conscientiousness-longevity association exists to explaining possible pathways and mechanisms.

Agreeableness has received less attention than the other five factors, and associations have been mixed, with many studies finding null results (e.g., Christensen et al., 2002; Iwasa et al., 2008; Taylor et al., 2009). Most clearly, hostility and cynicism (i.e., low Agreeableness) have been linked to heart disease mortality and all-cause mortality (Almada et al., 1991; Bunde & Suls, 2006; Chapman et al., 2011). Extraversion generally has not been associated with mortality risk, most likely because it depends on the pathways involved. That is, Extraversion is associated with both healthy patterns (e.g., sociability) and unhealthy patterns (e.g., smoking, drinking, thrill-seeking).

Openness to experience has also demonstrated mixed associations with longevity, although a meta-analysis with nearly 20,000 people suggested that it is protective, but its effect is attenuated by other risk factors (e.g., age, social class) (Ferguson & Bibby, 2012). The extent to which openness matters beyond SES, education, or intelligence is unclear.

Mental Health and Well-Being

Subjective well-being (SWB) is inherently subjective, and includes emotion, self-rated health, cognitive evaluation of life, and other related components. [Diener \(2012\)](#) defines subjective well-being in terms of affect (high positive affect, low negative affect) and cognition (life satisfaction). Others have suggested multidimensional approaches to well-being. For example, [Ryff and Keyes \(1995\)](#) define well-being in terms of six components: autonomy, environmental mastery, personal growth, positive relationships, purpose in life, and self-acceptance. [Seligman \(2011\)](#) defined five pillars of well-being: positive emotion, engagement, relationships, meaning, and accomplishment. [Huppert and So \(2013\)](#) suggested 10 domains of the flourishing life contrasted against depression and anxiety: competence, emotional stability, engagement, meaning, optimism, positive emotion, positive relationships, resilience, self-esteem, and vitality. Across these different definitions, there appear to be two main components: hedonic well-being, referring to the emotional side, and eudaimonic well-being, or the good life ([Ryan & Deci, 2001](#)). Life satisfaction possibly represents a third, cognitive component.

A meta-analysis found that when properly controlled in a multivariate approach, personality can explain anywhere between 39% and 63% of the variance in well-being (i.e., happiness, life satisfaction, positive and negative affect, and quality of life) based upon NEO measures ([Steel et al., 2008](#)). Neuroticism and Extraversion consistently related to lower and higher well-being, respectively, with moderate to large effect sizes. Conscientiousness was moderately associated with well-being, with the strongest associations for quality of life. Agreeableness effects were low to moderate, and Openness was only weakly related to well-being.

[Steel and colleagues \(2008\)](#) suggested four reasons why personality and SWB should be correlated (see also [Caspi et al., 2014](#)). First, a growing number of theories and research point to biological elements (such as serotonin, dopamine, and some genes) that influence both how traits are manifested and proneness toward mental health or illness. Second, there is conceptual and measurement confusion. For example, an item on the mental health component of the Short Form-36 ([Ware, Kosinski, & Keller, 1994](#)) is “How much of the time during the past 4 weeks have you felt downhearted and blue,” and an item assessing Neuroticism is “Often feel blue” ([www.ipip.org](#)). Not surprisingly, the two measures are correlated. Third, happiness levels tend to have a relative set point ([Lyubomirsky, Sheldon, &](#)

(Schkade, 2005). Correlations between well-being and personality measures will increase to the extent that well-being measures capture stable characteristics of the person rather than momentary states. Finally, personality influences the situations that people select and are drawn toward, and these situations have a strong influence on attitudes and emotions (Friedman, 2000).

Cognitive Function

The cognitive aspect of health includes mental processes such as memory, perception, language, reasoning, decision making, and spatial ability. Numerous tests have been developed, ranging from brief mental screenings to complex cognitive batteries that capture both function and timing of declines. At the negative extreme is dementia and Alzheimer's disease, in which almost all cognitive function is gone. Although it is commonly assumed (and perhaps feared) that cognitive ability decreases over time, studies suggest that although fluid intelligence (e.g., memory capacity, speed of processing) decreases, crystallized intelligence (e.g., cultural knowledge) generally remains fairly stable (Staudinger, Cornelius, & Baltes, 1989). There is also considerable variation; some individuals can maintain very effective cognitive performance even in old age (Reynolds et al., 2005; Richardson, 2005).

Studies are increasingly linking personality to cognitive function. Across a 6-year period, risk for Alzheimer's disease was associated with high levels of Neuroticism, low Openness, and low Conscientiousness (Duberstein et al., 2011). In the Lothian Birth Cohort, low Conscientiousness related to greater loss of brain tissue and hyperintensities of white matter, with effects partially mediated by health behaviors (Booth et al., 2014). A meta-analysis of 15 studies found that high Neuroticism was associated with higher risk for dementia, Conscientiousness was protective, and Openness, Extraversion, and Agreeableness were not reliably related (Low, Harrison, & Lackersteen, 2013). Findings again point to the cumulative physiological effects that Conscientiousness and Neuroticism seemingly have over the life course.

Social Competence and Productive Function

Social competence and productive function are two final health outcomes that are valuable both for individuals and for society as a whole. Consistent with the World Health Organization definition of health (described above),

the well-being of the individual and the well-being of society ought to be mutually reinforcing. Social competence refers to being able to develop and maintain positive social relationships with others. It is separate from social support—a contextual variable that can influence social relationships, but is not the same as how good those relationships are. It has become clear over the past decade that social relationships are very important in the thriving life (Tay, Tan, Diener, & Gonzalez, 2012; Taylor, 2011).

Whether in paid work or social/civic engagement, productivity allows society to function smoothly. Engaging in work and having a sense of productivity contributes to better life quality (Bambrick & Bonder, 2005). In his presidential address to the American Psychological Association, Robert Kaplan (1994) brought to light the importance of productive engagement. In a Ziggy cartoon, Ziggy asks the wise sage what the meaning of life is, and is told “life is doin’ stuff … as opposed to death, which is not doing stuff” (p. 452).

Perhaps the clearest markers of social competence and productivity are successful marriage (versus divorce or isolation) and educational/occupational attainment (versus unemployment or idleness), respectively. Neuroticism predicts divorce, and high Agreeableness and Conscientiousness are related to more stable and better marriages and less divorce (Roberts et al., 2007). In the lifespan Terman sample, across a 40-year period, Extraversion, Agreeableness, and Conscientiousness predicted greater social competence, and Conscientiousness predicted greater productivity (Friedman, Kern, & Reynolds, 2010). Agreeableness is particularly important for maintaining harmonious relationships with other people (Jensen-Campbell, Knack, & Gomez, 2010; see also the chapter by Graziano and Tobin). Each of the Big Five traits has been related to educational and occupational attainment, with Extraversion, Agreeableness, Conscientiousness, intellect, and low Neuroticism related to greater achievement and more stable employment (Roberts et al., 2007).

Linking Personality and Health

Now that we know that personality matters to health, the interesting question quickly becomes: *How and why does it matter?* Theories and studies are now breaking open the black box to expose the complex underpinnings of how personality affects health and how health affects personality.

Mechanisms and Moderators

Various pathways have been proposed to link personality and health outcomes (Chapman, Hampson, & Clarkin, 2014; Hampson, 2008; Kern & Friedman, 2010; Smith, 2006). Pathways include health behaviors, social situations, physiological changes, and indirect and moderating factors.

Health behaviors. The clearest pathway linking personality and health is through the behaviors in which people do and do not engage. Across 194 studies, Conscientiousness-related traits were positively related to health protective behaviors and negatively related to risky behaviors (Bogg & Roberts, 2004). In the Midlife in the United States (MIDUS) study, Conscientiousness and health links were substantially mediated by excessive alcohol use, smoking, and waist circumference (Turiano, Chapman, Gruenewald, & Mroczek, 2015). Conscientious individuals are more likely to adhere to medical advice, with physical health consequences (Hill & Roberts, 2011; O’Cleirigh, Ironson, Weiss, & Costa, 2007). Smoking explains part of the Neuroticism–mortality association (Mroczek, Spiro, & Turiano, 2009; Shipley et al., 2007). Extraversion, Agreeableness, and Openness have been inconsistently linked to risky and healthy behaviors.

Although numerous studies find that behaviors mediate the personality–mortality link, considerable variance consistently remains, suggesting that other pathways also matter. For example, in the Whitehall II cohort study, associations between Conscientiousness and mortality were attenuated only 13% when health behaviors were controlled (Hagger-Johnson et al., 2012). Adding in SES, physiological risk factors, and minor psychiatric morbidity further attenuated associations by 16%. Studies using structural equation modeling suggest that both health behaviors and education mediate Conscientiousness and health associations (Kern, Hampson, Goldberg, & Friedman, 2014; Lodi-Smith et al., 2010), but that is only the beginning.

Alternative study designs that unearth how personality plays out in daily life may be informative. For example, a 28-day study found that Conscientiousness related to less consumption of high fat snacks, but also higher caffeine intake and more smoking among those who did smoke (O’Connor, Conner, Jones, McMillan, & Ferguson, 2009). At the facet level, participants high in *order* did more exercise on stressful days, *self-efficacy* related to eating vegetables, and smokers high in *self-discipline* smoked more on stressful days, pointing to interactions between daily stress and health behaviors. Other studies similarly suggest that the facet level may be

more predictive of behaviors than the five factors alone (Kern et al., 2013; Paunonen, 1998; Paunonen & Ashton, 2001).

Social pathways. A second set of important pathways connecting personality and health is through social influences—situation selection, aspects of the social context, and interactions with other people, all of which influence and affect personality and health. Personality draws people toward certain situations, which become self-reinforcing over time (Friedman, 2000). For example, high Extraversion is related to experiencing more positive life events (both subjectively and objectively rated), whereas Neuroticism relates to experiencing more negative life events (Magnus, Diener, Fujita, & Pavot, 1993). Events and experiences in turn impact self-perceptions.

Self-regulation, social responsibility, Agreeableness, and emotional stability may help set the stage for better interpersonal relationships. In a group of adolescents, high Conscientiousness related to better friendships, higher peer acceptance, and less victimization, with associations mediated by externalizing behaviors (Jensen-Campbell & Malcolm, 2007). In the Mills Longitudinal Study of Women, social responsibility predicted family, work, and behavioral outcomes 20 to 30 years later, and marital quality, work behaviors, and substance use were associated with subsequent changes in social responsibility (Roberts & Bogg, 2004). A meta-analysis of 94 studies found that high Agreeableness, Emotional Stability, and Conscientiousness related to greater investment in work, family, religion, and volunteering social roles (Lodi-Smith & Roberts, 2007). Notably, the personality of others can also impact health; a spouse with high levels of Conscientiousness predicted better physical health outcomes, over and above the impact of the person's own personality (Karademas, & Tsaousis, 2014; Roberts, Smith, Jackson, & Edmonds, 2009). The company that we keep matters for both who we are as people (our personality) and for subsequent life outcomes.

Physiological pathways. As tools and methods have improved, considerable research is now turning toward internal mechanisms, attempting to untangle how personality affects physiological function, with possible health consequences. In a sample of healthy adults, participants scoring low on Agreeableness and Extraversion demonstrated increased sympathetic nervous system activity and, for Extraversion, higher natural killer cell cytotoxicity, suggesting that personality is associated with basal

physiological levels (Miller et al., 1999). In adults from Sardinia, high Neuroticism and low Conscientiousness were associated with higher levels of interleukin-6 (Sutin, Terracciano, Deiana, Naitza, et al., 2010), and low Conscientiousness was related to lower high-density lipoprotein (HDL) cholesterol and higher triglycerides (Sutin, Terracciano, Deiana, Uda, et al., 2010). Serotonin has been linked to impulsivity (low Conscientiousness) and hostility (low Agreeableness) (Carver & Miller, 2006).

Much of the work on physiological pathways has stemmed from a general focus on the deleterious effects of stress. According to the basic stress model, high levels of stressors can trigger a state of homeostatic disruption in which the heart beats faster, breathing speeds up, cortisol and catecholamine levels increase, inflammation increases, and immune function is depressed (Kemeny, 2007; McEwen, 2006). Although in the short term, this reaction may be adaptive, in the long term, a chronic negative response pattern becomes detrimental, disrupting metabolism, immune function, and physiological rhythms, and increasing susceptibility to illness, disease, and general breakdown. Illness in turn further affects psychological functioning, creating a negative cycle toward disease.

Personality seemingly impacts what stressful events are encountered, the extent to which stressors are considered stressful, and coping responses (Carver & Connor-Smith, 2010; Connor-Smith & Flachsbart, 2007; Segerstrom & O'Connor 2012). Neuroticism is consistently viewed as the trait that increases the risk for maladaptive responses, chronic stress, and poor health outcomes. For example, in one study, blood pressure in women high in Neuroticism showed less recovery after a hostile interaction than after a friendly interaction (Hutchinson & Ruiz, 2011). In a second study, Neuroticism was related to higher daily cortisol measures across a 6-day period (Nater, Hoppmann, & Klumb, 2010). Across a 10-year period, hostility was related to less healthy diastolic blood pressure, although effects varied by gender (Leclerc, Rahn, & Linden, 2006; see also Smith, Glazer, Ruiz, & Gallo, 2004; Williams & Williams, 2012). Positive traits may buffer the physiological system from stress reactions or quickly restore balance to the system when stress occurs (Fredrickson, 2001; Pressman & Cohen, 2005).

Studies addressing this model typically measure personality concurrently with physiological markers, such as blood pressure, immune and endocrine function, or cardiovascular reactivity. An assumption of this model is that

cross-sectional and short-term associations between personality and physiological function will extend to disease outcomes later in life. However, studies are only beginning to test the process longitudinally, and almost no studies have examined early life personality, prolonged stress exposure, long-term physiological disruption, and subsequent disease, at least in the same individuals. In one of the first long-term tests of the physiological pathway, in the Hawaii Personality and Health study, low childhood Conscientiousness was related to physiological dysregulation, greater obesity, and worse lipid profiles 40 years later ([Hampson, Edmonds, Goldberg, Dubanoski, & Hillier, 2013](#)). Personality may affect the immune system, and the immune system may impact personality, such that causal arrows are nonexistent ([Kemeny, 2007](#)). Longitudinal studies across long life periods, which include personality, physiological markers and stress measures across multiple time points, and health outcomes are necessary to truly establish the physiological pathway.

Third variables. Another way that personality and health can be connected is through third or confounding variables—factors that relate independently to personality and health, such that the two appear to be related, when it is really another factor that drives both relationships. The most notable third factor is genetic influences, although a host of other factors are potential confounders as well. Personality has both genetic and environmental influences ([Jang, Livesley, Angleitner, Riemann, & Vernon, 2002](#); [South & Krueger, 2014](#)), and some of these same influences also impact health outcomes. Genetic studies could reveal biological systems underlying trait and health differences, and may moderate how traits are manifested across the lifespan ([South & Krueger, 2014](#)). Some traits may turn on or off at different points in life, with health-related implications. Much of the work with genetics and personality shows promise, but the data are messy. As methods are continually refined, genetic studies will continue to play an important role in the future, but genetics have often been found to have relatively little predictive value unless environmental influences are simultaneously considered.

Similarly, the enduring social context, including SES and risky environments, influences both personality and health. For example, in MIDUS, personality explained about 20% of the SES gradient in mortality risk, and SES explained 8% of personality risk ([Chapman, Fiscella, Kawachi, & Duberstein, 2010](#)), such that some of the health risk comes from

the environment, part is due to individual dispositions, and part may be the interaction of the person and environment. Early environments may also promote particular traits and set various health trajectories. For example, secure attachment has been linked to optimal self-regulations in childhood and adolescence ([Eisenberg, Duckworth, Spinrad, & Valiente, 2014](#)). More complex models are needed, which consider how personality and social contexts interact to influence health outcomes across the lifespan.

Moderators. Finally, personality can also moderate and be moderated by other variables. In the Terman Life Cycle Study, Conscientiousness moderated the relationship between career success and mortality, such that Conscientiousness buffered the otherwise risky effects of career failure ([Kern et al., 2009](#)). In the German Socio-Economic Panel Study, Agreeableness moderated adaptation to disability, such that those high in Agreeableness regained general life satisfaction several years later, whereas disagreeable individuals did not ([Boyce & Wood, 2011](#)). In another sample, Openness, Extraversion, and Neuroticism moderated associations between stress and health behaviors ([Korotkov, 2008](#)). In a French sample, although Neuroticism related to worse physical functioning, this effect was amplified at low levels of education and diminished at high levels of education ([Jaconelli, Stephan, Canada, & Chapman, 2013](#)). In a group of children and adolescents, associations between prosocial behavior, externalizing problems, internalizing problems, and grades were moderated by the early family environment, with effects being stronger in more difficult circumstances ([Slobodskaya, Ashmetova, & Rippinen, 2014](#)).

Summary. By peering into the black box, we have identified multiple pathways that connect personality and health, which are often studied separately. The clearest and perhaps most straightforward pathway is health behaviors. Interventions need to be sensitive to personality dispositions, and by changing one's behaviors, risky characteristics may potentially shift to healthier ones ([Chapman et al., 2014](#)). However, the social context (especially relationships with other people and socioeconomic status), biological factors, and various environmental factors selected by and shaping personality are also very important, and may impact both behaviors and health outcomes. Personality shapes how a person experiences, interprets, and responds to events throughout the lifespan ([Caspi, Roberts, & Shiner, 2005](#)). It can moderate pathways and reactions, and effects can be bidirectional, synergetic, and cumulative. To truly understand the web of

influences, models that simultaneously bring together multiple pathways are needed.

A New Generation of Personality–Health Research

Friedman and colleagues (2014) introduced a new generation of personality and health models, characterized by complex, dynamic, lifespan models. Rather than separating out the pathways reviewed above, third generation models recognize that all of these pathways matter, and most likely reciprocally influence one another. An analogy for this new generation of models is a ship traveling on a journey. As the journey begins, its course is set by the captain. The shape and depth of the water determine how big the ship can be and how fast it can travel, just as genetic and environmental factors set boundaries for development. Personality is the rudder, steering the boat through the waters. It sets a course, which can shift, but takes time and effort. Just as the pathway for the journey is unknown to the passengers, many of the early influences on personality may take time to appear. As river conditions and obstacles are encountered, the captain might adjust the rudder, shifting the course of the journey, just as health behaviors, social relationships, physiological responses, and health outcomes affect personality. Thus, it is the dynamic process of a relatively stable trajectory in the midst of an unsteady and changing context that results in health-promoting or risky life pathways. By understanding the range of influences involved, interventions can be done at the right time to avoid danger and to travel an optimal route.

New theories and models within this framework provide some guidance for beginning this new generation of studies. For example, Smith and colleagues (2014) introduced the interpersonal perspective of personality, social, and clinical psychology in which psychosocial risk accumulates over long periods, resulting from dynamic interactions between individuals and their social contexts. Interpersonal experiences such as marriage can trigger physiological stress responses, which can result in cardiovascular disease or other health problems as stress becomes chronic. The overt experiences and covert behaviors reciprocally build either positive or negative patterns, which in turn affect cardiovascular reactivity, neuroendocrine responses, and other physiological components. Personality influences who ends up in different relationships, yet it is the resulting dynamic interaction patterns that have a stronger impact on chronic health risks. Eaton and colleagues (2012)

proposed a framework aimed at the complex genetic and environmental influences on healthy aging. Rather than measuring health behaviors at a single period, behaviors should be measured as patterns over time (see also [Friedman & Martin, 2011](#)). They further suggest that approaches from behavioral genetics, such as co-twin controls and gene-by-environment analyses, can provide a structure for more sophisticated models and analyses.

[Shanahan and colleagues \(2014\)](#) proposed the Life Course of Personality (LCP) model, which suggests that different mechanisms matter to health at different phases across life, and are moderated by the social context and other aspects of the person. Associations may depend on the specific facet. For example, for Conscientiousness, facets such as deliberation, responsibility, self-discipline, and low impulsivity may decrease chronic stress, whereas facets such as achievement striving, orderliness, and perseverance may increase daily stress. Personality is embedded in the social context throughout development, beginning with an infant's temperament and early interactions with parents; behavioral and educational choices in adolescence; decisions about school, work, and life during the transition to adulthood; and behavioral, work, and family patterns that occur in adulthood. To study such a model, there is a strong need to establish large, diverse samples followed over extensive time periods, as well as specific, strategic samples to study more fine-grained time-limited processes.

Testing dynamic models will be a challenging endeavor, and personality–health researchers will benefit from staying current on the ever-developing statistical tools available, as well as working collaboratively with statisticians who develop new tools. Dynamic processes can be misconstrued with traditional statistical models. Data are needed that follow people prospectively over time, with repeated measures of personality, health behaviors, physiological functions, social relationships, contextual elements, and health measures. Research needs to be theory driven, yet still open enough for exploration, with empirical findings informing the theoretical models. Below, we review some of the innovative trends that will take personality–health research into the future. To truly have an impact on health, our models and methods need to move to a greater level of sophistication.

Drawing on a growing arsenal of advanced statistical techniques, studies are starting to test more dynamic models. For example, using structural

equation modeling (SEM) to directly model lagged reciprocal effects, physical health influenced subsequent positive affect, whereas emotion did not affect subsequent physical health reports (Finch, Baranik, Liu, & West, 2012). Using SEM to capture multiple processes in the causal chain across a 25-year period, early adversity was related to more smoking and higher body mass 16 years later, which in turn were related to inflammatory markers measured 1 to 4 years later (Raposa et al., 2014). Combining SEM and survival analyses, Neuroticism was indirectly associated with mortality risk through somatic health, psychological distress, and smoking pathways, and Extraversion was indirectly associated with mortality through smoking (Ploubidis & Grundy, 2009).

Beyond single assessments of personality, health, and other variables, several studies have examined change over time. Across a 3-year period, latent change models indicated that changes in Conscientiousness were related to changes in health behaviors and self-perceived physical health (Takahashi, Edmonds, Jackson, & Roberts, 2013). In MIDUS, becoming less Conscientious and becoming more Neurotic over a 10-year period were related to worse perceived health and well-being, a greater presence of metabolic syndrome components, and a greater likelihood of diagnosis for metabolic syndrome at follow-up (Human et al., 2013), and changes in Conscientiousness were related to work limitations due to physical or mental reasons (Turiano et al., 2012). In an Australian study, increases in Conscientiousness and Extraversion were related to improved self-reported mental and physical health, and increases in Neuroticism related to worse self-reported health, but associations were moderated by birth cohort (Magee, Heaven, & Miller, 2013). In the VA Normative Aging Study, men with both a high average level of Neuroticism and increasing levels over time were at a higher mortality risk than those with lower levels or nonincreasing levels (Mroczek & Spiro, 2007). In the Lothian Birth Cohort of 1921, decreases in Conscientiousness across the ninth decade of life were associated with declining physical fitness (Mõttus, Johnson, Starr, & Deary, 2012).

Tools for the Future of Personality and Health

To overcome the flaws of studies based on self-reported data, future personality research will benefit from creative, interdisciplinary approaches. Numerous tools (e.g., innovative statistical approaches), data sources (e.g.,

behavioral observations, big data), and strategies (e.g., personality neuroscience, computational social science, animal comparisons) are increasingly available that will propel personality-health research into an exciting future.

The Power of Existing Studies: Long Data

Two decades ago [Jack Block \(1993\)](#) suggested that to truly study personality, studies should be intentional, open, long enough to observe things, theory-based, broad and deep, methodologically sound and well-orchestrated, innovative, have a reasonable sample size, and maintain high quality over time. Fortunately, over the years, many studies have been conducted that meet many of these qualities. Much of our existing knowledge of life course personality–health associations stem from long data—extensive data gathered prospectively across time documenting people’s lives. For example, much of the personality–health focus over the past decade has been on the importance of Conscientiousness for health outcomes. The Conscientiousness–longevity link was first uncovered in an exploration of data from the lifelong Terman Life Cycle Study ([Friedman et al., 1993](#)). Through over 40 years of working with the Harvard Grant Study, [George Vaillant \(2012\)](#) noted: “I’ve been studying adult development since I was thirty, and I know now that many of my past conjectures, apparently accurate at the time, were contingent or just plain wrong” (p. 1472). Only by looking at detailed information collected over many years can true relationships be fully revealed. “Long term longitudinal studies are like mature trees … like a century-old oak, such studies are rare resources and can add to our knowledge base in ways newer longitudinal studies cannot” ([Mroczek, 2014](#), p. 1472). Fortunately, studies such as the Terman Life Cycle Study and the Harvard Grant Study are converging on similar conclusions ([Friedman & Kern, 2014](#)).

Through existing longitudinal studies, it is now possible to model more complex pathways, especially when multiple measurement occasions were included. For example, survival analyses estimate mortality risk across different ages, while accounting for attrition and for long-lived individuals who are still alive at the point of analysis. Growth curve analyses with two or more time points can estimate whether the sample as a whole is changing over time and the extent to which individuals vary from that overall trajectory. Both initial levels (scores at baseline) and slope (changes over

time) can be related to other predictors and outcomes. Cross-lagged analyses start to untangle causal pathways (e.g., physical activity at time 1 affecting physical fitness at time 2 versus fitness affecting activity). SEM allows complex associations to be estimated, while directly including measurement error, direct and indirect pathways, mechanisms, moderators, control variables, and correlated error in the model. Growth mixture modeling identifies unobserved groups that change differently over time. An arsenal of modeling options is increasingly available.

Of course, longitudinal data are far from perfect ([Tomlinson-Keasey, 1993](#)). The original investigators usually were interested in different questions, scales are often nonexistent, and constructs are often represented by only one or two items. Data may be missing, although newer statistical techniques provide tools to deal with missing data problems. Attrition is a notorious challenge, and often those at highest health risk are those least likely to stay in the study. Studies were often done on select samples that may not generalize to other population groups (although this is often less of a problem than it first appears). Work with archival data needs to be driven by theory and specific research questions. It is a long process, involving developing an extensive knowledge of the data, carefully considering validity issues, and the possibility of recasting parts of the archive (i.e., restructuring existing data to create new measures of a construct) to address different questions ([Elder, Pavalko, & Clipp, 1993](#)). Yet existing studies offer a wealth of data, representing major investments by prior researchers, funding agencies, and participants, and it is well worth the effort to work with them and learn what we can from the data. By building on prior work, we can augment the field and science as a whole ([Friedman et al., 2014](#)).

Integrative Data Analysis

Taking long data to the next level, the existence of many longitudinal datasets has brought the intriguing possibility of directly combining studies to study lifespan personality and health processes in greater detail. There are multiple ways that data can be integrated. A common method, and what many of the strongest findings in personality and health research are based on, is aggregated data meta-analysis, in which effect studies from multiple studies are combined, and moderators are examined. Meta-analyses have identified the clearest personality and health associations, but gloss over longitudinal trajectories and data needed to capture more complex

trajectories. One of the greatest criticisms is that meta-analysis can seem to combine apples and oranges; although both are types of fruit, results are more of a fruit salad than an apple pie.

Pooled integrative data analysis directly combines the data from multiple studies at an item level, rather than combining the average study effect sizes. Direct integration ensures that the same items or constructs are being assessed in each sample, rather than combining divergent constructs that are labeled as the same. Directly pooling data provides increased statistical power, the ability to study extended developmental periods, and direct tests of sample heterogeneity. One of the best examples of integrative studies in health psychology is the Integrative Analysis of Longitudinal Studies on Aging (IALSA) network, a collaboration of longitudinal studies on aging, health, and cognition (see <http://www.alsia.org>). The group has pioneered methods to link psychological studies together at the item level ([Bauer & Hussong, 2009](#); [Curran & Hussong, 2009](#); [Hofer & Piccinin, 2009, 2010](#)).

[Friedman and colleagues \(2014\)](#) suggested that the same approach could be used to examine personality and health associations, integrating studies where possible to link two or more studies together, and then extending analyses to unique aspects of each study. For example, [Kern and colleagues \(2014\)](#) directly integrated data from the lifelong eight-decade Terman Life Cycle Study and the Hawaii Personality and Health Study. Items in each sample were aligned to the five factors. Then, using the pooled data, personality was tested as a predictor of self-rated health 40 years later. Conscientiousness predicted better self-rated health, directly and indirectly through educational attainment. The aligned personality factors were then used to test Conscientiousness as a predictor of longevity in the Terman sample and physiological regulation in the Hawaii sample, supporting pieces of the lifespan model. Unlike study level meta-analyses, this process ensures that the same constructs are being used as predictors. By testing well-defined lifespan theories with integrative data, it may be possible to empirically piece together the whole life course model.

Ongoing and New Longitudinal Studies

As many of the longitudinal studies are still ongoing, there are opportunities to add measures within the broader studies to test lifespan development. A particularly promising approach is the measurement burst design, in which intensive periods of measurements, such as daily diaries or

experience sampling, are nested within long-term longitudinal studies ([Nesselroade, 1991](#)). The design allows direct consideration of intraindividual variation. With larger, nationally representative samples, participants from different age groups can be randomly selected for periods of short-term intensive measures, testing some of the more fine-grained mechanisms defined by the theoretical models.

New studies will add the most benefit to the field by carefully planning measures and strategies to test complex models. Cross-sectional studies that simply show that variables are related offer limited value; prospective studies are needed. To help manage the time burden for participants, growing numbers of computer-adapted tests (CATs) are available, such as the National Institute of Health's PROMIS (www.nihpromis.org). CATs include a large item bank, in which items are aligned across an underlying distribution for a given characteristic. Depending upon how a person answers a question, subsequent questions are pulled from different parts of the distribution, such that a reliable estimate of the person's true score can be determined with four to six questions. The most discriminating items might be compiled into a short form for off-line panel studies. Furthermore, planned missingness allows different subsets of participants to complete measures at each occasion, reducing the burden on participants, while increasing the number of constructs that can be measured.

Behavioral Data

Beyond self-reported data, a growing body of research has focused on behavioral health and personality measures. For example, the self-control facet of Conscientiousness has been measured by delay of gratification tasks and various executive function tests (e.g., Stroop test, go/no-go task, trail making task, Balloon Analogue Risk Task). Convergence across self-report, observer report, delay of gratification measures, and executive function tasks is moderate, and studies may benefit from including both questionnaire and behavioral tasks to provide a more complete assessment of the person ([Duckworth & Kern, 2011](#)). Behavioral-based measures can also be used with young children who cannot read and answer questions and with lower SES or cognitively challenged participants who may have trouble understanding normal personality questions.

Using videotaped interviews, lay people could reliably rate 62 behaviors as diagnostic of the Big Five traits, suggesting that we often make

personality judgments about others through the things that they do ([Funder & Sneed, 1993](#)). [Gosling and colleagues \(2002\)](#) found that personality is manifested in the surrounding environment. Observers who briefly saw a person's bedroom or office made ratings of the person's personality; these moderately correlated with self-ratings and peer-ratings of the same person. [Jackson and colleagues \(2010\)](#) identified behavioral components of Conscientiousness and developed the Behavioral Indicators of Conscientiousness, which offers a way to assess what Conscientious people do in their daily lives. Studying how positive personality traits are manifested in everyday life may inform interventions.

Taking this a step further, [Mehl and Pennebaker \(2003\)](#) developed the Electronically Activated Recorder (EAR), which captures 30-second sound bites throughout a person's day. Judges rated their impression of the person's personality using the recordings; their ratings were generally accurate, particularly for Extraversion, suggesting that natural observations offer a method to understand how personality is expressed in everyday behavior ([Mehl, Gosling, & Pennebaker, 2006](#)). Such unobtrusive measures might also point to the pathways toward health as social interactions, behaviors, and emotional reactions are captured in the moment throughout the day.

Computational Social Science: Big Data Intrigues

Over the past decade, massive amounts of data, including online social media (e.g., Facebook, Twitter), electronic health records, online blogs, and search patterns, have been created, unobtrusively documenting peoples' lives ([Anderson, Fagan, Woodnutt, & Chamorro-Premuzic, 2012](#)). By combining tools from computer science, the massive amount of available data, and personality theory, health psychology researchers can and should take advantage of these rich data sources.

Using words expressed through online modalities, evidence suggests that personality is displayed and perceived through the language that people use in online and mobile environments ([Gill, 2004](#)). In nearly 70,000 Facebook users with 20 million status updates, personality scores were related to language use ([Kern, Eichstaedt, Schwartz, Dziurzynski, et al., 2014](#)). [Figure 18.1](#) shows word clouds of 50 words and phrases (a series of two to three words, indicated by an underscore) that were most strongly correlated with Conscientiousness (left) and Neuroticism (right). The size of the word indicates how strongly the word or phrase is correlated with the trait (larger

equals a stronger correlations). The method was also used to examine age-related differences (Kern, Eichstaedt, Schwartz, Park, et al., 2014). Although all analyses were cross-sectional (i.e., different people selected from each age group), as social media is used over time, it will become a tool to follow people's words, behaviors, and social interactions over the course of days, months, or even years.

Big data offer opportunities for identifying contextual aspects that may influence health outcomes. Personality research focuses primarily on the experience and perspective of individuals, and yet people exist within ecosystems. Many of the key sociocultural variables that moderate the life course models are either unmeasured in a particular sample or unidentified, and big data can identify these sociocultural factors. Key contributors can then be tested in smaller studies, comparing aspects of different communities, being cognizant of the individual and social personalities that appear.

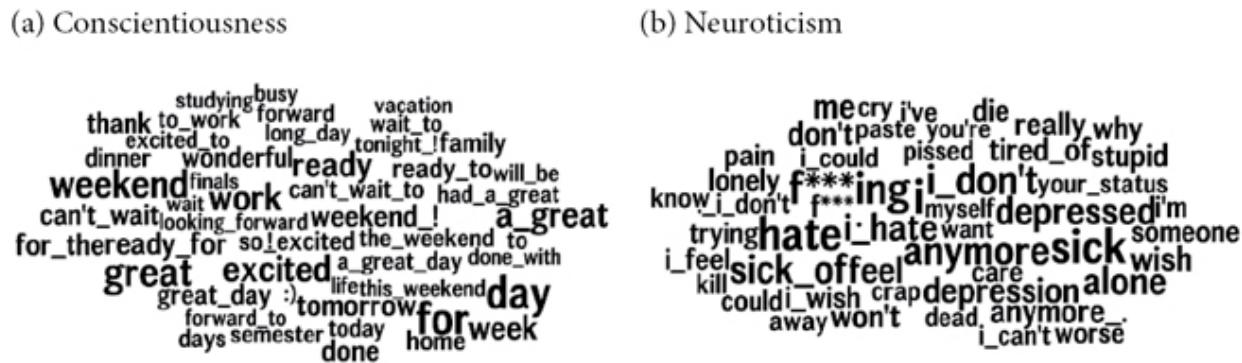


Figure 18.1. Word clouds depicting 50 words/phrases that most strongly correlated with Conscientiousness (left) and Neuroticism (right) in 69,792 Facebook users. Larger words are more strongly correlated with the factor. Phrases (two- to three-word combinations) are indicated by an underscore. (Adapted from Kern, Eichstaedt, Schwartz, Dziurzynski, et al., 2014.)

For example, geo-tagged search queries from consented mobile phones predicted health care utilization and duration of hospital stays (Yang, White, & Horvitz, 2013). Monitoring search logs identified adverse drug reactions, and may serve as a complement to the Food and Drug Administration's adverse event reporting system, which relies on spontaneous reports of problematic reactions (White, Harpaz, Shah, DuMouchel, & Horvitz, 2014). With Twitter data, U.S. counties scoring high in self-reported life satisfaction expressed language reflecting productive engagement in life, physical activity, spirituality, and nature (Schwartz et al., 2013), and counties with

high incidence of atherosclerotic heart disease expressed language reflecting hostility and apathy ([Eichstaedt et al., 2015](#)). The tweets may be reflecting aspects of the social or cultural context that may be more or less health promoting.

Data from online social media, mobile applications, and other technologies provide a new experiential sampling method that documents people's everyday lives unobtrusively, with relatively low cost and resources. When combined with long data, there is the possibility for a new type of measurement burst design ([Nesselroade, 1991](#)), with questionnaire and physiological measures collected over many years complemented by bursts of daily patterns determined through online data sources. Interventions can be administered and tested remotely and adjusted to the person's responses. Altogether, combining long and big data offers the potential to study and understand the personality–health model in ways never before imagined.

Personality Neuroscience

Personality neuroscience attempts to find markers of personality in the brain, and then to map those markers back to gene-by-environment interactions ([DeYoung & Gray, 2009](#)). Personality neuroscience attempts to determine why people differ from one another, identifying biological sources for differences between individuals (see also the chapter by [Allen and DeYoung](#)). Methods include neuroimaging, genomics, electrophysiological techniques, assays of psychoactive substances such as neurotransmitters, and direct changes through pharmaceuticals. For example, [DeYoung and colleagues \(2010\)](#) mapped neural images to the Big Five factors. Extraversion was related to the brain area that processes rewards, Neuroticism was related to the brain regions associated with negative affect and threat, Conscientiousness was related to the areas involved in planning and control of behavior, and Agreeableness was associated with areas involving understanding the intentions and motivations of other people. Similarly, the five factors correlated with different parts of the default mode network (a series of stable cortical brain areas thought to serve various cognitive and emotional functions), regions that have themselves been correlated with various response patterns for different emotional and cognitive stimuli ([Sampaio, Soares, Countinho, Sousa, & Gonçalves, 2013](#)).

Neuroscience approaches have been relatively neglected in most lifespan personality–health research, in large part because measures have not been available within existing studies. If neurological measures are embedded within larger lifespan studies, neural mechanisms underlying personality and health processes can potentially be identified. Physiological indicators might be reliably mapped to the five factors via a self-report measure, and then neurometric measures of personality could be developed, and the brain circuitry that plays a part in individual differences could be identified (Patrick, 2014). Combined with the network of complex models, personality neuroscience may help to further break open the black box, revealing minute processes that connect personality processes and subsequent health outcomes.

Other Species Parallels: Animal Studies

Another approach for studying personality and health involves utilizing nonhuman species (see also the chapter by Weiss and Gartner). Personality clearly appears in animals. For example, dog personality has been classified into dimensions such as reactivity, fearfulness, activity, sociability, responsiveness to training, submission, and aggression. A meta-analysis of 31 studies suggested moderate consistency in traits, with personality being more consistent in adult dogs than in puppies (Fratkin, Sinn, Patall, & Gosling, 2013), similar to the stability of personality in adulthood versus childhood in humans. Reflecting the hierarchical structure of the Big Five factors in humans (i.e., two higher order alpha and beta meta-factors, the five factors, and underlying aspects, facets, and specific traits), a study of chimpanzees found a similar hierarchical structure of personality, with two higher order alpha and beta factors hierarchically situated above a five factor structure (Latzman, Hopkins, Keebaugh, & Young, 2014). In a study with seven different social groups of rhesus macaques, personality influenced who successfully intervened in group conflict as well as roles in grooming and network behavior (McCowan et al., 2011). By using a network analysis, the study identified interactive effects among personality, social status, and sex, which together influenced the stability of social groups.

Whereas human studies are almost exclusively correlational in nature, direct experiments can be done with animals, directly testing cause and effect associations (Cavigelli, 2005). Furthermore, the entire life course can be observed over a much shorter period of time. For example, studies

suggest that physical activity extends longevity in animals, and both biological and nonbiological factors play a role (Sallis, 2000). Stress studies with animals suggest that persistent activation of the hypothalamic–pituitary–adrenal (HPA) axis can lead to permanent physiological damage (Repetti, Taylor, & Seeman, 2002). Animals can be bred with particular characteristics to test genetic versus environmental effects on physiological outcomes. Environments can be created to mirror different human conditions, testing the effects on physiological measures, length of life, and changes in brain structure. Altogether, evidence suggests that animals do indeed have personality characteristics relevant to the Big Five factors, and can be useful for studies on personality, stress, immunity, and health (Mehta & Gosling, 2008).

Application: Intervention

The value of identifying pathways and influential factors lies in the potential to inform interventions that will help more people live happier, healthier, productive lives, with benefits to society through reduced economic costs and burden to the system. Currently, there is a large gap between personality research and the real world context of medicine and behaviors (Mermelstein & Revenson, 2013). The most successful theories will explicitly specify causal, direct, and indirect links, will be dynamic in nature and sensitive to context, will be consistent with real-world evidence, and will be implemented by health care providers and the general public (Michie, West, & Spring, 2013). By moving from theoretical models to practical application, interventions may be more effective, and we can directly observe boundary conditions for the theories. Thus, the new generation of models will benefit from an iterative process in which basic research informs application, and application informs basic research (Rothman, Klein, & Cameron, 2013).

One of the primary places that personality may be informative is in medicine. There is a growing emphasis in the medical world on the need for patient-centered approaches to care. Theory-based studies on personality and health can potentially inform risk models, decision making, and treatment options (Chapman et al., 2014). Personality assessments may help healthcare professionals make predictions of future health risks. With high treatment costs, interventions could be targeted more directly to those most likely to respond, thus saving time and costs that accrue from nonresponders.

How could this work in practice? At any given appointment, medical teams often collect background information, including disease history, weight, blood pressure, and in some cases risky health behaviors (e.g., smoking, drinking, physical inactivity). Intake assessments could include a brief personality measure, which would help the physician quickly get to know the patient better. The information could be included in the electronic health record, sharing the information with others on the care team, offering some immediate information about individual differences, risk status, and communication preferences. Treatments could be adjusted based on different traits. For example, as Conscientiousness is associated with adherence, those low in Conscientiousness could be provided with additional monitoring, reminders, and other tools. In turn, the additional information added to the health records will inform research on personality influences on patient–provider communication, health service use, and overall patient outcomes ([Israel et al., 2014](#)).

Another reason for specifying and testing specific theories that include causal clauses is to identify when and how to best intervene. For example, secure attachment has been related to optimal self-regulation; early interventions that teach parents parenting skills may help the parents raise self-regulated children and conscientious adults ([Drake, Belsky, & Pasco Fearon, 2014](#)). Motivation, which has implications for productivity and health, is influenced by parental behaviors and beliefs, peers, and the school environment. In the Dunedin Multidisciplinary Health and Development Study, childhood self-control predicted numerous midlife outcomes (including education, health, wealth, crime, parenting, and life satisfaction) in a linear fashion, suggesting that even children with good self-control benefit from improving their self-control skills further ([Israel & Moffitt, 2014](#)). However, the extent to which levels of self-control and other personality traits change through intervention has yet to be established.

The idea for personalized medicine and timely interventions certainly has merit, but the feasibility of such approaches needs to be tested ([Israel & Moffitt, 2014](#)), and ethics need to be carefully considered. Again, the theories underlying personality and health relationships should inform the assessments and interventions that are conducted.

Conclusions

Once the flaws and limits of single-factor, single-disease approaches such as the Type A personality were documented, the need for studying multiple personality factors predicting multiple outcomes emerged (Friedman & Booth-Kewley, 1987). Since then, the Five Factor Model has provided a useful heuristic lens for studying the personality side of personality–health relations. With a small, core set of factors, which at a broad level represents the universe of personality traits, multidimensional studies can be conducted. The resulting body of research has produced strikingly replicable results.

Conscientiousness has the clearest and most important influence on health. Its effects are comparable to or larger than those of many traditional medical risk factors (Chapman et al., 2011; Friedman & Kern, 2014; Shanahan et al., 2014). The other four factors are also important, but their effects depend more on situations and life paths. Personality matters for health, but typically not in simple or straightforward ways; the two are connected through a complex array of intertwined circuits and wires. For example, individuals high on Extraversion, seeking stimulation and interactions with others, may develop unhealthy drinking and drug abuse if they attend a “party” college and proceed into a carousing career; but the same level of Extraversion might prove helpful when it leads individuals to establish good social networks of caring friends. Multiple pathways occur—behaviors, interactions with other people, situations encountered, the social context, and inner physiological reactions all are impacted by personality and in turn shape personality over time.

We have also emphasized the health outcomes side of the equation and the importance of postulating and testing mechanisms and pathways. Personality is a naturally valuable concept for understanding health because it captures biological bases, health behaviors, and situation selection, and it involves homeostatic forces and changes over time. For example, the neurotransmitter serotonin is related both to Conscientiousness and to a myriad of bodily homeostatic functions. As we have seen, conscientious behavior in turn often involves a variety of health-protective actions, ranging from less likelihood of smoking and risk-taking activities to safe driving and regular medical check ups. And Conscientiousness also leads to a host of healthier psychosocial environments, from more education and career success to better marriages (Friedman & Martin, 2011; Shanahan et al., 2014). More complete models of personality and health are important for identifying and

clarifying causality, which in turn influences how and when interventions should occur.

Modern personality research based on a five factor approach is clarifying the patterns, predictors, and trajectories of health and longevity. Big data, longitudinal studies with multiple outcomes including longevity, and other innovative empirical approaches can be combined with a growing array of advanced statistical methods, making it possible to test complex, dynamic models of life trajectories. There is no longer a need for short-term studies that correlate a trait and a disease. Instead, by unraveling the causal pathways, we can develop interventions that will be better informed and more effective, providing considerable value to both individuals and society.

Cross-Over Analysis Using the Five Factor Model and NEO Personality Inventory-3 for Assessing Compatibility and Conflict in Couples

Ralph L. Piedmont and Thomas E. Rodgerson

Abstract

This chapter describes the application of the Five Factor Model (FFM) of personality description for couple therapy; more specifically, cross over analysis. Cross over analysis concerns a comparison of each person's self-description with the description provided by the spouse. The FFM offers a compelling basis and means for a couple therapeutic analysis and intervention. It provides a clear, simple means to understand language for describing motivations and conflict that couples can easily understand and apply. Second, the availability of a validated rater form provides an effective and compelling medium for couples to express their own expectations about each other. Finally, an FFM cross over analysis can provide for clinicians' insight into the motivational forces that may be creating conflict and dissatisfaction for the couple.

Key Words: Five Factor Model, couple therapy, cross over analysis, marital therapy, marriage and family therapy, NEO PI-3

Although divorce rates of 50% for American couples (National Center for Health Statistics) and 45% for European couples ([Hahlweg, Baucom, Grawe-Gerber, & Snyder, 2009](#)) could be taken as indicative of the need for couples therapy, it could also be argued that they are indicative of the failure of much couple therapy, given the data of outcome studies over the past 30 years. Jacobson's ([Jacobson & Christensen, 1996](#)) early outcome studies led to the conclusion that "novice graduate students, with no previous clinical experience, could produce outcomes with behavioral marital therapy that were as good as or better than those produced by trained professionals" (p. vii). Applying clinical significance analysis to a number of published clinical trials, he discovered that a 50% success rate was characteristic of marital therapy outcome research generally and not unique to a behavioral approach

(Jacobson & Addis, 1993; Jacobson & Christensen, 1996). Other long-term studies of treatment gains in couple therapy showed that 56–58% of couples were unchanged or deteriorated from their pretreatment status (Jacobson, Schmalin, & Holtzworth-Munroe, 1987; Snyder, Wills, & Grady-Fletcher, 1991) and only 56.4% of couples in conjoint forms of therapy and 29.8% of couples treated in nonconjoint formats were still married 5 years after therapy (Cookerly, 1980). More recent long-term studies have shown a 51–56% maintenance rate of treatment gains for behavioral couple therapy and emotionally focused therapy in 6 months to 2 years of follow-up (Byrne, Carr, & Clark, 2004) and a 45.9% rate of maintained significant improvement after 5 years for Behavioral Couple Therapy couples and 50% for Integrated Behavioral Couple Therapy (IBCT; Christensen, Atkins, Baucom, & Yi, 2010; Jacobson & Christensen, 1996).

The experience of many clinicians may be parallel to such data. On the one hand, they may experience a high level of demand for couple therapy. On the other hand, they may still be searching for a form of therapy that consistently contributes to positive outcomes. It is the intent of this chapter to show that use of the NEO Personality Inventory-3 (NEO PI-3; McCrae & Costa, 2010) has significant clinical value in the early assessment phase of couple therapy and has a unique contribution to make in the construction of a way of understanding that can contribute to positive outcomes in couple therapy. Information from the NEO PI-3 can enhance the clinician's ability to interpret controlling variables, to provide new meaning for old differences, to set limits, and to foster acceptance.

Whatever the form of couple therapy chosen by the clinician, there usually follows some form of assessment that leads to an understanding of the problem(s) and to a subsequent treatment protocol. Depending upon the assumptive world of the clinician, assessments can range from clinical interview style questions to pen and paper tests. Although clinical interview questions grounded in the theoretical approach and experience of the clinician are the sine qua non of assessment, pen and paper forms of "data" collection provide additional input into the level and nature of distress, interpersonal versus intrapersonal issues, the level of commitment, perception of positive and negative behaviors, direction of desired change, temperaments, and personality characteristics.

The value of personality assessment to the clinician is 5-fold. First, it provides an ability to discern if the intrapersonal issues are of such

overriding concern that couple therapy is not warranted at this time. There may be significant mental health issues in one or both members that need to be addressed before couple therapy can be effective. Second, assessment enables the clinician to determine if both parties are invested in the process, and if critical issues such as domestic violence are a concern. Third, assessment instruments provide a means for the clinician to gauge the degree of change that might be expected and to guard against overfunctioning to elicit change. Fourth, measures of personality, such as the NEO PI-3, provide another, objective way of framing differences that enables the clinician and the clients to discuss difference in nonreactive ways. Finally, assessment contributes to a way of understanding that moves from a focus on derivative variables and techniques to controlling variables that underlie given behaviors ([Jacobson & Christensen, 1996](#)).

By way of illustration, IBCT is a form of therapy that has demonstrated sustained treatment gains over 5 years and with divorce rates only at 25.7% after 5 years ([Christensen et al., 2010](#)). This form of therapy integrates traditional behavioral approaches with systems theory and Eastern philosophy, and builds upon the work of [Linehan \(1993\)](#) in her proposed treatment of borderline personality disorder. The missing link according to this theory has been *acceptance*. [Jacobson and Christensen \(1996\)](#) found that although traditional behavioral therapy might work with couples who were able and willing to change, it was acceptance that made the difference for those with incompatibilities and truly irreconcilable differences. Central to the work of acceptance is the ability to come to a “formulation” in which a couple understands the core theme, polarization process, and mutual trap in many of their interactions.

The formulation provides an organizing principle for both therapist and client. Once therapists have formulations, there is something to refer back to when couples have conflicts either during or between therapy sessions.... For the partners, the formulation becomes a context for making sense out of a confusing, desperate, hopeless, and painful relationship.

([Jacobson & Christensen, 1996](#), p. 57)

They go on to say, “The primary purpose of assessment is to come up with a formulation, which will serve as the basis for a treatment plan” (p. 59).

Although this chapter does not intend to advocate for one form of couple therapy over another, only taking IBCT as an example, it does advocate for the importance of a clear assessment in any therapeutic approach. Because couple therapy is a complex, multidimensional experience, assessments can

be conducted on a number of different levels, each with its own insight. The goal of assessment is to help construct an image and/or formulation of the relationship that can be discussed and examined by the couple and their therapist. The next section will outline the three levels on which assessments can be made.

Types of Couples Assessments

The goal of couple's assessment is to capture important aspects of the relationship that impact personal satisfaction and dyadic harmony. We see three types of assessment that approach the relationship from different perspectives and can be used in addition to the clinical interview. The information each provides varies in terms of complexity. Each is described in turn.

Level 1 Assessment

Measures at this level of analysis capture individual perspectives on satisfaction and harmony. These are the most basic and straightforward measures; they simply query each person separately about how satisfied he or she is. Measures such as the Locke–Wallace Marital Satisfaction Scale ([Locke & Wallace, 1959](#)) typify scales of this nature. Because the goal of these assessments is merely to identify an individual's perspective, no attempt is made to compare or contrast responses with the partner. It does provide an overall index of the individual's levels of satisfaction with the relationship. However, this level of assessment does not provide any context for evaluating these perspectives.

Level 2 Assessment

Measures at this level attempt to incorporate information from *both* members of the couple about their beliefs, feelings, and attitudes. Essentially, measures at this level involve the comparison of self-reported scores from each person on a common set of questions. Responses are then compared and discussion/dialogue between the members can proceed. The ENRICH/PREPARE ([Olson, Fournier, & Druckman, 1987](#)) scale characterizes measures at this level. Here each individual expresses his or her expectations about various aspects of the relationship and these responses are compared between the two.

Level 3 Assessment

At this level an active effort is made to obtain a more complex, dynamic assessment of the couple. With this mode of assessment, self-reported scores are obtained and compared with ratings from the partner. This level of analysis attempts to address the more interactive aspects of the relationships: how perceptions of your partner may impact the quality of the relationship for the rater. Such comparisons call attention to how much or how little the individuals understand themselves and each other. Lack of agreement between the self and observer rating may indicate specific areas of contention *for the rater*. At this level, measurement scales attempt to summarize in static form the on-going processes that have been characterizing the couples' patterns of interpersonal interaction. The Taylor-Johnson Temperament Analysis ([Taylor & Morrison, 1984](#)) is an exemplar of this level. Its “criss-cross” paradigm systematically examines both the extent to which the two self-reports complement one another and the level of agreement between the self-ratings and the corresponding partner ratings.

The NEO PI-3 is another instrument well-suited for conducting Level 3 analyses of couples (see [Piedmont, 1998](#)). Unlike any other commercial measure, the NEO PI-3 is based on an empirically robust, comprehensive taxonomy of personality. This ensures that all relevant personological qualities have been assessed. The NEO PI-3 also has validated self- and observer rating forms, which are essential for conducting this type of analysis. It is important that the self and observer responses are standardized on *their own* normative distributions, thus enabling a direct, meaningful comparison of their resulting T-scores. *Cross-over analyses* can be easily accomplished using the NEO PI-3 computer scoring program, which can automatically plot the different combinations of responses on a common graph.

Self and Observer Ratings in the Assessment of Couples

In assessing individuals, there is no “gold standard” for finding the truth about the person. There is no one method or measure that provides a perfect, or even near perfect, account of the underlying nature of an individual. As such, assessors are forced to employ multiple types of measures that assess different aspects of the person. [There are four data sources: life outcome, self-reports, observer ratings, and test data. [Piedmont \(2005\)](#) describes the

value of each source.] Although no one method is perfect, using different methods that complement one another will help reduce error due to responding characteristics (e.g., halo effects, response styles). Identifying areas of convergence across methods provides high confidence in the veracity of a finding.

Self-reports are perhaps the most frequently employed method of assessment because of their ease of administration, scoring, and interpretation. Furthermore, the underlying assumption of a self-report is that the individual is in the best position to provide information about himself or herself (e.g., private beliefs and past behaviors) that may not be readily accessible to other persons. It seems obvious that if you want to know something about people, ask them. However, despite such an appealing paradigm, there has always been skepticism and mistrust surrounding the use of self-reports. Concerns about defensiveness, faking, and response distortions have always created a pall over such procedures and have led to the development of many different types of “validity” scales to correct for these sources of error (e.g., Schinka, Kinder, & Kremer, 1997). Despite the large literature that validates the use of self-reports, they do not provide a complete picture of people.

Observer ratings provide a counterpoint to self-reports (e.g., McCrae, 1994). Individuals providing ratings rarely have the same motivations to distort their responses as the target himself or herself. Raters are not necessarily committed to making the target appear “good” or socially desirable. Furthermore, raters provide another perspective on the individual, such as the type of social impressions he or she generates or a person’s reputation, which cannot be obtained from a self-rating. Although ratings have their own sources of error (e.g., halo effects, stereotypes), these biases do not overlap with the errors that are inherent to self-reports (McCrae, 1982). Thus, convergence between peer and self-ratings cannot be attributable to correlated error but to a *reliable* effect.

A large literature has developed demonstrating the cross-observer validity of the NEO PI-3, with self–other correlations on the five personality domains ranging from $r = .30$ to $r = .50$. Interestingly, the level of self–other agreement is, not surprisingly, stronger in married couples than in general samples [convergence coefficients in couples range as high as $r = .74$ (Costa & McCrae, 1992)]. That the NEO PI-3 personality domains do have such convergence makes it an ideal tool for use with couples. As we will show, it

will be the presence of *disagreements* between these two sources of information that will be indicative of some type of distortion in the relationship that may be causing levels of disharmony and conflict. We term the process of examining self–other agreement in a couple *cross over analysis* (COA).

Cross-Over Analysis for Assessing Couples

Research has already begun to evaluate the kinds of perceptions individuals hold of their spouses and the degree to which they correspond to spouses' self-perceptions. The underlying hypothesis is that the amount of congruence between a self-report and the partner's rating would be revealing of the level of satisfaction experienced by the *rater*. This approach goes by different names, such as *insight analysis* ([Megargee, 1972](#)) or *criss-cross testing* ([Taylor & Morrison, 1984](#)). Whatever its label, the approach provides a methodology for couple evaluation that focuses on the images each person holds of the other and the role these expectations play in facilitating marital adjustment.

The value of a COA is that it focuses on the central dynamic of the relationship: how each person perceives the motivations underlying the behavior of his or her partner. When individuals form committed relationships, they have an inner image of the person they believe their partner to be. These internal images generate certain expectations about their partner's behavior, both inside and outside the relationship. As the couple spends more time together, these expectations (or hypotheses) are tested. Behaviors are observed and the correspondence of these behaviors to the "expected" personality is evaluated. A good "fit" leads to more satisfaction in the relationship because the perceiver is able to accurately anticipate the behavior of his or her partner (e.g., [Gaunt, 2006](#)). Predictability in a relationship is hypothesized to lead to greater happiness and contentment. However, when the partner's behaviors are *not* consistent with the rater's implicit personality schema of the partner, the lack of predictiveness leads to dissatisfaction within the rater. The inability to correctly anticipate the actions of your partner is hypothesized to lead to an increased sense of dissatisfaction and interpersonal anomie. Perhaps the failure to predict is associated with heightened feelings of interpersonal isolation and decreased feelings of intimacy.

Another reason why the lack of congruence would be related to dissatisfaction is that the individual is misperceiving the motivations of the partner, which leads to misattributions of the partner's behavior. For example, Kevin may believe that his wife scores low on NEO PI-3 Neuroticism; she is thought by Kevin to be an emotionally stable person who is not prone to emotional outbursts and prolonged experiences of negative affect. If, however, his wife is indeed high on neuroticism, then Kevin will misattribute the reasons for her many complaints, her nagging, and her yelling at him. Rather than understanding these behaviors as a sign of her need for succorance and reassurance, he will instead interpret these behaviors as attacks on him. He may see her as very antagonistic, leading him to withdraw or to retaliate in kind. This, in turn, only exacerbates her feelings of loneliness and abandonment. A negative cycle of conflict and disharmony is created because Kevin does not accurately perceive the needs of his wife. Or his own personal needs are creating expectations for his wife that she cannot fulfill.

In either case, the nature and degree of cross-observer congruence between a rating and a self-report can be a useful barometer of the levels of satisfaction in the couple. It can outline the motivational dynamics that may be precipitating and maintaining conflict. It is important to note here that the disagreement between the rating and the self-report is diagnostic of the lack of satisfaction in the *rater*. If the rater has misperceived the partner, then he or she will be unable to accurately anticipate the partner's behavior and/or be led to make incorrect attributions of the partner's motivations. In either case, the individual has a tenuous grasp of the interpersonal context of the relationship and this leads to conflict and unhappiness.

The value of the NEO PI-3 in this context is 3-fold. First, the NEO PI-3 provides a useful language for talking about and describing personality. The Five Factor Model (FFM) of personality is an empirically robust, comprehensive model for organizing traditional personality traits. It provides a clear, simple means to understand language for describing motivations and conflict that couples can easily understand and apply. Second, the availability of a validated rater form makes the NEO PI-3 an ideal medium for couples to express their own expectations about each other. Finally, it provides for clinicians' insight into the motivational forces that may be creating conflict and dissatisfaction for the couple. These patterns may

suggest intervention strategies that would benefit the couple. [Taylor and Morrison \(1984\)](#) provide a good description of the value of COA:

The test can be effectively used to shift the focus from the immediate complaints to an examination of the influence of the two personalities; as well as to develop an understanding of the interpersonal dynamics involved. [COA]...can help the couple objectify their problems and focus more on the role played by their individual personalities and behavior in the overall situation. (p. 17)

Aside from identifying aspects of conflict in a relationship, we believe an evaluation of self-ratings versus observer ratings can also be used to identify aspects of compatibility for each partner in the relationship. To examine for compatibility, we would compare the self-report of one person to the ratings that individual has of his or her partner. To the extent that the partner is viewed as having qualities that complement the characteristics of the rater, then the rater would experience higher levels of satisfaction with the relationship. This approach underscores the assumption that it is the images we carry of our partner that play a significant role in how we interpret and experience the relationship. Of course, if the perceptions a person has of his or her partner do not match the reality of who that person is, then feelings of enduring compatibility may prove elusive.

Performing a Cross-Over Analysis

To conduct a COA, a couple must complete the NEO PI-3 for both themselves and their partner. This generates four separate profiles for each couple. The NEO PI-3 works well in this context because it provides self-report and observer booklets as well as separate norms. Scores can also be readily translated into T-scores, and the resulting profiles can be jointly plotted on the same profile sheet. In addition, the NEO PI-3 computer scoring program has the capacity to combine a self-report and an observer rating into a single report, and it will statistically compare the two profile in terms of comparability (an overall profile congruence coefficient is calculated that quantifies the extent to which the two sets of ratings are similar) as well as determine whether any facets are significantly different. The computer program can also generate a simultaneous plotting of both profiles. The graphs produced for this chapter were generated by the scoring program.

Step 1: Comparing the Self-Reports

Self-reported scores provide a statement of how people perceive their strengths and liabilities. These scores work directly from their self-concepts and presents their perceptions of what motivates them and the goals they are pursuing. A comparison of these profiles can provide information about how well the two individuals may complement each other temperamentally. Although the research literature suggests that happier couples will tend to be more alike temperamentally than less satisfied couples (Buss, 1984, 1991; Gaunt, 2006; Keller, Thiessen, & Young, 1996), there are times when differences may not be problematic. This section will outline some strategies for analyzing these data.

By evaluating these data, a clinician can identify motivational patterns that are likely to complement each other and those that may not. Furthermore, an analysis of the self-profiles can also provide insight into the tone and texture of the relationship itself. Couples may wish to explore the expectations they have for themselves and the relationship.

We will provide some general hypotheses about how the five personality domains should relate to one another. Considering facet level agreement would open up this type of analysis to another level of detail and precision. However, for the purposes of our brief review here, we will constrain our comments to the domain level. It should also be kept in mind that the comments we provide are general ones, and there may be instances in which gender differences in the combinations may also be important. One final caveat: when analyzing couple data, it is important that profiles are examined configurally (i.e., a full consideration is given to how the various facet scores may combine to create a specific, individual personality style). Specific facet combinations may suggest potentially good couple compatibility whereas merely considering domains scores may suggest otherwise. COA is a complex interpretive endeavor that requires a high level of skill and a broad knowledge of the construct validity of all 35 scales included in the NEO PI-3 from the practitioner. Reliance on simple interpretive formulas can quickly become inadequate.

Concerning NEO PI-3 Neuroticism, perhaps the ideal combination would be if both individuals were low on this dimension, indicating that each is emotionally stable, hardy, and resilient. Having two people with good coping skills suggests that together the couple will be well equipped to manage external stressors and internal conflicts. Each person can be emotionally

available to the other in times of need. Another complementing pattern would be if one member was high and the other low. Here, one person can provide emotional support and succorance to the other when needed. Of course, the person low on Neuroticism may find it difficult to obtain emotional support during his or her times of personal distress, although his or her own emotional adjustment can be helpful in periods of personal distress. In this high-low combination, it may be better if the woman was higher on Neuroticism than if the man was higher. The least preferred combination would be if both members were high on this domain. High scores would indicate that this relationship would be characterized by much emotionally charged energy; interpersonal conflict may be common. Individuals may find it difficult to have their partner meet their emotional needs, which may be heavy and continuous. The relationship may carry a lot of tension within it. With both people in distress, it may be hard for them to find balance and emotional succor without the help of outside forces (e.g., counselor, family). Even with support, there may be chronic feelings of dissatisfaction with the relationship. Couples thinking about entering a committed relationship may want to explore strategies for finding the emotional support they need.

With regard to NEOI PI-3 Extraversion, there does not seem to be any “toxic” combination on this domain. When couples are consistent on this domain (e.g., both high or both low), they create for themselves an interpersonal world that is consistent with their own temperaments. Whether being socially active and ascendant or being quiet and solitary, the couple shares a similar level of personal arousal and desire for interpersonal contact. Inconsistency on this domain (e.g., one person high, the other low) may not necessarily be problematic. Sometimes the introvert may find the energy and social stimulation that the extraverted partner brings to the relationship engaging and interesting. The extravert may feel that the introvert helps to keep him or her grounded. It is only when one partner feels that the other is making unreasonable demands that problems may occur. The extraverted person may feel that his partner is “a stick in the mud,” never wanting to socialize or to be involved in any type of social activities. The introvert may view her partner as a “good time Charlie” or as running away from issues in the relationship. This may create some resentment, with the extravert being seen as someone who spends too much time with others and does not attend sufficiently to the needs of the relationship.

In evaluating NEO PI-3 Openness, it is important to keep in mind that the dimension does reflect the types of values each person has. Regardless of how scores may or may not match on this domain, basic values and religious/political preferences ought to be examined. Does the couple share similar beliefs and priorities? This is particularly important for those couples who are both low on this domain. Such individuals may be traditional in their outlook and espouse conservative values. It would be important to determine that each person be clear about the values of the other. Lack of agreement on these values may prove to be the most distressing for the couple. Usually, couples who are low on Openness share common values and beliefs, having specifically sought individuals who share their world view. For those high on Openness, the lack of common values may be less problematic (given each person's strong capacity for tolerance and diversity), but it may contribute to the couple drifting apart as they pursue their own interests. This assessment of values will be of particular importance for couples that are inconsistent on this dimension. With one person clearly committed to some set of truths, the other may be more tentative about such commitments. It would be important to evaluate how the differing value orientations impact the relationship. Does the high open person find his or her partner rigid and traditional? Does the high open person feel confined and/or bored by the habits of the partner? Conversely, does the person low on Openness feel that he or she is being constantly challenged regarding his or her values? When the scores of the couple are in opposite directions, it would be important to discuss how the creative interests of one member are handled within the conventional orientation of the other.

Agreeableness is an important domain for consideration, given that it includes attitudes toward others. A couple in which both are high on this domain would be the ideal. Here, both individuals take a compassionate orientation toward others; they are willing to be helpful and will sacrifice for the other. They are trusting and modest and they seek to support and enable others. Such a couple can find it easy to work together toward common goals. Their trusting nature makes it easier for them to develop intimacy and build interpersonal bonds. Couples in which both are low on Agreeableness present an entirely different set of issues. With both individuals being manipulative, cynical, and distrustful, it will be hard for this couple to engage cooperatively in their relationship. Intrigue and dissimulation may be

quite apparent as each struggles to find a strategic advantage in the relationship. Having two individuals low on Agreeableness may be a toxic combination for a relationship, the key reason being their inability to reconcile once conflict erupts. Thus, for individuals low on Agreeableness, it may be important for them to find an agreeable partner. A partner high on Agreeableness would be less willing to retaliate when injured, would be more understanding and compassionate, and would be ready to make amends when emotional upsets occurred. Here again, though, there may be another gender difference: In discordant pairs having the female higher may be better than the reverse. We hypothesize that men often seek out partners who are accommodating, supportive, and “maternal” in orientation. Men sometimes harbor an expectation that they need to be assertive and dominant and to sometimes break the rules; after all, “boys will be boys.” In these cases women are expected to understand men’s churlish behavior. However, the opposite pattern is believed to be less optimal in this example. A manipulative, selfish, abusive female would have a more ruinous effect on the relationship, even when her partner is high on Agreeableness, because such behavior may be perceived as belittling the man’s sense of masculinity.

With regard to the NEO PI-3 Conscientiousness domain, optimal satisfaction may be found with couples who are discordant. Couples high on Conscientiousness are highly organized, motivated toward high standards of success, and personally organized and reliable. Although these are all laudable qualities, when both members are high on this domain the couple may be competing against each other. As with Openness, what are the goals these individuals are pursuing? Are they in conflict with one another and/or the relationship? In a dual career relationship, it becomes essential that the couple find ways to work together at building intimacy and closeness despite a hectic work schedule. When both individuals are low on Conscientiousness, there is a more relaxed family atmosphere that focuses on personal needs and gratification. Although it may be easy for such a couple to find the time to build closeness and intimacy, there may be issues around managing the logistics of the relationship. There may be problems with the individuals fulfilling their responsibilities and obligations, resulting in one person (or both) feeling put upon by the failures of the other. Discordant pairs may be more optimally configured, although ideally the “lower” partner on this dimension should be in the average range.

Low Conscientiousness is never a desired quality in a partner by someone who is high on this dimension. Individuals high on Conscientiousness always appreciate some level of personal organization and reliability in their partners who may be expected to provide essential support by managing the logistics of their lifestyle (e.g., caring for children, running the household). Here again, we hypothesize another gender difference. We believe in some cases that a woman scoring low on Conscientiousness presents less of an issue in the relationship with a man scoring high on Conscientiousness than the reverse. Regardless of their levels of Conscientiousness, women sometimes prefer men who are successful and can “pull their weight,” both emotionally and financially. For the woman low on Conscientiousness, a man average to high on Conscientiousness provides leadership and financial resources. For a woman high on Conscientiousness, the high scoring man is seen as a real partner in the relationship. The man scoring low may be perceived as being a sponge on the woman’s financial and emotional resources.

The hypotheses presented above simply represent broad interpretive strokes in an effort to convey the basic sense of how such an analysis should proceed. Also, some of these comments reflect more stereotypical behaviors that certainly will not generalize to all couples. Furthermore, we have limited ourselves to heterosexual couples, and these comments may not be relevant to lesbian and gay relationships. Given the space limitations of this chapter, we are not able to discuss what is meant by “high” and “low” scores; certainly different interpretations would emerge with individuals who are moderate or average on the various domains. In addition, the magnitude of scores needs to be considered when giving an interpretation. Most importantly, our interpretations made no reference to scores on the other personality domains. For example, interpretations about Conscientiousness scores need to proceed with consideration of the person’s level of Neuroticism. Extraversion and Agreeableness are also considered in tandem. Finally, Openness and Conscientiousness need to be examined together. To understand the personological implications of any personality score, it must be viewed through the filter of the other four dimensions. Information from the NEO PI-3 should also be combined with data obtained from other sources such as clinical interviews. For a fuller overview of interpretive strategies with the NEO PI-3, the reader is referred to [Piedmont \(1998\)](#).

Step 2: Cross-Over Analysis: Identifying Areas of Contention

The essential feature of the Cross-Over Analysis is the comparison of a self-report profile with that of the person's rated profile generated by an observer. As we have stated above, such a comparison speaks to the needs and issues of the person doing the rating. After all, self-other agreement is very strong in couples. Therefore, when areas of disagreement appear, they should be diagnostically revealing of the kinds of issues and problems the *rater* is experiencing with the partner. Differences are determined by subtracting the self-report T-score from the observer rating T-score (i.e., rating minus self-report). Differences of 15 points or more ought to be considered statistically significant. Significant differences on the domains indicate a general class of problems that the *rater* is experiencing. For example, a higher rating on Extraversion may suggest that the rater finds the spouse to be too dominant, overly involved with friends and acquaintances, overcontrolling, and taking too many risks. A lower rating on Extraversion may suggest that the rater finds the partner to be unaffectionate, passive, unassertive, and not communicating in the relationship. Significant differences on the facet scales may suggest more specific issues and areas of contention.

[Piedmont \(1998\)](#) provided data validating the usefulness of COA for identifying specific marital conflicts. [Table 19.1](#) presents some of the potential issues that may arise when raters perceive their partners as being higher or lower on each of the personality domains. For example, when the partner is rated higher on Neuroticism than he or she rates himself or herself, the rater may perceive the partner as immature, jealous, and complaining. If the rater sees the partner as lower on Neuroticism than he or she rates himself or herself, the rater may see the partner as being emotionally bland and as expressing too much emotional control. Significant differences on each personality domain are associated with specific types of perceived issues and points of conflict. The more dissatisfaction the *rater* is experiencing in the relationship, the more discrepancies there will be. The NEO PI 3 scoring program does calculate a profile agreement coefficient (PAC) when a rating and self-report are combined into a single report. This coefficient is similar in nature to a correlation coefficient in that it ranges in value from zero to one. Unlike the correlation coefficient, the PAC assesses agreement in terms of both pattern and magnitude (see [McCrae, 2008](#), for a review of this statistic). The program also provides an interpretive context

for evaluating the magnitude of this coefficient (i.e., denotes whether the level of agreement is below average, average, or above average).

It should be kept in mind that distortions in perception are not always bidirectional. It is possible that only one partner in a relationship is experiencing distress, and that person's PAC value should be low. Yet, the partner may have a higher level of marital satisfaction and evidence a higher PAC. Thus, COA can be useful in identifying which individual is having a problem and the corresponding issues that are at stake.

Step 3: Cross-Over Analysis: Identifying Areas of Compatibility

Although discrepancies between a rating and a self-report may indicate problems that the rater is experiencing in the relationship, an opposite approach may be helpful for identifying areas of compatibility. Specifically, a self-report can be compared to the rating of that individual's partner. To the extent that an individual perceives his or her partner as having qualities that can satisfy the rater's needs, then the rater should experience higher levels of relationship satisfaction. Whether the partner actually self-reports having those qualities is not the issue. Rather, it is the person's belief that his or her partner has those qualities that is important. We believe that there are certain personality combinations that would support enhanced feelings of compatibility in a relationship, and these patterns are provided in [Table 19.2](#). For now, these patterns represent a set of hypotheses that is in need of empirical testing. They have emerged from our work with couples both clinically and empirically. The patterns are slightly different for men and women, reflecting our belief that gender roles have an influence on the expectations individuals bring to their relationship.

Table 19.1. Potential Relationship Problems Experienced by Raters Who Perceive Their Partners Higher or Lower on the FFM Personality Domains

Personality Domain	Potential Problems ^a	
	Rated Higher on Domain	Rated Lower on Domain
Neuroticism	Feels inadequate, complains a lot, immature, jealous	Too calm, emotionally bland, too much emotional control
Extraversion	Always wants to “party,” hyperactive, shows little interest in my projects	Loner, aloof, has few or no friends, does not communicate
Openness	Snobbish, nonconformist, overly analytical	Uncultured, rigid, lacks emotional depth
Agreeableness	Unable to set limits, easily manipulated, gullible	Conceited, arrogant, selfish, cruel, confrontational
Conscientiousness	Compulsive, miserly, too regimented, expects too much from others	Self-centered, pleasure seeking, lazy, spends money too easily, unreliable

^a Items taken from the *Couples Critical Incidents Check List* (Piedmont & Piedmont, 1996).

Column 1 in [Table 19.2](#) breaks down the self-report score on each domain into three categories: low (T-scores below 45), average (T-scores between 45 and 55), and high (T-scores above 55). Column 2 presents those ratings a husband has of his wife that would lead to higher levels of compatibility, and column 3 presents those ratings a wife has of her husband that are related to higher levels of compatibility for her. For example, if a husband reports being low on Extraversion, then according to column 2 he would be happiest if he perceives his wife as being high on Extraversion. If she were rated low on Extraversion, this would represent a lack of compatibility. If a wife rated herself as being low on Extraversion, perceiving her husband as high on Extraversion would similarly indicate an area of compatibility, although if she rated her husband low on Extraversion, this would not necessarily be problematic as hypothesized for the husband. Although the patterns are similar for both genders, there are some subtle differences. For example, men low to average on Agreeableness would feel more compatibility with their spouses if they were high on Agreeableness. However, men scoring high on Agreeableness feel more comfortable with wives who are low on that dimension. For women, regardless of their own self-rated levels of Agreeableness, they feel most compatible with men who are high on that dimension. Women who rate their husbands as low on Agreeableness feel lower levels of satisfaction.

The value of this approach is that it allows for an assessment of what *may be* working in a relationship. Despite any conflict that may be present, it is

important to be equally aware of potential areas of satisfaction and support that may also be operating. These dynamics may be potential therapeutic resources that can be drawn upon in the course of treatment. However, it is not currently known how these sources of compatibility and contention operate relative to each other. Can a higher level of compatibility moderate the adverse impact of conflict? Regardless of levels of conflict, does a relationship need some level of compatibility to remain viable? These are questions for future research to address. Although there is currently no index that can quantify the level of compatibility, clinicians will need to apply their own judgment in applying the hypotheses found in [Table 19.2](#). Nonetheless, COA can help provide a way to conceptualize the complex dynamics of attraction and conflict in a manageable way. As noted in the previous section, levels of compatibility are not necessarily bidirectional. Patterns may exist that would provide a sense of satisfaction for one partner but not the other. The following section will present a single case of a couple who were in marital counseling and indicate how the COA can be applied in a therapeutically meaningful manner.

Table 19.2. Cross-Over Analysis Patterns Associated with Increased Levels of Compatibility

Self-Rated Personality Level	Husband's Rating of Wife	Wife's Rating of Husband
<i>Neuroticism</i>		
Low	Low N	Average N
Average	Low N	Low N
High	Low N	Low N (high bad)
<i>Extraversion</i>		
Low	High E (low E bad)	High E
Average	High E	High or Low E (average bad)
High	High E (low E bad)	High or Low E (average bad)
<i>Openness</i>		
Low	High O	Average to High O (low bad)
Average	High O	High O
High	Average O (low bad)	Average O (low or high bad)
<i>Agreeableness</i>		
Low	High A	Average to High A (low bad)
Average	High A	High A (low bad)
High	Low A	High A (low or average bad)
<i>Conscientiousness</i>		
Low	High C	Average to High C (low bad)
Average	Average to High C (low bad)	Average to High C (low bad)
High	High C (low bad)	Average to High C (low bad)

Case Study: Leigh and Ed G.

Ed is a 39-year-old white male with a college education who currently works as an Assistant Pastor in a conservative Christian church, having worked in a secular job for 15 years after attending a Bible college. He learned carpentry skills from his father, who was a self-educated man and an entrepreneur who built up his own business until it financially dissolved in the 1990s and he lost everything, including the house in which they lived. Ed said that he was not close to his father who worked all the time and on weekends watched television and drank. Ed described his mother as a “good woman who loves me, but she can’t show it.” He described her as “loud and heavy handed” and as a “ball of nerves, frustrated in her marriage and she took it out on me.” As the oldest child with one sister 2 years his junior, Ed felt as if he had to fend for himself with little nurture being given. Only in retrospect did he learn that his difficulties with math and reading in school were from his dyslexia. He reported some kind of a “nervous breakdown” in high school. Ed says that what he learned in his family system about marriage was what “not to do,” having observed an affectionless marriage with lots of anger and resentment (his mother always slept on the couch). His parents divorced when he was in college and he said he always feared the prospect of divorce and dysfunction in marriage. Ed said that he learned to cope with adversity in his family system by blocking out any stress, learning to be overresponsible, learning to “just take the hits,” including thinking of himself as stupid, wrong, or worthless, and learning to be outgoing to attract friends even though on the inside he knew he was a different kind of person.

Leigh is a 37-year-old white female with a Bachelor’s degree in Religious Education who currently works part-time as a paralegal in a local law office and has primary responsibility for their three children ages 9, 6, and 3 years. Leigh’s father was a dentist in her early years, but when she was about 10 years old he became the pastor of a church. After her parent’s divorce (when she was dating Ed) her father returned to his profession as a dentist. Leigh described her father as loving, kind, and strong, but also said that he was depressed and on medication much of her life. She said that she was “close to him,” but admits that he was never around. Leigh’s mother, who died of cancer in 2007, was a “drama-queen.” Leigh said that “Every major life event for me was ‘bombed’ by my mother’s drama.” As the oldest child with a younger brother (by 15 months) and sister (by 4 years), Leigh described

herself as the “stable one” in the family. She learned to cope with the frustrations in her life by going inward, being self-contained, and learning to rely only on herself. She said that what she learned about marriage from her family was that you have to be committed even if you are not happy and “God blesses that.” She said that she learned that marriage is hard work and the person just has to be obedient.

The couple has been married for 13 years. They began dating in college and dated for 4.5 years before they married. They admit to having conflict in their relationship from the beginning, but it became worse they said after the birth of their first child 9 years ago and has included times of physical violence perpetrated by both Ed and Leigh. Ed said that he decided to marry Leigh because during a difficult time in college when he was asked to leave the school “because I could not keep my mouth shut” she was “my friend and was on my team, giving attention to me and being the one person who was not against me. I developed a relationship and fell in love with her, but I was not ‘head over heels’ in love.” Leigh said that she married Ed because she liked his ideas and he became her friend. She appreciated his desire to follow God and be used by God. She said, “I felt the Lord was matching me with him to support and encourage him and, even though it was easier just to rely on myself and I knew that marriage would be a lot of work, the Lord said to ‘be with Ed.’ It was a logical decision for me. I decided analytically. I decided that he was ‘my family’ and I did not want him to leave.” For the past 7 years, the couple has lived in Leigh’s father’s house for financial reasons, with her father having moved to the basement.

Within the year prior to their coming to counseling, both Ed and Leigh had called individually to talk about setting up an appointment for marital counseling and to give their reasons for why it would be hard to come and why their spouse might not choose to come. The couple came to therapy after an incident in which Leigh pushed Ed and he blew up saying that he no longer cared what happened and that there was nothing he could do anyway. The senior pastor of their church was called in to mediate and required them to get counseling since in their conservative Christian church Ed would lose his job if they divorced. On her intake sheet where it asked for the reason for seeking counseling at this time, Leigh wrote, “Marital issues—my husband is angry and reached a level that can no longer allow for functioning or civility.” Ed wrote nothing in response to this question on his intake sheet. The couple attended eight counseling sessions between the months of July

2013 and January 2014, often canceling scheduled sessions. Several assessments were given to the couple early in an attempt to develop a working formulation of the couple's style of interaction. Although they were given the COA forms to fill out earlier, they delayed in returning the forms and the COA was not scored until October 31, 2013. Each person also completed the *Couples Critical Incidents Check List* (CCICL; [Piedmont & Piedmont, 1996](#)), a form that contains over 130 specific marital problems that have been linked with high and low scores on each of the FFM personality domains. Individuals check those behaviors they find problematic in the relationship (see [Piedmont, 1998](#), for more information about the scale and how it relates to COA scores on the NEO).

Essentially a Level 1 Assessment, the CCICL identifies specific personal qualities of the partner that are causing distress for the rater. These ratings can be usefully compared to the observer ratings of personality to determine whether the identified problem characteristics are consistent with the personality expectations that the rater holds of the partner. Discrepancies between these two sets of ratings provide a basis for exploring with the rater the reasons why he or she maintains a belief about the partner that is not substantiated by experiences. In addition, the individual elements of the measure identify very specific issues that are causing conflict in the relationship for each person (see [Table 19.1](#)). These items can be used as a point of departure in treatment for addressing areas of conflict.

Step 1: Comparing Self-Reports

[Figure 19.1](#) presents a comparison of Ed's and Leigh's self-report profiles. As can be seen, there are areas of similarities as well as areas of differences between the two profiles. The agreement coefficient for these two protocols is .40, indicating a low level of convergences across the two profiles.

On Neuroticism, both score similarly overall, but Ed scores higher on the facet scales of Self-Consciousness and Impulsiveness, whereas Leigh scores higher on Anxiety and Hostility. Both acknowledge on-going feelings of sadness and helplessness. Thus, Ed's negative emotionality surrounds feelings of personal inadequacy whereas Leigh's negative feelings center on anxiety and worry. Although both are high on Neuroticism, suggesting a very emotionally volatile combination, it is interesting to point out that both do score low on Vulnerability. This may suggest that each member has the ability to manage his or her personal distress in adaptive ways. Combined

with higher scores on Conscientiousness for the couple, it may be possible that they are able to manage their emotional weaknesses appropriately (i.e., in ways that may enable them to provide emotional succor to the other in their times of need).

The Extraversion domain presents some interesting areas of disagreement. Leigh is much less sociable and charismatic than Ed, who clearly prefers being with others and whose personal enthusiasm may attract many social contacts. This may create some stress in their lives as Ed will seek to identify and develop relationships, whereas his wife will prefer that they spend more time together and alone, including being away from him. Given Leigh's high level of Assertiveness, she may be very forthcoming in her ability to set limits on the number and types of social interactions in which she may be willing to engage. Thus, Leigh may find herself feeling anxious and uncomfortable by her husband's on-going desires to reach out into a larger social world. Ed, on the other hand, may find his wife manipulative and confrontational surrounding his social needs.

On Openness, there are significant differences between them. Ed is very high on this domain (and on five of the six facet scales) whereas Leigh is low on the facets of Fantasy, Feelings, and Values. Both share similar scores on Ideas. The contrasts on this domain are quite clear. Ed is very flexible, creative, inquisitive, empathic, and intellectually complex. Leigh, on the other hand, prefers more structure and focus. She is not very empathic and has a reasonable desire for structure and clarity. One area in clear need of examination is the Values facet. Leigh has some very strongly held beliefs that help define her worldview. Ed may be more flexible in terms of his own values. The extent to which Ed may not conform to Leigh's expectations (i.e., roles and duties of husbands and wives, religious/political values) would be a source of contention and conflict between the two. Although Leigh is high on Ideas, indicating a preference for "big picture" thinking and intellectual creativity, her lower scores on Feelings and Fantasy may provide a source of conflict for Ed. Although Leigh can converse on any topic, her ability to emote and process deep and powerful emotions will be limited. Ed may find that Leigh is unable to understand his feelings and is emotionally superficial. He may also find that she is rigid, dogmatic, and authoritarian on certain matters that are important to him. Conversely, Leigh may not appreciate it when Ed questions her world views. Ed scores high on Fantasy, indicating that he has a well-developed inner world in which he may like to

spend time. This would be something that Leigh may not understand. She tends to be quite realistic in her views and may find it difficult when Ed spends time in flights of fancy. It would be important to make sure that Ed does not use this inner world as a place of refuge in times of conflict in the marriage. He does not want to appear as if he is actually escaping from his relationship.

The couple continues to evidence many differences on Agreeableness, suggesting that they have some different views of others and their own sense of care and compassion. An inspection of the facet scales for this domain indicates fewer differences than one would be led to expect given the overall domain scores. Perhaps the two most important discrepancies to consider is that Leigh is much lower than Ed on Compliance and Tender-Mindedness. Leigh certainly likes getting her way. Interpreting this score in light of her high Assertiveness scale noted above, she may appear to be very confrontational and insistent in her desire to get her way. Coupled with the lower Openness scores, Ed may find Leigh to be uncompromising and unresponsive to his needs. Her lower Tender-Mindedness score in conjunction with her low score on Openness to Feelings may also create an impression of emotional detachment. Leigh may appear to be cold, punitive, and unfeeling. As someone who is intuitive, empathic, and having a well-developed inner world, Ed may find Leigh to be emotionally unavailable. It is interesting to note their comparable low scores on Trust, which may suggest a dynamic that may be complicating their relationship. Low scores on Trust indicate a tendency to be wary of others and their intentions. It would be necessary to explore how this motivation may be operating in their relationship to impede their ability to be vulnerable.

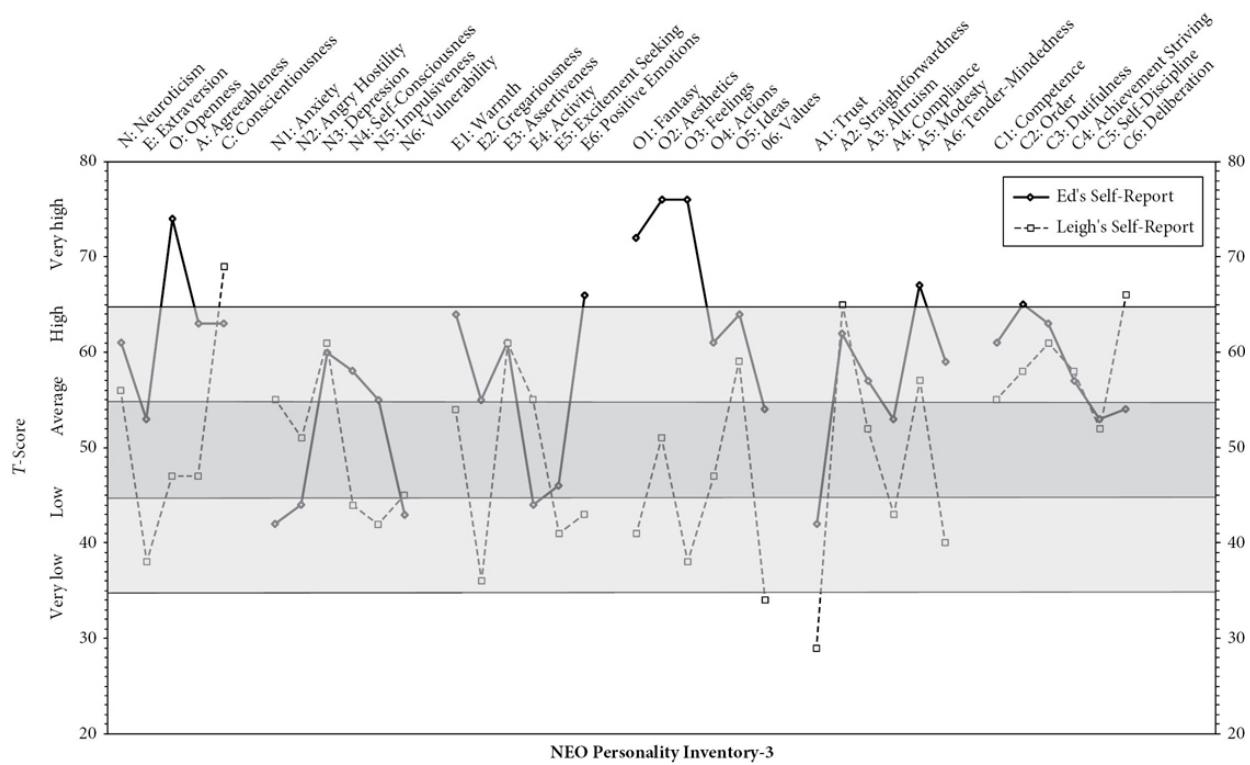


Figure 19.1. Combined self-reports for Ed and Leigh.

Finally, on Conscientiousness the two indicate their highest level of similarity. Both score high on this domain, and facet level scores are also very comparable to each other. As noted in the discussion on Neuroticism, the high levels of Self-Discipline and Deliberation can provide emotional resources for regulating whatever negative emotionality each experiences. They both share high levels of aspiration for themselves and work hard to reach their goals. It will be important, however, to understand how their drive and ambition are being expressed in the relationship. Are they pursuing similar goals? Are they competing against each other? Given the differences between the two noted above, it is important to consider how they manage situations in which their goals are divergent, such as in the area of social engagements.

The self-report profiles provide insight into some of the potential motivational conflicts this couple will have to deal with in their relationship. These will be on-going issues, and how they respond to them will set the tempo and texture of their marriage. It becomes important therefore to examine the cross-over profiles of the couple to determine how these conflicts may have shaped their perceptions of each other.

Step 2: Cross-Over Analysis

Analyzing Ed's areas of conflict. Figure 19.2 presents the self-rated profile of Leigh with Ed's observer rating. The NEO PI-3 combined report indicated a couple agreement coefficient of $-.17$, suggesting a very low level of convergence between the two ratings. This suggests that Ed may be experiencing high levels of marital distress. On the CCICL he rated his overall level of dissatisfaction as a "7," extreme dissatisfaction, very unhappy, and experiencing much conflict. Overall, Ed rated Leigh significantly lower on Agreeableness and Conscientiousness. An examination of the facet scales indicates significantly higher ratings on Angry Hostility, Impulsiveness, Vulnerability, and Warmth. Thus, Ed believes his wife is much more emotionally undercontrolled, hostile, anxious, and unable to cope with stress. High ratings on Neuroticism indicate that Ed sees Leigh as being emotionally selfish, self-absorbed, and unable to understand his feelings and needs. Such ratings indicate that these behaviors are found to be problematic by Ed. On the CCICL, he indicated that he found his wife *emotionally unstable, yells and screams frequently, can't receive criticism, is moody, and worries too much*.

Concerning Extraversion, both ratings indicate that Leigh is low on this domain. An examination of the facets indicates that Ed sees Leigh as being much lower on Warmth, Activity, and Positive Emotions. This pattern indicates a perception of Leigh as being cold, stoic, and unenthusiastic. Ed's ratings on the Interpersonal domain of the CCICL includes *unaffectionate, does not communicate, and is distant from others*. The similar high ratings on Assertiveness indicate a person who wishes to be in control and dominant. Ed's ratings of her on the CCICL confirm this: *too dominant, always want to be the boss, overcontrolling*. This rating in conjunction with low ratings on Compliance (A4) indicates that Leigh always wants to have things done her own way, leaving little room for compromise or accommodation. Lacking the feelings of warmth and acceptance, such forcefulness may be seen as aggressiveness and hostility by others.

The lower ratings by Ed on Openness indicates that he sees Leigh as being rigid, inflexible, and dogmatic. The very low ratings on Actions and Values suggest a perception of Leigh as having a high need for structure and clarity. The need for organization is accented by the low Values score, which may suggest that Leigh is seen as having a clear agenda by which things must be done. Again, Leigh is perceived as having little room for making changes or

being accommodating of the wishes of others. CCICL ratings include *intolerant of diversity, rigid, insensitive to the feelings of others, to set in his or her ways*. In conjunction with the findings discussed above, Ed may find that Leigh is a truly frustrating person to deal with. Rigid and emotionally distant/cold, Leigh demands that others conform to her wishes and beliefs. Little discussion is tolerated and all appeals are dismissed. Ed may find Leigh's intransience to be a constant source of frustration in the relationship.

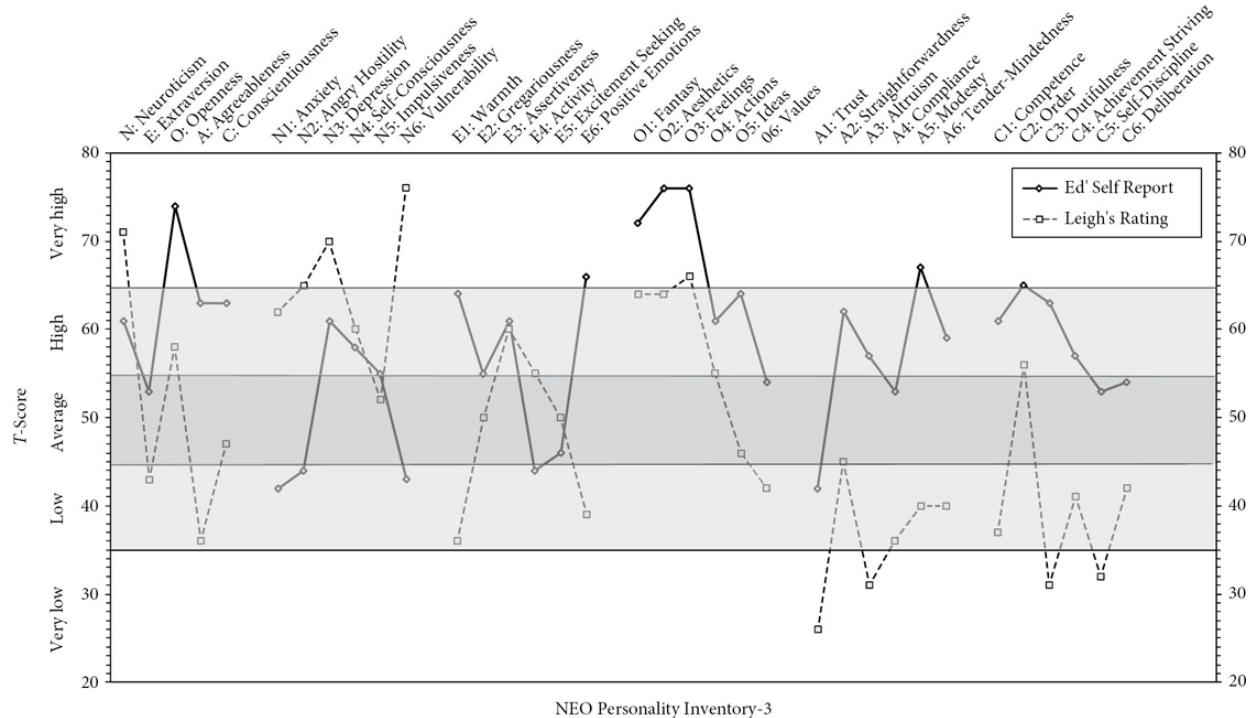


Figure 19.2. Ed's COA profile.

Agreeableness shows distinctive differences between the self-reports and observer reports. Ed sees Leigh as very low on Agreeableness, with ratings on all facets in the low to very low range. With the exception of Tender-Mindedness, Ed rates Leigh significantly lower on all the facets than she rates herself. Clearly, Ed sees Leigh as very antagonistic, manipulative, deceptive, and vengeful. Leigh is seen as capable of doing whatever it takes to get her way, including physical and verbal intimidation. Ed's ratings of her on the CCICL confirm his very antagonistic perceptions: *cruel, cynical, manipulative, confrontational, selfish, always does things his or her way, physically abusive*. The very low rating on Modesty also suggests that Leigh is perceived as being arrogant, condescending, and contemptuous of others.

Other ratings of her on the CCICL included *arrogant, conceited, “stuck on” himself or herself*.

Rounding out Ed's perceptions of Leigh are significantly lower ratings on the domain and facet scales of Conscientiousness. Whereas Leigh sees herself as having drive, ambition, and competence, Ed's ratings are all in the low to very low range. Low ratings on Conscientiousness indicate a perception of the person as being very self-oriented and pleasure-oriented. Such individuals are seen as requiring immediate gratification of their needs and as unable to control their own impulses well. They cannot be counted on to follow through on their commitments and are willing to cut corners to get what they want. There is little regard for the needs of others. Ed's CCICL ratings included *self-centered, sloppy/messy, breaks confidences, unable to maintain emotional intimacy*.

What emerges from this analysis is a perception of Leigh as being very much centered in her own personal world of needs and expectations. She evidences little understanding of and regard for the needs and feelings of others. Rigid, dictatorial, and very much physically confrontational in style, Leigh is seen as being immovable. Ed experiences little emotional warmth and intimacy in his relationship with Leigh. He perceives Leigh as being a very emotionally/psychologically strong woman, capable of firmly “pushing back” against him when in conflict. Ed may feel intimidated by her strong sense of self-confidence and personal power (high ratings on Assertiveness and low ratings on Self-Consciousness, Compliance, and Modesty). The low profile agreement coefficient indicates that Ed is experiencing a large amount of emotional distress and conflict in this relationship. There appear to be many areas of conflict, including Leigh's perceived intransigence, physical acting-out, and emotional detachment.

Analyzing Ed's areas of compatibility. The next question to emerge is, “Are there any aspects to these ratings that offer potential sources of strength?” [Figure 19.3](#) presents Ed's self-report scores alongside his ratings of Leigh in order to examine areas of potential compatibility. We will use the hypotheses presented in [Table 19.2](#) as a guide for this analysis.

Ed scores himself high on Neuroticism and whereas Leigh is rated as having an average score on the domain, she is rated as being higher than Ed on four of the six facet scales for the domain. Thus, her rated levels of Neuroticism are not in the low range and may be interpreted as being high. There is little evidence here for compatibility. Considering Extraversion, Ed

scores average and would benefit from having a wife high on this domain. Leigh is rated as being low and therefore does not offer a compatible profile. A similar pattern emerges for Openness. With Ed scoring high on this domain, it is expected that a wife who is average on this domain would be ideal. Leigh scores in the low range, which is considered to be particularly toxic for a man high on Openness.

The Agreeableness domain seems to offer some level of compatibility. With Ed scoring high and Leigh being rated low, this seems to be a positive combination. A person scoring high on Agreeableness may find some comfort and personal security in a partner who is low on this dimension. This may be an issue to explore and develop; how Leigh provides a safe “space” for Ed. Her sense of conviction and perceived personal power may provide some compensation for and clarity to Ed’s lowered sense of self-esteem and emotive/intuitive approach to life. However, the negative patterns on the other domains may mitigate any positive effects generated by this combination.

Finally, another noncompatible combination is found for Conscientiousness. A high score on this domain for Ed would hopefully find a similar high rating for Leigh, but just the opposite is found. Overall, there appears to be little evidence of compatibility of Ed with Leigh in these ratings. With little perceived motivational incentive for coming together and a high level of experienced distress, it will be important to explore what is keeping Ed in the relationship. Perhaps it is his sense of dutifulness and the need to stay in the marriage “for the kids.” It may also be possible that he may feel “safe” with Leigh; she is a very strong psychological individual. Given his high self-ratings on Agreeableness, Self-Consciousness, and Feelings, Ed may believe himself to be an emotionally sensitive and vulnerable person who finds some psychological protection in his relationship with Leigh.

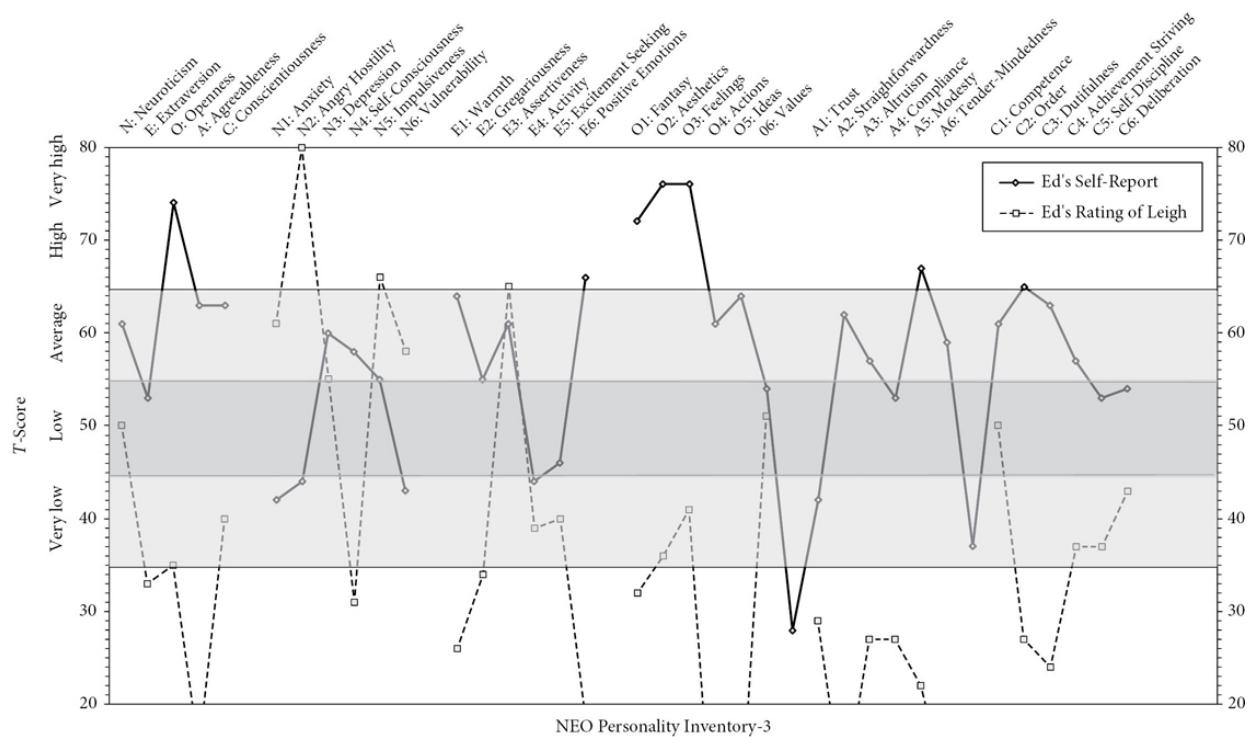


Figure 19.3. Ed's COA compatibility profile.

Analyzing Leigh's areas of conflict. Figure 19.4 presents Ed's self-report along with Leigh's rating of him. From the NEO scoring report, the congruence coefficient is .11, suggesting a low level of agreement. Leigh appears to be equally inaccurate in describing Ed's personality. On the CCICL Leigh also rates the level of dissatisfaction in her relationship at "7," indicating extreme dissatisfaction, very unhappy, and much conflict. There are a number of significant (i.e., 15 point differences) differences between the two profiles (19 of the 35 scales), indicating many areas in which Leigh may not clearly understand Ed's motivations.

Leigh rates Ed very high on Neuroticism, although Ed's self-reported score is also in the high range. Although accurately noting Ed's high scores on Depression and Self-Consciousness, Leigh also sees Ed as being high to very high on Anxiety, Angry Hostility, and Vulnerability. Leigh perceives Ed as being very emotionally labile and fragile. In addition, she believes that he is not adept at coping with these negative feelings and acts them out. On the CCICL Leigh indicated that she found Ed to be very needy and selected descriptors of him that included *immature, easily panics, feels inadequate, hostile attitude toward others, moody*.

On Extraversion, Leigh rates Ed significantly lower on Warmth and Positive Emotions. Although Ed may see himself as a welcoming, engaging person toward others, Leigh does not experience any charisma or approachability. Overall, she rates Ed low on Extraversion; this suggests that in conjunction with her high rating of him on Neuroticism, she believes that Ed has a poor sense of both well-being and emotional adjustment. Any interpersonal motivations are perceived to reflect Ed's tendency to seek reassurance and succorance from others. Leigh also rates Ed high on Assertiveness, and this may suggest that she perceives his interpersonal style to be controlling and manipulative. On the CCICL she indicated on the Interpersonal domain that she found Ed to be *too dominant, always wants to be the boss, overcontrolling, unaffectionate*. Thus, Ed's interpersonal style is perceived as being very selfish and egoistic. Ed is seen as actively reaching out to others in order to manipulate others into meeting his needs. He seems to lack much interest in the needs and feelings of others.

Leigh does indicate more agreement with Ed's ratings on the Openness domain. She acknowledges his investment in his inner world (high ratings on Fantasy, Aesthetics, and Feelings) and his focus on inner experiences. Less agreement is seen with the facet scales of Ideas and Values, in which Leigh sees Ed as much more dogmatic and rigid in his views. Leigh may experience Ed as having a clear agenda about how their relationship must proceed, along with all the ancillary expectations that arise from such a clear cut worldview. Leigh appears to believe that there is little flexibility in Ed's ability to accommodate her needs. On the CCICL Leigh rated Ed as *sees the world in black or white terms, rigid, insensitive to the feelings of others*. An interesting pattern of ratings is found for Leigh. On the one hand, she sees her husband as being empathic, emotionally sensitive, and having a well-developed inner life. On the other hand, Ed evidences some rigidity and strong authoritarian attitudes. This contrast can give rise to perceptions that Ed is selfish, manipulative, and egotistical. He can well articulate his needs and how he believes they need to be addressed by others. This clarity may create the impression that although he knows what he wants, he is not considering the feelings/needs of others.

The Agreeableness domain provides the greatest differences between the two sets of ratings, with Leigh seeing Ed as being much more antagonistic, selfish, and manipulative than he sees himself. All of Leigh's ratings are significantly lower than the corresponding self-report and are in the low to

very low range (with the exception of Straightforwardness, which is on the cusp between low and average with a T-score rating of 45). Leigh's ratings on the CCICL clearly capture her perceptions of Ed: *cynical, stubborn, cruel, “stuck on” himself or herself, selfish, manipulative, guarded, arrogant, conceited, confrontational, suspicious/nontrusting, always does things his or her way*. Such low ratings on Agreeableness may also indicate that the partner acts out in ways that hurt or injure the rater. Those low on Agreeableness are not beyond using physical force to attain their goals. On the CCICL Leigh does note the following issues in their relationship: *physically abusive, mocks me in front of others, verbally abusive, romantically insensitive, fails to take a stand on issues I think are important*. It is clear that the tensions in the relationship do spill over into overt (public) behaviors. It would need to be explored how extensive the physical and verbal abuse is.

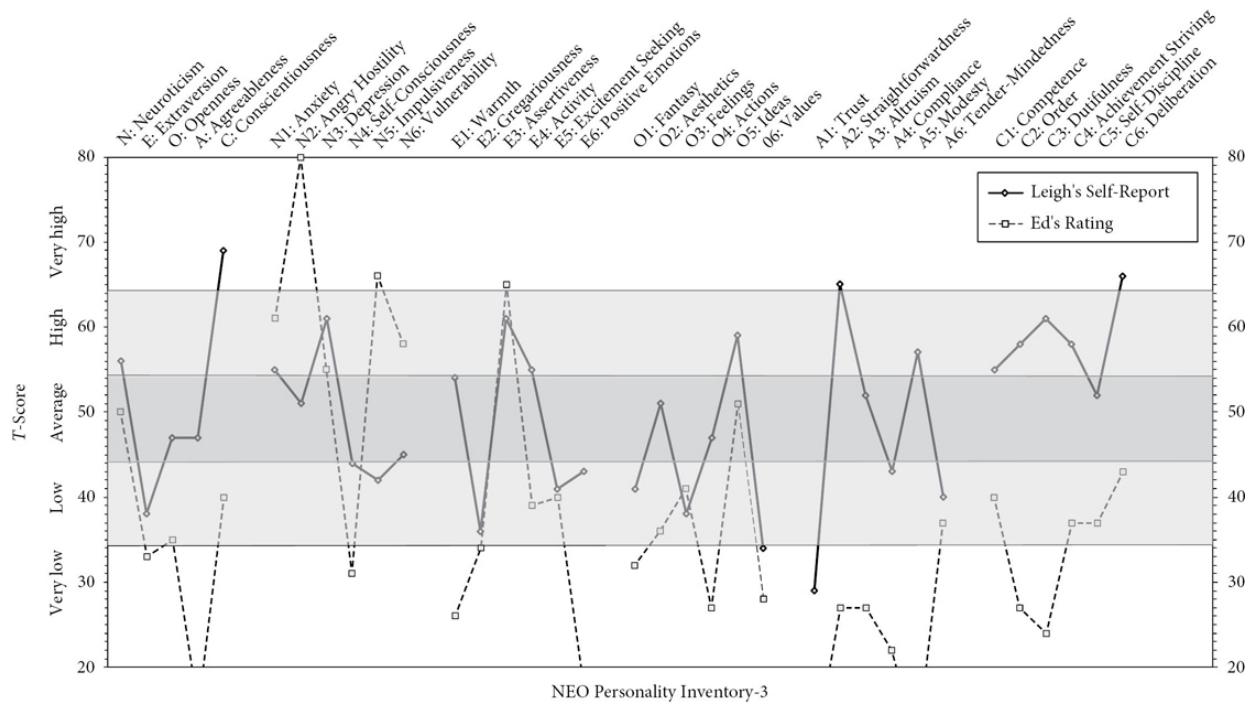


Figure 19.4. Leigh's COA profile.

Finally, Leigh rates Ed lower on all the facets of Conscientiousness with the exception of Order, where he rated in the high range. Significantly lower ratings are found for Competence, Dutifulness, Achievement Striving, and Self-Discipline. This pattern indicates a perception of Ed as being very interested in his own immediate gratifications. He is not ambitious or

forward looking, and can easily be persuaded to put off his work to pursue more pleasurable activities. In conjunction with the low ratings on Agreeableness, these lower scores would also suggest that Leigh experiences Ed as being exploitative in his actions, using others as “things” for his own interest. Little consideration, respect, or mutuality is recognized in this pattern of ratings. Leigh rates Ed on the CCICL as being *self-centered, unambitious, and unreliable*. The high rating on Order may continue to reflect Leigh’s perception of Ed as being rigid and structured. His desire for order may work out of his need to control and contain his feelings of inadequacy and anxiety. Giving form and strength to this need for order are the perceived authoritarian attitudes that demand strict adherence to specific patterns of behavior and action.

Overall, it is clear the Leigh is experiencing quite a bit of distress in the relationship. She views Ed as an emotionally underregulated individual who reaches out to others to provide him with emotional support and satisfaction. His motives are perceived as being selfish and exploitative; he seems to show little interest in or consideration for the needs and desires of others. Failure to comply is met with both physical and verbal abuse. There is a perceived rigidity in Ed that makes Leigh believe that compromise or change is not an option. However, an examination of areas of compatibility may provide perspectives on potential areas in which the relationship may have strengths. [Figure 19.5](#) provides an analysis of compatibility based on Leigh’s self-report scores and her ratings of Ed. Using the hypotheses in [Table 19.2](#), areas in which the relationship may provide some positive connections will be examined.

Analyzing Leigh’s areas of compatibility. Concerning Neuroticism, Leigh’s high self-score would require a partner who is low on this domain, which is not the case with Ed who is rated high. Two individuals scoring high on Neuroticism would generate much negative affect in the relationship. Without appropriate psychological mechanisms to regulate these emotions, conflict can quickly ensue. Thus, it is not surprising that there is much tension in this relationship.

Another lack of fit is found for Extraversion. Leigh’s low score on this domain indicates that she would seek out someone who is high. Although both have high scores on Assertiveness and Activity, the lower scores on the remaining facets indicate that there are few positive emotions being experienced. On a more positive note is the pattern observed on Openness.

Leigh's average score on this domain indicates that she would seek out someone high, which is the case here for the domain score. Ed being rated as high is compatible with Leigh's self-reported level. Ed exhibits much more comfort with his inner world of experiences and feelings than does Leigh. He may be able to provide Leigh with a language and structure for her own efforts at understanding her inner life and emotions. However, Leigh's ratings of Ed also indicate that he is more stereotypical in his thinking and worldview.

On Agreeableness, Ed's low rating is at odds with Leigh's own average self-reported score. Ed's low Agreeableness is not compatible with Leigh, who may find Ed's need for autonomy and control in conflict with her own desires for the same. Finally, on Conscientiousness there is nominal compatibility: Ed's average rating is consistent with Leigh's high self-reported score. However, an inspection of the facet scales indicates that Leigh rates Ed low on all the facets except Order, on which he scores very high. It seems that the rating on this one facet is what is moving the overall score into the average range. It would be worth exploring how Ed's level of orderliness can be used to build rapport with Leigh, who also shares a high score on this facet.

Overall, it may be possible that Leigh's attraction to Ed may form around three dynamics. First, she does experience high levels of negative affect, particularly around anxiety and depression. Ed's facility with managing and discussing emotions, especially negative feelings, may provide her with a means for confronting, discussing, and managing these feelings. Leigh may find it comforting to know that her negative feelings are not off-putting to Ed. A second area of compatibility may be found in Ed's high level of Assertiveness, comparable to Leigh's. When she gets "pushy" and demanding, she may find comfort in knowing the Ed will "push back" and not retreat. Finally, Leigh sees herself as very focused and driven. She has set goals for herself that she works systematically toward attaining. Her competitive efforts may find support in Ed's perceived low scores on Values and Ideas, as well as his high score on Order. He may provide Leigh with ancillary emotional support and reinforcement for her own ambitions.

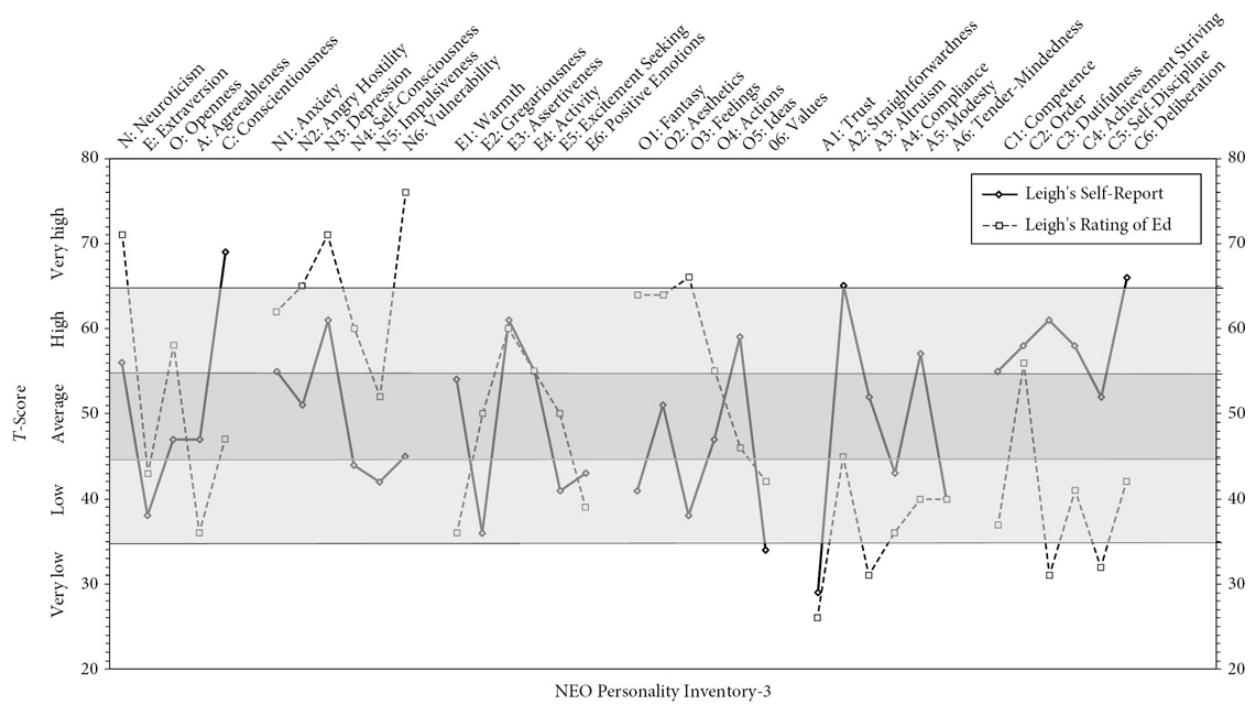


Figure 19.5. Leigh's COA compatibility profile.

Interpreting the Cross-Over Analysis Findings

The most distinctive aspect of this couple's protocol is the mutual lack of perceptual accuracy in their ratings of each other (profile agreement coefficients of $-.17$ and $.11$ for the husband and wife, respectively). This level of distortion underscores the extreme amount of marital discord that is being experienced by each partner. The patterns of these distortions are similar for each person. Each sees the other as rigid, selfish, manipulative, self-involved, and abusive. Each sees high levels of emotional dysregulation in the partner and that is creating high levels of objective distress and negative affect. That each sees the other as being rigid and locked into their own perspective may indicate that the couple has reached an impasse in their relationship. Whatever discussions are occurring between them, it may have reached that point at which they are unable to be flexible; doing so may result in a “loss of face” in the relationship and indicate weakness.

Another area of concern is the low self-report ratings on Trust for both individuals. People low on trust are cynical and skeptical and assume that others are dishonest and threatening. As such, they may keep others at an emotional distance and have difficulties in establishing and maintaining intimacy with others. That both members of this couple score so low may

indicate a serious issue in managing this couple in treatment. Given the high levels of dissatisfaction, the husband and wife may find it difficult to find rapport. The conflicts inherent to their relationship will most likely serve to heighten their mutual distrust and make compromise difficult.

Based on their self-reported scores, it appears that Ed is the more emotionally sensitive one. His profile indicates a sensitivity to inner feelings and emotions. As noted in the compatibility analysis, Leigh may have found this an attractive quality, because he could help her verbalize her own inner feelings. Ed also sees himself as being an outgoing, sociable individual who can exude charm and warmth. This is an interesting point given that Ed also scores himself high on Self-Consciousness and Depression (also note the lower score on Activity). Thus, despite the happy face he may present to others, inside he has issues concerning his personal sense of worth and adequacy. It is not uncommon to find that individuals with high scores on Self-Consciousness tend to be more socially phobic, not wanting to draw attention to themselves. Such public scrutiny could lead to ridicule, criticism, and rejection; these are all issues that are anathema to individuals with low self-esteem. Thus, Leigh may be picking up on something in Ed's interpersonal behavior: He reaches out to people to glean emotional and social succor from them. She may be identifying a manipulative quality concerning his social interactions. Interestingly, it may be Ed's emotional vulnerabilities that lead him to be attracted to Leigh. Although she has her own negative affect (depression and anxiety), she does not share Ed's low self-esteem. Leigh's high level of assertiveness, social confidence, leadership qualities (e.g., low scores on Compliance and high scores on Assertiveness), and high aspiration levels may make her appear to Ed as a strong figure who can psychologically protect him from social criticism and other threats to his sense of worthiness.

However, those same perceived strengths in Leigh can also make him feel intimidated as well. Leigh's lower levels of Agreeableness, her desire to be in control of all situations, and her drive and ambition, can all be threatening to Ed, especially when Leigh is provoked or challenged. Leigh rates herself as having a more closed experiential style, and perceives Ed similarly. As indicated earlier when examining Leigh's compatibility patterns, the fact that Leigh perceived Ed to be as focused, directed, and experientially closed as herself may be a positive resource for the couple. Leigh's own personal energy and directiveness may be a source of conflict in her larger social

world. Others may bristle under the strength of her focus and may find her more brusque style off-putting. However, Leigh may believe, and rightly so, that Ed has much less of a problem with these qualities than those in her larger social world. It may be reassuring to her to know that whatever personal drives she has, Ed has the psychological wherewithal not to be negatively affected by it. But Leigh may not realize just how sensitive Ed is and that his open experiential style means that he does acutely experience Leigh's brusqueness in a personal manner. Although his own levels of Assertiveness and Conscientiousness may help him "push back" when needed, his low self-esteem and high openness to feelings will make him pay an emotional price for these encounters. Ed's low score on Activity further indicates that he may not always have the emotional energy for these encounters and could get overwhelmed by them. Leigh does not seem to recognize these emotional vulnerabilities in Ed and may not recognize when Ed begins to shut down.

When Ed becomes overwhelmed with Leigh's emotional energy and directiveness, two things may happen. First, Ed may just stop engaging in the process and put up emotional guards against Leigh's high energy levels. This may make it seem as if he was becoming disinterested, uninvolved, and dismissive. As Ed disengages, he may also become more rigid and stereotypical in his thinking. If Ed finds the encounters as hurtful, he may just refuse to be engaged in further discussions. Again, this may lead to him being perceived as being rigid and selfish. Second, such powerful encounters, especially ones in which Ed may have felt hurt by Leigh, may lead him to seek out emotional reassurances and succorance from his partner. Leigh may not realize that Ed is emotionally exhausted and seeking comfort and instead perceive these behaviors as Ed trying to impose his own agenda on the situation. He may believe he is reaching out emotionally to Leigh, but she may see this as his effort to use her for his own emotional needs and reject his advances. The result of this process is two people feeling hurt, used, and objectified.

Treatment would need to focus on outlining for Leigh just how emotionally sensitive Ed is and how he depends on her for emotional strength. Although he may have innate abilities to manage Leigh's strong persona, both need to become more aware of when Ed is becoming overwhelmed and the need for the situation to be defused. Both individuals ought to become more aware of the emotional vulnerabilities each possesses.

Leigh may need to become more in touch with her feelings and how she may be perceived by others. Both may need to find more nuanced ways of communicating with each other. Helping to clarify their perceptions of each other may help to improve their levels of marital satisfaction. The therapist may need to exercise a large amount of diplomacy in helping each of these individuals to become dislodged from their current intransigence. To emotionally defend themselves, these two people have created emotional bunkers to protect themselves from attacks by the other. Ed will need to appreciate Leigh's more individualistic orientation to life. She is an introvert who prefers being by herself. She is not comfortable with groups or interpersonal circles. Whether this is a consequence of earlier family of origin issues would need to be established. Nonetheless, Leigh establishes very thick boundaries between herself and others. No doubt that stress and interpersonal crisis will serve only to exacerbate these issues. Ed will need to find ways of respecting the personal space Leigh wants while simultaneously finding ways of constructively engaging her emotionally. This will need to be a learning process for both of them.

Therapeutic Epilogue

Although the previous analysis was generated “blind” by the first author by looking only at the COA data, it provides a good deal of accuracy with regards to the actual therapeutic experience. Differences in scores on the NEO PI-3 actually presented the possibility of success of the marriage. For instance, Leigh's strong psychological character seen in her high level of assertiveness, leadership qualities, social confidence, and high aspiration levels was a part of why Ed married her at a time when she was the only person on “his team” and was a strong advocate for him when others were against him. Part of the therapy worked to help him see how this was still the case as Leigh demonstrated strength in dealing with the family while also working outside of the home. She was also an advocate for him during difficulties at his current job and also had the potential to understand his mixed motives for putting on a happy face and seeing himself as warm and caring for others. This, in fact, was a style of coping that he learned early in life as he would escape his family dysfunction by forcing himself to be outgoing to attract friends, when on the inside he felt worthless and inadequate personally and socially. This was his attempt to “put the negative away” and it may have contributed to what he described as a “nervous

breakdown” in his teen years. Similarly, Ed’s openness to new ideas and new ways of thinking were a part of why Leigh married him. She was attracted to his ideas that had core values similar to her own but were new and exciting to her. In the marriage, Ed had the potential to draw Leigh out of her rigid and “one right way” kind of thinking. His own sensitivity to inner feelings was a potential gift in the marriage not only to understand and share his own inner world, but also to guide Leigh into understanding and sharing her inner world. In fact, at some level she wanted his leadership in this area. The articulation and affirmation of these positive potentials were a focus of the couple’s therapy as they were invited to notice and to reinforce these positives in the other. The high scores on Consciousness were a positive for this couple, which sporadically gave them a determined effort to work on the relationship, often driving 2 hours each way to come to therapy. Their low scores on the Vulnerability facet were also reflected in their periodic willingness to open up to one another during the therapy hour in a revealing way. These were attempts on the part of Ed and Leigh to manage their distress in adaptive ways, although their “default” coping mechanism of retreat from the other and retreat from therapy often prevailed as a maladaptive way to manage their distress.

The most striking data in the COA analysis, which prevailed in the couple’s therapy, is in the couple coefficient agreement score of $-.17$ for Ed and $.11$ for Leigh. These scores indicate that the images and beliefs about the other person constructed in the mind of *the rater* are far different from the other’s own experience of self. In the case of Ed and Leigh, these constructed images are usually more negative and appear to inhibit *the rater’s* ability to see certain personality characteristics in a positive light with good potential for the marriage. For instance, Ed’s higher rating of Leigh on Neuroticism reflect his image of her as being emotionally unstable, needy, and out of control with little energy to pay attention to or attend to his needs. He was not able to see her as someone who needed his help and to see her as a hurting person who could benefit from some of his self-determined Tender-Mindedness. His lower rating of Leigh on Extraversion reflects his image of her as cold and distant, which blocked his ability to see the times during therapy when she was making intentional efforts to move toward him emotionally and physically. Ed’s lower rating of Leigh on Openness contributed to his seeing her as more rigid than she really was and left him unable to affirm her for the consistency and stability that she often provided

the family. His low assessment of her Conscientiousness caused her to comment on her disorganization around the house and blocked him from seeing her concentrated efforts to manage the home and work outside the home. Similarly, Leigh's low rating of Ed on Extraversion is indicative of her inability to see his efforts of being positive toward her and contributed to the misinterpretation of his efforts at socialization as avoidance of family responsibilities and as an attempt to be somebody that he was not. Ed reported that "she sees me as damaged goods because of the family in which I grew up." Leigh's low rating of Ed on Agreeableness reflects her rejection of his attempts to understand her inner world in the times that he tenderly tried to approach her for emotional intimacy. It also led to her judgment of his pastoral outreach to others as fake and simply a diversion from the family so that he would look good. Leigh's low rating of Ed on Conscientiousness was indicative of a way of seeing him that made her blind to the major efforts that he made to fix up a house that he did not own and to clean up after her father. These factors and others contributed to a predominant image that they similarly held of each other and that they revealed in a poignant therapy session on August 23, 2013—namely, that the other person was an "abuser." More difficult for them was to acknowledge their own abusive tendencies and to establish an image of the other person as someone with positive characteristics who was trying to call for help with their deepest needs.

It is not that there were no events in the marriage or actions on the part of the other that led to these constructed images that emerge from *the rater* in the COA analysis. However, it may also be the case that Ed and Leigh brought to the marriage interpretive schemas already formed in the nonnurturing environments in which they were raised, or formed from genetic predispositions encoded in the brain. When they were presented with the COA data and the possibility that they were constructing an overly negative image of the other person, they defaulted to the safety of retreat and chose not to continue in therapy. This is accurately described in the COA analysis above as a retreat to their emotional bunkers to protect themselves from perceived attacks by the other, or others, unable to trust the possibility of a differently constructed image of their selves, the other, or the world.

Conclusions

Couple therapy is complex work, involving interactions at multiple levels. The dynamic process of two people interacting can be difficult to track and organize. Personality assessment provides a tool for capturing specific aspects of this process in ways that promote understanding and encourage dialogue. The NEO PI-3 is an ideal tool for use within couple therapy. Its validated self- and observer rating forms provide a tremendous amount of information about the personal styles of the couple, both separately and together. The personality interpretations provide clear and nonreactive information about the relationship that enables both members to step back and see themselves in a way that promotes them taking a “second look” at their style of relating. The use of the cross-over analysis paradigm generates a tremendous amount of relevant material. The essence of COA is identifying those points of *discrepancy* among the various ratings. The areas of disagreement identify where important points of conflict exist. They also help to identify the underlying issues in the *rater* that may be fueling the conflict. Thus, COA provides the clinician with areas of engagement with the clients in an effort to understand the psychological dynamics underlying these discrepancies.

Although trait based, FFM scores can be easily integrated with a broad variety of theories for interpreting the expectations behind the ratings of the partner. Psychodynamic, behavioral, gestalt, interpersonal, or humanistic interpretations can easily be fit to the perceptions evidenced in the NEO PI-3 protocol. There is no doubt that this type of personality information can serve as the platform for the generation of clinical hypotheses. The CCICL can be a useful complement to this process. It can identify those specific behaviors that are creating problems within the relationship. The items on the CCICL have been selected on the basis of both their relevance for capturing salient aspects of conflict in a relationship and their relevance to high and low scores on each of the personality dimensions. For example, partners of individuals high on Neuroticism may find their mate whiny, obsessive, or moody. Those seen as being low on Neuroticism may be perceived as too calm, emotionally bland, or unconcerned about the impressions made on others. Usually, the more problems that are checked, the more distress there is in the relationship. The CCICL can provide a very specific place to start in discussing issues among the couple.

Perhaps the most useful application of the COA would be with premarital couples. Individuals exploring the possibilities of a committed relationship

could greatly benefit from this intimate examination of each other's personal preferences and expectations. Individuals can come to examine aspects of their own personalities as well as the implications these qualities may have for their on-going relationship.

As noted earlier, the hypotheses we presented were intended for heterosexual couples, demonstrating the need for research to determine whether these expectations would hold for gay and lesbian couples as well. Greater examination of the personological implications of discrepancies between self-ratings and observer ratings needs to be done. The CCICL was a first effort at trying to link specific relationship issues to particular incongruities on the NEO PI-3 profile. Much more work needs to be done in empirically developing these relationships, especially as they relate to the facet scales. A new dimension added to the COA process was an assessment of compatibility. Rather than simply focusing on areas of distress and conflict, it seems appropriate to also identify positive dimensions of the relationship. Individuals seek others who can complement them in ways that provide gratification for basic needs. In some instances we seek individuals like ourselves (e.g., those scoring high on Extraversion wanting high levels of Extraversion in our partners), whereas at other times we seek someone different (e.g., those low on Conscientiousness seeking someone average to high on the dimension). Ultimately compatibility may be a more complex process than we have hypothesized. The patterns outlined in [Table 19.2](#) provide a set of expectations that is in need of further testing and analysis. Nonetheless, these dynamics can serve as potential resources to be drawn upon over the course of treatment.

Finally, one area that was not touched on in this article but offers a new dimension of analysis concerns a comparison of the two observer ratings. Do areas of convergence and divergence have implications for relationship stability and satisfaction? What new insight would a consideration of the observer ratings provide over what is already gleaned from the COA? Although the ratings reflect perceptions held of the partner, it would be interesting to see how these perceptions, and their related expectations, may be serving to create conflict and/or build compatibility. In the end, it will be necessary to derive algorithms that are capable of efficiently linking all of this information together in ways that will allow both useful analysis of a couple's intimacy patterns and assessment of the viability of the relationship.

Thomas A. Widiger, Whitney L. Gore, Cristina Crego, Stephanie L. Rojas, and Joshua R. Oltmanns

Abstract

The purpose of this chapter is to provide an overview of the relationship of the Five Factor Model (FFM) to personality disorder. The FFM has traditionally been viewed as a dimensional model of normal personality structure. However, it should probably be viewed as a dimensional model of general personality structure, including maladaptive as well as adaptive personality traits. Discussed herein is the empirical support for the coverage of personality disorders within the FFM; the ability of the FFM to explain the convergence and divergence among personality disorder scales; the relationship of the FFM to the *DSM-5* dimensional trait model; the empirical support for maladaptivity within both poles of each FFM domain (focusing in particular on agreeableness, conscientiousness, and openness); and the development of scales for the assessment of maladaptive variants of the FFM.

Key Words: Five Factor Model, trait, personality, personality disorder, *DSM-IV*, *DSM-5*

One of the strengths of the Five Factor Model (FFM) is its robustness (John, Naumann, & Soto, 2008). “Personality psychology has been long beset by a chaotic plethora of personality constructs that sometimes differ in label while measuring nearly the same thing, and sometimes have the same label while measuring very different things” (Funder, 2001, p. 200). As expressed by Funder (2001), “The use of five broad traits as a common currency for personality psychology has been an important counterforce to this Tower of Babel” (p. 200). The FFM has indeed been used quite effectively as a basis for comparing, contrasting, and integrating seemingly diverse sets of personality trait scales (Goldberg, 1993; McCrae & Costa, 2003; Ozer & Reise, 1994). “One of the great strengths of the Big Five taxonomy is that it can capture, at a broad level of abstraction, the commonalities among most of the existing systems of personality traits, thus providing an integrative descriptive model” (John et al., 2008, p. 139).

The FFM is comparably robust in its coverage of abnormal as well as normal personality functioning (Clark, 2007; Widiger & Costa, 1994). The

purpose of this chapter is to provide the empirical support for the coverage of personality disorder and dysfunction within the FFM; the ability of the FFM to explain the convergence and divergence among personality disorder scales; the relationship of the FFM to the *DSM-5* dimensional trait model; the theoretical and empirical support for maladaptivity within both poles of each FFM domain (focusing in particular on agreeableness, conscientiousness, and openness); and the development of scales for the assessment of maladaptive variants of the FFM.

FFM Coverage of Personality Disorders

Costa, McCrae, and their colleagues conducted a series of studies in the 1980s indicating how the FFM, as assessed by the NEO Personality Inventory ([Costa & McCrae, 1992](#)), can account for constructs contained within alternative models of personality ([McCrae & Costa, 2003](#); see also the chapter by [Costa and McCrae](#)). [O'Connor \(2002\)](#) conducted integrative factor analyses of previously published findings from approximately 75 studies involving FFM scales along with the scales of 28 commonly used self-report inventories of personality (see also the chapter by [O'Connor](#)). He concluded that “the factor structures that exist in the scales of many popular inventories can be closely replicated using data derived solely from the scale associations with the FFM” ([O'Connor, 2002](#), p. 198). [O'Connor \(2002\)](#) further suggested that “the basic dimensions that exist in other personality inventories can thus be considered ‘well captured’ by the FFM” (p. 198).

The research conducted by [O'Connor \(2002\)](#), [McCrae and Costa \(2003\)](#), and others is traditionally considered to be studies of normal personality. However, much of this research is directly relevant to the coverage of maladaptive personality functioning, as most of the instruments and scales they investigated have been and continue to be used within clinical populations to assess personality dysfunction ([Widiger, Costa, Gore, & Crego, 2013](#)). For example, [McCrae, Costa, and Busch \(1986\)](#) demonstrated how the 100 items within the California Q-Set (CQS; [Block, 2008](#)) are well understood from the perspective of the FFM. The CQS items were developed by successive panels of psychodynamically oriented clinicians seeking a common language. A factor analysis of the complete set of items yielded five factors that aligned closely with the FFM. An

inspection of the CQS items illustrates its pertinence to abnormal, as well as normal, personality functioning. The neuroticism factor contrasted CQS items such as “thin-skinned,” “extrapunitive,” and “brittle ego defenses” (with “socially poised” and “calm, relaxed”); introversion contrasted “avoids close relationships” and “emotionally bland” (with “self-dramatizing,” “talkative,” and “behaves assertively”); openness contrasted “unusual thought processes,” “engages in fantasy, daydreams,” and “rebellious noncomforming” (with “moralistic,” “uncomfortable with complexities,” and “favors conservative values”); antagonism contrasted “basically distrustful,” “expresses hostility directly,” and “critical, skeptical” (with “behaves in a giving way” and “warm, compassionate”); and, finally, low conscientiousness contrasted “self-indulgent” and “unable to delay gratification” (with “dependable, responsible,” and “has a high aspiration level”). Support for their interpretation of these factors was obtained from convergent and discriminant validity correlations with self and peer assessments of the FFM. In sum, the results of their study demonstrated a close correspondence of a sophisticated psychodynamic nomenclature that concerned fundamental components of personality disturbance with the FFM. The CQS “represents a distillation of clinical insights, and the fact that very similar factors can be found in it provides striking support for the five factor model” ([McCrae et al., 1986](#), p. 442).

[Mullins-Sweatt and Widiger \(2007\)](#) reported similar results with the Shedler-Westen Assessment Procedure-200 (SWAP-200), a psychodynamically oriented clinician Q-sort for personality disorder pathology comparable to the CQS ([Shedler & Westen, 2004b](#)). They had persons with significant personality problems described in terms of the SWAP-200 and the FFM. They reported a close convergence of the FFM and SWAP-200 descriptions. SWAP-200 Emotional Dysregulation and Dysphoria aligned with FFM neuroticism; Schizoid Orientation aligned with introversion; Obsessionality aligned with conscientiousness; and Hostility, Psychopathy, and Narcissism aligned with antagonism (consistent with expectations, Psychopathy also correlated with low conscientiousness and Narcissism correlated with extraversion). The only SWAP-200 scales that did not have large effect size relationships with the FFM were Dissociation, Oedipal Conflict, and Sexual Conflict. However, these scales included many items that do not appear to be strongly related to personality disorder or personality. For example, the SWAP-200 Sexual Conflict scale

includes items such as “Experiences a specific sexual dysfunction during sexual intercourse or attempts at intercourse (e.g., inhibited orgasm or vaginismus in women, impotence or premature ejaculation in men)” and “Tends to see sexual experiences as somehow revolting or disgusting” ([Shedler & Westen, 2004a](#), p. 1750). SWAP-200 Sexual Conflict is perhaps best understood to be a measure of sexual dysfunction rather than a measure of personality dysfunction.

[Shedler and Westen \(2004a\)](#) used a subset of SWAP-200 items to create a SWAP-based measure of the FFM with the intention of demonstrating “that the five factor model is not sufficiently comprehensive” (p. 1753). They felt that only 30% of the SWAP-200 items had any relevance to the FFM. [McCrae, Lockenhoff, and Costa \(2005\)](#), however, coded 93% of the SWAP-200 items in terms of the FFM, suggesting that all but a small minority of the SWAP-200 can be understood from the perspective of the FFM.

[Mullins-Sweatt and Widiger \(2008\)](#) compared the convergent (and discriminant) validity of the Shedler and Westen and McCrae et al. SWAP-200 scales (administered by clinicians describing their patients) using the NEO Personality Inventory-Revised (NEO PI-R; [Costa & McCrae, 1992](#)) as the FFM criterion measure. There was no difference in convergent validity for the respective Extraversion scales, but the McCrae et al. Conscientiousness scale had significantly better convergent validity than the Shedler and Westen Conscientiousness scale, and the McCrae et al. Neuroticism, Agreeableness, and Openness scales had substantially higher convergent validity. The convergent validity coefficients for the McCrae et al. scales using 93% of the SWAP-200 item set were .74 for Neuroticism, .72 for Extraversion, .51 for Openness, .77 for Agreeableness, and .76 for Conscientiousness.

A considerable body of research indicates that the FFM successfully accounts for the features and symptoms of the personality disorders included within the American Psychiatric Association’s (APA) *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; [American Psychiatric Association, 2013](#)) (e.g., [Aluja, Cuevas, Garcia, & Garcia, 2007](#); [Bagby, Costa, Widiger, Ryder, & Marshall, 2005](#); [Bagby, Marshall, & Georgiades, 2005](#); [Ball, Tennen, Poling, Kranzler, & Rounsville, 1997](#); [Bastiaansen, Rossi, & De Fruyt, 2013](#); [Bastiaansen, Rossi, Schotte, & De Fruyt, 2011](#); [Blais, 1997](#); [Chai et al., 2012](#); [Costa & McCrae, 1990](#); [De Fruyt, De Clercq, van de Wiele, & Van Heeringen, 2006](#); [Dyce & O’Connor, 1998](#); [Few et al.,](#)

2010; Furnham, 2014; Furnham & Crump, 2005; Huprich, 2003b; Madsen, Parsons, & Grubin, 2006; Nederstrom & Furnham, 2012; Nestadt et al., 2008; O'Connor, 2005; Oluf & Furnham, 2015; Quirk, Christiansen, Wagner, & McNulty, 2003; Ramanaiah, Rielage, & Cheng, 2002; Reynolds & Clark, 2001; Rolland & de Fruyt, 2003; Rossier & Rigozzi, 2008; Saulsman & Page, 2004; Soldz, Budman, Demby, & Merry, 1993; Stepp, Trull, Burr, Wolftenstein, & Vieth, 2005; Trull, 1992; Wang et al., 2003; Wiggins & Pincus, 1989; Yeung, Lyons, Wateraux, Faraone, & Tsuang, 1993). Widiger, Samuel, Mullins-Sweat, Gore, and Crego (2012) summarize the research across the personality disorders. Reviews of the research concerning individual personality disorders have been provided for the borderline (Trull & Brown, 2013), the schizotypal (Edmundson & Kwapil, 2013), the antisocial (Derefinko & Lynam, 2013), the dependent (Gore & Pincus, 2013), and the narcissistic (Campbell & Miller, 2013) personality disorders. Additional maladaptive personality functioning not recognized within the APA diagnostic manual is also covered, including, for instance, the traits of psychopathy (Borroni, Somma, Andershed, Maffei, & Fossati, 2014; Crego & Widiger, 2014; Derefinko & Lynam, 2013; Gaughan, Miller, Pryor, & Lynam, 2009; Lilienfeld et al., 2015; Lynam & Miller, 2015; Lynam & Widiger, 2007), successful psychopathy (Mullins-Sweatt, Glover, Derefinko, Miller, & Widiger, 2010), Cleckley psychopathy (Crego & Widiger, 2015a), alexithymia (Luminet, Bagby, Wagner, Taylor, & Parker, 1999; Taylor & Bagby, 2013; Zimmerman, Rossier, de Stadelhofen, & Gaillard, 2005), depressive personality disorder (Bagby, Watson, & Ryder, 2013; Huprich, 2000, 2003a; Vachon, Sellbom, Ryder, Miller, & Bagby, 2009), and prejudice (Flynn, 2005). Livesley (2001) concluded on the basis of his review of the FFM-personality disorder research that “all categorical diagnoses of DSM can be accommodated within the five factor framework” (p. 24). Markon, Krueger, and Watson (2005) conducted meta-analytic and exploratory hierarchical factor analyses of numerous measures of normal and abnormal personality functioning, and consistently obtained a five factor solution that they indicated “strongly resembles the Big Five factor structure commonly described in the literature, including neuroticism, agreeableness, extraversion, conscientiousness, and openness factors” (p. 144). Clark (2007) concluded that “the five factor model of personality is widely accepted as representing

the higher-order structure of both normal and abnormal personality traits” (p. 246).

Samuel, Simms, Clark, Livesley, and Widiger (2010) demonstrated through item response theory analysis that the maladaptive personality trait scales of the Dimensional Assessment of Personality Pathology-Basic Questionnaire (DAPP-BQ; Livesley & Jackson, 2009) and the Schedule for Nonadaptive and Adaptive Personality (SNAP; Clark, 1993) lie along the same latent traits as those assessed by the NEO PI-R (Costa & McCrae, 1992). The primary distinction is that the DAPP-BQ and SNAP scales have relatively greater fidelity (or coverage) for the assessment of the (maladaptively) extreme variants of FFM traits, whereas the NEO PI-R has relatively greater fidelity for the more normal variants. In addition, what was most evident from this study was that there is considerably more overlap among the scales than uniqueness, due in part to the fact that the NEO PI-R assesses a substantial range of maladaptivity with respect to neuroticism, introversion, low openness, antagonism, and low conscientiousness.

Samuel, Carroll, Rounsville, and Ball (2013) focused their IRT results specifically on borderline personality disorder. They indicated that the borderline symptoms (e.g., recurrent suicidality) fall along the same latent trait as FFM neuroticism and have relatively greater fidelity for the (maladaptively) extreme variants of neuroticism, whereas the NEO PI-R has relatively greater fidelity for the more normal variants. Stepp et al. (2012) integrated items from the NEO PI-R, the Tridimensional Personality Questionnaire (TCI; Cloninger, 2000), and the SNAP (Clark, 1993) in a confirmatory factor analysis that documented the presence of a common five factor model that was closely aligned with the FFM. Using IRT, they selected the optimal subset of items from each instrument, with NEO PI-R items covering the lower range of each domain and the SNAP and/or TCI items covering the more extreme, maladaptive range.

Personality Disorder Scales and the FFM

There has been quite a bit of research using the FFM to effectively differentiate among different forms of psychopathology (e.g., Bagby et al., 1997; Bienvenu et al., 2001; see also the chapter by Bagby, Uliaszek, Gralnick, and Al-Dajani), including the personality disorders (Bagby et al.,

2005; Miller, Bagby, Pilkonis, Reynolds, & Lynam, 2005). Each personality disorder in fact has a relatively distinctive FFM profile. Lynam and Widiger (2001) and Samuel and Widiger (2004) asked researchers and clinicians (respectively) to describe a prototypic case of each personality disorder in terms of the FFM. The descriptions included strikingly different profiles for the histrionic (high extraversion) versus the schizoid (high introversion); dependent (high agreeableness) versus antisocial (high antagonism); and obsessive-compulsive (high conscientiousness) versus antisocial (low conscientiousness). The avoidant and schizoid do share introversion, but the former is also characterized by neuroticism whereas schizoid is not. The avoidant and dependent share neuroticism, but the latter is also characterized by agreeableness. The schizoid and schizotypal share introversion, but the latter is also characterized by neuroticism and openness.

There should not, of course, be entirely distinct FFM profiles for each *DSM-IV-TR* personality disorder because these disorders overlap and obtain considerable diagnostic cooccurrence (Clark, 2007). Lynam and Widiger (2001) in fact demonstrated that the extent to which the *DSM-IV-TR* personality disorders cooccur is explained by the FFM traits they share. The “overlap among FFM profiles reproduced well the covariation obtained for the schizoid, schizotypal, antisocial, borderline, histrionic, narcissistic, avoidant, and compulsive PDs aggregated across several sets of studies” (Lynam & Widiger, 2001, p. 410). The only personality disorder whose diagnostic cooccurrence could not be explained well was the dependent, precisely because its FFM description was considerably more differentiated from other personality disorders than would be suggested by its extensive diagnostic cooccurrence.

Samuel and Widiger (2008b) conducted a meta-analysis of research relating FFM scales to the *DSM-IV* personality disorders. The results confirmed the distinctions suggested by Lynam and Widiger (2001) and Samuel and Widiger (2004). The empirically based profiles correlated with expert-consensus profiles from a low of .60 for the dependent personality disorder to a high of .92 for the obsessive-compulsive. One of the more important results from their meta-analysis though was strong instrument effects, particularly for the relationship of conscientiousness with OCPD, openness with the schizotypal personality disorder, and extraversion with the histrionic.

Indeed, the FFM has also been very useful in providing meaningful differentiations among scales purportedly assessing the same personality disorder (e.g., Paulhus & Williams, 2002; Ruiz, Pincus, & Schinka, 2008; Trobst, Ayearst, & Salekin, 2004), including more specifically the antisocial (Costa & McCrae, 1990; Decuyper, De Pauw, De Fruyt, De Bolle, & De Clercq, 2009; Gudonis, Miller, Miller, & Lynam, 2008; Hicklin & Widiger, 2005; Seibert, Miller, Few, Zeichner, & Lynam, 2011), dependent (Lowe et al., 2009; McBride, Zuroff, Bagby, & Bacchichiochi, 2006; Mongrain, 1993; Pincus & Gurtman, 1995; Zuroff, 1994), narcissistic (Miller & Campbell, 2008; Samuel & Widiger, 2008a), histrionic (Gore, Tomiatti, & Widiger, 2011), and obsessive-compulsive (Samuel & Widiger, 2010).

For example, Costa and McCrae (1990) compared different editions of the Millon Clinical Multiaxial Inventory (MCMI; Millon, Millon, Davis, & Grossman, 2009) with respect to the FFM. They indicated how the early version of the MCMI antisocial personality disorder scale was saturated with high neuroticism that was removed from subsequent versions, which, in turn, increased the representation of low conscientiousness. Samuel and Widiger (2010) compared, from the perspective of the FFM, eight different *DSM-IV-TR* obsessive-compulsive personality disorder (OCPD) measures. The Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943) assessment of OCPD (Somwaru & Ben-Porath, 1995), in stark contrast to the others, was confined largely to neuroticism, with little to no representation of conscientiousness, likely due to the fact that the MMPI-2 item pool in general lacks much representation of FFM conscientiousness (Trull, Useda, Costa, & McCrae, 1995). The SNAP (Clark, 1993) provided approximately equal weight to its coverage of neuroticism and conscientiousness, whereas the MCMI-III was heavily saturated with items from conscientiousness. Even more striking for the MCMI-III was its negative correlation with neuroticism, whereas all other OCPD measures correlated positively with neuroticism. From this perspective, it is not surprising that the MCMI-III OCPD scale obtains weak convergent validity with other measures of OCPD (Miller, Few, & Widiger, 2012; Widiger & Boyd, 2009).

Gore et al. (2011) indicated how different measures of histrionic personality traits can be understood from the perspective of the FFM. The MCMI-III and MMPI-2 assessments of histrionic personality disorder (HPD) correlated negatively with neuroticism, whereas in striking contrast

the HPD scales from the Coolidge Axis II Inventory (CATI; [Coolidge & Merwin, 1992](#)), the SNAP, the OMNI Personality Inventory-IV (OMNI-IV; [Loranger, 2001](#)), the PDQ-IV, and the WISPI ([Klein et al., 1993](#)) all correlated positively with neuroticism. Furthermore, the MCMII-III and MMPI-2 HPD scales correlated substantially with extraversion (above .70), whereas the PDQ-IV, OMNI-IV, and WISPI were uncorrelated with extraversion (the SNAP and CATI though obtained moderately high positive correlations). The PDQ-IV, OMNI-IV, and WISPI HPD scales correlated negatively with conscientiousness, whereas the MMPI-2 and MCMII-III were not.

The term “impulsivity” is used by a wide variety of researchers, yet alternative assessments of impulsivity can produce strikingly different results. [Whiteside and Lynam \(2001\)](#) compared alternative measures of “impulsivity” from the perspective of the FFM, leading to the useful distinction of negative urgency (a facet of neuroticism), lack of premeditation (low deliberation), lack of perseverance (low self-discipline), and sensation seeking (a facet of extraversion). They demonstrated how existing measures of “impulsivity” vary considerably with respect to which variant is being assessed, as well as the social and clinical importance of the four different variants. Considerable amounts of subsequent validation and extension of these FFM variants have since been published (e.g., [Lynam, Miller, Miller, Bournovalova, & Lejuez, 2011](#); [Ruiz et al., 2008](#); [Sharma, Markon, & Clark, 2013](#); [Whiteside, Lynam, Miller, & Reynolds, 2005](#)). [Cyders and Smith \(2008\)](#) and [Smith et al. \(2007\)](#) have also extended this FFM-based model of “impulsivity” to include positive urgency, a facet of extraversion.

One of the more heavily researched personality disorder constructs is the “dark triad,” combining key traits from psychopathy, narcissism, and Machiavellianism into one “super” or “meta” evil syndrome ([Paulhus & Williams, 2002](#)). [Furnham, Richards, Rangel, and Jones \(2014\)](#) demonstrated through a meta-analysis of dark triad FFM research that the three dark triad constructs can be largely understood as maladaptive variants of FFM antagonism, albeit they can also be distinguished with Machiavellianism and psychopathy including aspects of low conscientiousness and neuroticism, and psychopathy involving facets of extraversion. Indeed, what is shared among the dark triad constructs and what is distinct for each of them can all be well accounted for in terms of

the FFM domains and facets (DeShong, Grant, & Mullins-Sweatt, 2015; O'Boyle, Forsyth, Banks, Story, & White, 2015).

Samuel and Widiger (2008a) compared and contrasted five alternative measures of narcissism from the perspective of the FFM. Among their findings was that the SNAP (Clark, 1993) and PDQ-IV (Bagby & Farvolden, 2004) were confined largely to aspects of antagonism with no relationship to neuroticism or extraversion. In stark contrast, the MMPI-2 assessment of NPD was unrelated to antagonism and was evenly weighted in its coverage of neuroticism and extraversion. The MCMI-III fell in between, including a negative relationship with neuroticism and positive relationships with antagonism and extraversion. Similar findings were reported by Miller and Campbell (2008). The distinction between grandiose and vulnerable narcissism has also been well understood in terms of the FFM (Campbell & Miller, 2013), with both variants involving antagonism (and extraversion), but vulnerable narcissism including traits of high neuroticism and grandiose narcissism either being unrelated or negatively correlated with neuroticism (Glover, Miller, Lynam, Crego, & Widiger, 2012; Miller et al., 2013).

Finally, Crego and Widiger (2014) contrasted alternative conceptualizations and assessments of antisocial personality disorder (ASPD) and psychopathy from the perspective of the FFM. The more traditional measures of ASPD (assessed by the PDQ-R) and psychopathy (assessed by the Self-Report Psychopathy—Version III [SRP-III]; Paulhus, Neumann, & Hare, 2015) were confined to the domains of antagonism and low conscientiousness (or disinhibition). In stark contrast, the more recently developed measures and models of psychopathy, provided by the Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld & Widows, 2005), the Triadic Model of Psychopathy (Patrick, Fowles, & Krueger, 2009), and the Elemental Psychopathy Assessment (EPA; Lynam et al., 2011) all include components of low neuroticism (e.g., fearless and invulnerability) and high extraversion (boldness and dominance) that converge highly with one another but not with the traditional models. Their findings are consistent with those of Lynam et al. (2011), Few, Miller, and Lynam (2013), and Poy et al. (2014).

In sum, research has indicated that the personality disorders are well understood in terms of the FFM (Clark, 2007; Livesley, 2001; Widiger et al., 2012) as well as distinguished (Lynam & Widiger, 2001; Samuel &

[Widiger, 2004, 2008](#)). The FFM has also been very effective in explaining the diagnostic cooccurrence among the personality disorders ([Lynam & Widiger, 2001](#)). Finally, FFM research has also been effective in explaining the lack of adequate convergence among alternative measures of the same personality disorder construct ([Widiger, Costa, Gore, & Crego, 2013](#)).

DSM-5 Section III and the FFM

A major step toward a conceptualization of the *DSM-IV-TR* personality disorders from the perspective of the FFM occurred with *DSM-5* ([American Psychiatric Association, 2013](#)), the current edition of the American Psychiatric Association diagnostic manual. The [American Psychiatric Association \(2013\)](#) *DSM-5* includes a dimensional model of maladaptive traits consisting of five broad domains of negative affectivity, detachment, psychotism, antagonism, and disinhibition. These five broad domains are aligned with the FFM. As expressed in *DSM-5*, “these five broad domains are maladaptive variants of the five domains of the extensively validated and replicated personality model known as the ‘Big Five’ or Five Factor Model of personality (FFM)” ([American Psychiatric Association, 2013](#), p. 773). As affirmed by [Krueger and Markon \(2014](#), p. 480), “these domains can be understood as maladaptive extremes of the five factor model (FFM) that has usefully framed extensive research in the field of personality and individual differences ([Widiger & Costa, 2012, 2013](#)).”

However, this alignment might also be somewhat precarious or uncertain. First, there was (and continues to be) substantial opposition to the inclusion of any dimensional trait model in *DSM-5* (e.g., [Clarkin & Huprich, 2011](#); [Gunderson, 2010](#); [Shedler et al., 2010](#)). This opposition was certainly a major factor in the eventual decision to relegate the dimensional trait model to an appendix of *DSM-5*. In addition, there also appeared to be some ambivalence within the work group itself, if not in fact opposition, to an alignment with the FFM. Even persons who have had no history of advocating for or working from the perspective of the FFM perceived a reluctant attitude toward the FFM within the *DSM-5* work group (e.g., [Blashfield & Reynolds, 2012](#); [Lilienfeld, Watts, & Smith, 2012](#); [Livesley, 2012](#)).

For example, the final literature review in support of the dimensional trait model (i.e., [American Psychiatric Association, 2012](#)) made only a passing

reference to the extensive body of FFM personality disorder research summarized within this chapter (Blashfield & Reynolds, 2012; Widiger, 2013). In addition, the initial proposal was for a newly developed six-factor model, for which an alignment with two of the five domains of the FFM (i.e., conscientiousness and openness) was explicitly rejected (i.e., Clark & Krueger, 2010). It was also suggested that the *DSM-5* trait model could not be aligned with the FFM because the FFM was equivalent to one particular, copyrighted measure, the NEO PI-R of Costa and McCrae (1992). “A potential conflict of interest exists if the *DSM-5* articulates a trait model that is isomorphic with a model that is assessed by a specific inventory sold by a specific test publisher” (Krueger et al., 2011, p. 326; see also Krueger, 2013). However, proposals for an alignment with the FFM had never suggested that the model be equivalent to the NEO PI-R domains and facets. Indeed, a proposal for *DSM-5* provided at a preliminary *DSM-5* preparatory conference that was aligned explicitly with the FFM had no such measure-specific association or copyright concerns (i.e., Widiger & Simonsen, 2005). In fact, if there is a dimensional trait model that is assessed by alternative instruments, it is the FFM (e.g., De Raad & Perugini, 2002; Samuel, 2013; see also the chapter by Simms, Williams, and Simms). There are a number of commonly used measures of the FFM that are freely available, the most notable of which is the IPIP-NEO (Goldberg et al., 2006).

In contrast, there has never been any reluctance to align the *DSM-5* trait model with the Psychopathology-5 (PSY-5; Harkness, McNulty, & Ben-Porath, 1995; see American Psychiatric Association, 2013, p. 773) that is in fact “assessed by a specific inventory sold by a specific test publisher” (Krueger et al., 2011, p. 326). There exists only one measure for the PSY-5, which is a specific, copyrighted inventory, the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) sold by a specific test publisher (University of Minnesota Press). Although there is an IPIP-NEO that is freely available to all researchers and clinicians to use, there is no equivalent “IPIP-MMPI-2.”

Nevertheless, in the end, the decision was to align the dimensional trait model with the FFM (Krueger & Markon, 2014), including an explicit recognition of this alignment within the diagnostic manual itself (American Psychiatric Association, 2013, p. 773). The dimensional trait proposal did not receive final approval for inclusion in the main body of the text, but it

was at least included within Section III of *DSM-5* for “emerging measures and models” ([American Psychiatric Association, 2013](#), p. 728). There is likely to remain a preference among some to align the *DSM-5* dimensional trait model with the MMPI-2 PSY-5, rather than with the FFM, but perhaps the validity and utility of an alignment with the FFM will become more apparent over time. Empirical support for an alignment of the *DSM-5* trait model with the FFM has indeed been indicated in a number of studies, although the alignment of *DSM-5* psychoticism with openness has been problematic (e.g., [Crego, Gore, Rojas, & Widiger, 2015](#); [De Fruyt et al., 2013](#); [Gore & Widiger, 2013](#); [Griffin & Samuel, 2014](#); [Thomas et al., 2012](#); [Wright & Simms, 2014](#)).

FFM Openness and DSM-5 Psychoticism

The initial position of the *DSM-5* Personality and Personality Disorders Work Group was that there was no alignment of FFM openness with schizotypal thinking (e.g., [Krueger et al., 2011](#)). As stated within the first *DSM-5* website post, “only the ‘social and interpersonal deficits’ of schizotypal personality disorder, and not the ‘cognitive or perceptual distortions and eccentricities of behavior’ are tapped by FFM traits” ([Clark & Krueger, 2010](#), para. 2).

Parsimony and consistency would suggest that there would or should be some form of an alignment of FFM openness with some form of maladaptive personality functioning. It is fundamentally inconsistent as well as nonparsimonious to suggest that four domains of normal personality have an abnormal variant but for no apparent reason one domain (i.e., openness) does not, and that four domains of abnormal personality have a normal variant but for no apparent reason one domain (i.e., oddity or psychoticism) does not. It would seem more compelling that there would be a maladaptive variant of each pole of the FFM ([Nettle, 2006a, 2006b](#)).

Odd, peculiar, and/or aberrant beliefs would appear to be the natural expectation for this domain (see also the chapter by [Sutin](#)). An association of open-mindedness with schizotypal and/or paranormal beliefs has been reported in a number of studies (e.g., [Miller & Tal, 2007](#); [Nettle, 2006b](#); [Nettle & Clegg, 2006](#); [Thalbourne, 2000](#)). On the other hand, the initial position of the *DSM-5* work group was to a degree understandable because the empirical relationship of FFM openness with the *DSM-IV* personality disorders has consistently been the weakest, including the relationship with

schizotypal thinking (Bastiaansen, Rossi, Schotte, & De Fruyt, 2011; Samuel & Widiger, 2008b; Saulsman & Page, 2004; Watson, Clark, & Chmielewski, 2008).

Watson et al. (2008), for instance, conducted factor analyses in which they separated openness from maladaptive traits, including schizotypal cognitions (albeit see the chapter by Wright for the suggestion that this may have been a statistical artifact). Other factor analytic studies have supported an alignment of schizotypal thinking with openness (e.g., Camisa et al., 2005; Kwapisil, Barrantes-Vidal, & Silvia, 2008; Wiggins & Pincus, 1989), including more recent studies by *DSM-5* work group members and other researchers concerning the relationship of FFM openness with *DSM-5* psychotism (e.g., De Fruyt et al., 2013; Gore & Widiger, 2013; Griffin & Samuel, 2014; Thomas et al., 2012). Stepp et al. (2012) integrated items from the NEO PI-R, the TCI (Cloninger, 2000), and the SNAP (Clark, 1993) in a confirmatory factor analysis that documented the presence of a common five factor model that was closely aligned with the FFM, including openness. Using IRT, they selected the optimal subset of items from each instrument. They reported that items from the NEO PI-R scales assessing openness to ideas, fantasy, and aesthetics defined the normal range of their unconventionality dimension, whereas the SNAP scale assessing eccentric perceptions (along with TCI self-transcendence) defined the abnormal range.

There are reasons though to expect that the relationship of openness with schizotypal thinking (and *DSM-5* Section III psychotism in particular) will not always be confirmed. One reason for a relatively weak relationship of openness with schizotypal personality disorder (STPD) is that STPD includes indicators of both high and low openness. Studies have indicated that schizotypal symptomatology can have opposite relationships to different facets of openness. Kwapisil et al. (2008) and Ross, Lutz, and Bailey (2002) reported that the positive symptoms of schizotypia (e.g., magical ideation and perceptual aberrations) correlated positively with FFM openness (a finding replicated by Asail, Sugimori, Bando, & Tanno, 2011), whereas negative symptoms of schizotypia (e.g., physical anhedonia) correlated negatively. To the extent that an assessment of STPD includes both positive and negative components, a correlation with FFM openness might not appear as they may cancel each other out.

More important than the complexity of STPD, however, is how both constructs, openness and psychotism, are conceptualized and assessed (Ashton & Lee, 2012; Chmielewski, Bagby, Markon, Ring, & Ryder, 2014; Gore & Widiger, 2013; Samuel & Widiger, 2008b). Haigler and Widiger (2001) demonstrated empirically that when NEO PI-R Openness items are revised to assess maladaptive variants of the same openness content, correlations with schizotypy emerged, but still only at a marginal level. The NEO PI-R Openness scale was originally constructed prior to any knowledge of Costa or McCrae regarding the lexical Big Five (see the chapters by De Raad and Mlačić, by Costa and McCrae, and by Wright). Costa and McCrae (1980) began with just a three-factor model, assessed by the NEO Inventory (e.g., McCrae & Costa, 1983). They conceptualized openness at that time to represent ideal personality traits such as self-actualization, an open mind, and self-realization, citing humanism papers and texts by Coan (1974), Rokeach (1960), and Rogers (1961). Soon after the development of the NEO Inventory, Costa and McCrae became aware of the Big Five and they extended their model and instrument to include the domains of agreeableness and conscientiousness. However, they did not revise the scales for neuroticism, extraversion, or openness. This does not appear to have been a significant problem for the assessment of extraversion, but they subsequently acknowledged that NEO PI-R Openness did not align as well with lexical Big Five intellect (McCrae, 1990).

In more recent years, a number of alternative models (as well as measures) of FFM and/or Big Five openness have been developed (see the chapter by Sutin) for which a clear relationship of schizotypal thinking with openness is much more readily apparent. For example, Piedmont, Sherman, Sherman, Dy-Liacco, and Williams (2009) developed scales to assess maladaptive variants of both high and low FFM openness. One of their scales for high openness is Odd and Eccentric, which correlates significantly with schizotypal personality disorder and various measures of aberrant perceptions and paranormal beliefs (Piedmont, Sherman, & Sherman, 2012). Edmundson et al. (2011) constructed a measure of schizotypal personality traits from the perspective of the FFM, and indicated that its scales assessing aberrant perceptions, aberrant ideas, and odd, eccentric behavior converged well with alternative measures of FFM openness. DeYoung, Quilty, and Peterson (2007) developed the Big Five Aspects Scale (BFAS), which distinguishes between openness and intellect

within a domain of “openness/intellect” (see also the chapter by [Allen and DeYoung](#)). [DeYoung, Grazioplene, and Peterson \(2012\)](#) suggest that BFAS Openness will be associated with schizotypal thinking but BFAS Intellect will not (see also [Chmielewski et al., 2014](#)). [Van Kampen \(2012\)](#) includes within his 5-Dimensional Personality Test (5DPT) an Absorption scale, which aligns explicitly with FFM openness and assesses dissociative absorption and positive symptoms of schizotypy. The HEXACO-Personality Inventory (HEXACO-PI; [Lee & Ashton, 2004](#)) includes an Openness to Experience scale that corresponds conceptually and empirically with FFM openness. This HEXACO-PI scale includes four facet scales, one of which is titled Unconventionality, which assesses the disposition to be eccentric, weird, peculiar, odd, and strange. Tellegen similarly includes an unconventionality domain within his dimensional trait model that is aligned explicitly with FFM openness, the scale for which contains items that assess normal openness (e.g., curious, inquisitive, imaginative, and creative) as well as items that concern attributes such as having ideas or beliefs that have little basis within reality, dwelling upon fantasies, or often engaging in activities that are bizarre, deviant, or aberrant ([Tellegen & Waller, 1987](#)). [Tellegen \(1993\)](#) in fact suggested years ago with respect to his conceptualization of openness that “markers of this type are clinically suggestive, particularly of schizotypal personality disorder” (p. 126).

The strength of the alignment can also be similarly affected by the conceptualization and assessment of schizotypal thinking, oddity, and/or psychoticism. For example, *DSM-5* psychoticism may go beyond schizotypal magical and aberrant thinking to include overt psychotic delusions that are apparent in schizophrenia but not in STPD. The assessment of *DSM-5* psychoticism within the Personality Inventory for *DSM-5* (PID-5; [Krueger et al., 2012](#)), which is the official measure for the *DSM-5* dimensional trait model, includes psychotic symptoms that perhaps lie outside of general personality structure (e.g., “Sometimes I feel ‘controlled’ by thoughts that belong to someone else,” and “Sometimes I think someone else is removing thoughts from my head”). Items that suggest Schneiderian delusions ([Schneider, 1959](#)), such as thought control and thought broadcasting, are perhaps best understood as part of a schizophrenic psychotic disorder rather than reflecting the magical thinking and perceptual confusions that would be evident in persons who are just

odd, peculiar, and/or eccentric in a schizotypic manner ([Kwapil & Barrantes-Vidal, 2012](#)).

Bipolarity of Maladaptive Personality Structure

There are some differences between the *DSM-5* dimensional trait model and the FFM of maladaptive personality functioning ([Trull, 2012](#)). The FFM of personality disorder, as it is typically presented, includes maladaptivity at both poles of all five domains (e.g., [Lynam & Widiger, 2001](#); [Miller, 2012](#); [Samuel, 2011](#); [Trull, 2012](#); [Widiger & Trull, 2007](#)). The *DSM-5* dimensional trait model does indeed recognize some of this “bipolarity of maladaptivity,” but to a much more limited degree ([Clark & Krueger, 2010](#); [Krueger et al., 2011](#); see also the chapter by [Simms, Williams, and Simms](#)).

Some dimensional models of maladaptive personality functioning are entirely unipolar in the maladaptivity of their structure. One example of such a model is the Dimensional Assessment of Personality Pathology by Livesley ([Livesley & Jackson, 2009](#)), consisting of the four domains of emotional dysregulation, dissocial behavior, inhibition, and compulsivity. Traits that are considered to be opposite or low on these domains do not involve any maladaptive functioning (i.e., “unipolar” in their coverage of maladaptivity). However, in contrast, most other dimensional trait models and/or measures include at least some degree of bipolar maladaptivity, with some more so than others.

For example, the SNAP by [Clark \(1993\)](#) includes considerable bipolarity. The 12 scales of the SNAP are organized with respect to three domains: negative affectivity (or negative temperament), positive affectivity (or positive temperament), and constraint versus disinhibition. The Exhibitionism and Entitlement scales load positively on the positive affectivity domain (which aligns with FFM extraversion), whereas the Detachment scale loads negatively. Similarly, Propriety and Workaholism load positively on the constraint factor (which aligns with FFM conscientiousness), whereas the Impulsivity scale loads negatively. This SNAP bipolarity has been replicated in many subsequent factor analytic studies (e.g., [Markon et al., 2005](#); [Simms & Clark, 2005, 2006](#); [Watson et al., 2008](#)). The *DSM-5* trait model does not include exhibitionism, entitlement, propriety, or workaholism. The *DSM-5* trait model though does

include rigid perfectionism, as a trait opposite to disinhibition (i.e., a maladaptive variant of conscientiousness).

There is a comparable bipolarity in the Computerized Adaptive Test of Personality Disorder (CAT-PD; [Simms et al., 2011](#); see also the chapter by [Simms, Williams, and Simms](#)). The CAT-PD has three scales that load negatively on disinhibition (i.e., Perfectionism, Rigidity, and Workaholism, which aligns with FFM conscientiousness), whereas Irresponsibility, Non-planfulness, and Non-perseverance load positively ([Wright & Simms, 2014](#)). The CAT-PD also has a scale for maladaptive extraversion: Exhibitionism, which loads negatively on the detachment factor (which aligns with FFM introversion).

In sum, existing measures and models do include some representation of maladaptive variants of the domains of extraversion and conscientiousness, including the CAT-PD ([Wright & Simms, 2014](#)) and the SNAP ([Simms & Clark, 2005, 2006](#)). Nevertheless, questions have been raised with respect to the inclusion of any such representation (see the chapters by [Wright](#) and by [Simms, Williams, and Simms](#)). The extent of this representation is likely to be a continued point of contention and disagreement.

Pettersson and colleagues suggest that the maladaptivity of both poles of all five domains emerges more clearly after variance is first removed due to an evaluation bias ([Pettersson, Turkheimer, Horn, & Menatti, 2012](#); [Pettersson et al., 2014](#)). “We suggest that there is some degree of bipolarity in most, if not all, traits in terms of both their adaptive and their maladaptive qualities” ([Pettersson et al., 2014](#), p. 444). In [Pettersson et al. \(2012\)](#), traits such as overbearing and wild became apparent for extraversion; workaholic and uptight for conscientiousness; and gullible, timid, and submissive for agreeableness.

The variance that [Pettersson and colleagues \(2014\)](#) refer to as constituting an evaluative method factor may also reflect, for the most part, the extent of maladaptive dysfunction. There will be a very high correlation between extent of positive versus negative evaluation and extent of adaptive versus maladaptive functioning. [Pettersson et al. \(2014\)](#) indicated how persons will endorse items that are opposite to one another, such as perfectionism that leads to job failure and negligence that leads to job failure. They suggest that this reflects a contaminating method variance of evaluation (e.g., a disposition to endorse negative, undesirable traits irrespective of the content). However, it may also simply reflect the fact that

there will be a strong positive correlation of one form of maladaptive behavior with other maladaptive behaviors (again regardless of content). For example, persons may describe themselves as being both perfectionistic and irresponsible, largely because they both result in a tendency to do jobs poorly. There is considerable discussion in the current psychopathology literature regarding a “p-factor,” or a general factor of maladaptivity that contributes to a nonspecific covariation (comorbidity) across widely diverse forms of mental disorder ([Caspi et al., 2014](#)). This p-factor is evident as well within the field of personality disorder ([Wright et al., 2012](#)). Personality disorders that clearly involve behaviors opposite to one another (e.g., dependent and antisocial or avoidant and histrionic) can be comorbid (diagnosed in the same person), due largely to the fact that they involve comparable levels or manner of dysfunction.

It would seem straightforward to suggest that gullibility is a maladaptive variant of being trusting, selflessness is an extreme variant of altruism, subservience is an extreme form of compliance, workaholism is a maladaptive variant of achievement-striving, and perfectionism is a maladaptive variant of competence ([Nettle, 2006a](#)). Yet, it would also not be surprising to find a lack of a positive correlation (for instance) between adaptive trust and maladaptive gullibility, or between adaptive compliance and maladaptive subservience. Adaptive traits will naturally correlate negatively with maladaptive traits, even when they concern the same trait. It is then perhaps all the more compelling that researchers have in fact been able to demonstrate positive correlations between adaptive and maladaptive variants of the same trait ([Haigler & Widiger, 2001](#)), as the natural tendency for there to be a negative correlation has to be overcome.

Maladaptive agreeableness and extraversion have been well recognized when these FFM domains are considered from the perspective of the interpersonal circumplex (IPC). FFM agreeableness and extraversion are readily understood as approximately 45 degree rotations of the IPC dimensions of agency and communion ([McCrae & Costa, 1989](#); [Wiggins & Pincus, 2002](#)). This has not received any significant dispute. And it is also well established that there are maladaptive variants of all eight octants of the IPC ([Pincus & Hopwood, 2012](#)), including the locations occupied by agreeableness (as well as its polar opposite antagonism) and extraversion (as well as its polar opposite introversion). There are even well-established measures of the maladaptive variants for every octant of the circumplex,

such as the Inventory of Interpersonal Problems (Horowitz, Alden, Wiggins, & Pincus, 2000). Wright et al. (2012) reviewed the *DSM-5* dimensional trait model from the perspective of the IPC and noted the inadequate representation of maladaptive variants of the gregarious–extraverted, warm–agreeable, and even the unassuming–ingenuous octants. “Pathologically warm traits are not extensively represented in the *DSM-5* trait model, relative to other interpersonal domains” (Wright et al., 2012, p. 271). In sum, the presence of the maladaptive variants of the lower right and upper right octants of the IPC have not been in dispute, and these are the precise locations of FFM agreeableness and FFM extraversion, respectively. To suggest that there are no meaningful maladaptive variants of extraversion and agreeableness would be to neglect the considerable body of IPC personality disorder literature and research (see Pincus & Hopwood, 2012).

Coker, Samuel, and Widiger (2002) conducted a lexical study on the presence and extent of socially undesirable, maladaptive traits within the English language. They coded each of the 1,710 trait terms within the language with respect to their undesirability and then considered their location within the FFM (Goldberg, 1993). It was apparent that there are considerably more desirable terms for low neuroticism than for high neuroticism, for extraversion than for introversion, for high rather than low openness, for agreeableness than for antagonism, and for high conscientiousness than for low conscientiousness. Nevertheless, there were still many undesirable, maladaptive trait terms for agreeableness, extraversion, openness, conscientiousness, and even for low neuroticism. In fact, 43% of the extraversion traits were considered to be undesirable. Table 20.1 provides the percentages for each pole.

Table 20.2 provides illustrative examples for all 10 poles, based on the findings of Coker et al. (2002).

Table 20.1 Percent of Maladaptive (Undesirable) Trait Terms within High and Low Poles of the Big Five

Big Five Domain				
Emotional Instability (Neuroticism)	Surgency (Extraversion)	Intellect (Openness)	Agreeableness	Conscientiousness
High	60%	43%	26%	14%
Low	8%	89%	94%	97%

Note: Data adapted from Coker, Samuel, and Widiger (2002).

Table 20.2 Maladaptive (Undesirable) Trait Terms within High and Low Poles of the Big Five

Big Five Domain				
Emotional Instability (Neuroticism)	Surgency (Extraversion)	Intellect (Openness)	Agreeableness	Conscientiousness
High	Defensive	Blustery	Overindulgent	Deceivable
	Moody	Exaggerative	Rebellious	Dependent
	Hypersensitive	Flaunty	Unconformable	Ingratiating
	Self-Destructive	Showy	Unconventional	Transparent
Low	Conscienceless	Aloof	Dogmatic	Overbookish
	Emotionless	Humorless	Prejudiced	Overcautious
	Inexcitable	Reclusive	Unimaginative	Stringent
	Inhuman	Somber	Unreflective	Tight

Note: Data obtained from [Coker, Samuel, and Widiger \(2002\)](#).

For extraversion there was long-winded, blustery, showy, flaunty, and exaggerative; for conscientiousness there was overbookish, overcautious, leisureless, stringent, and tight; and for agreeableness there was deceivable, dependent, soft-shelled, and ingratiating. These three sets of traits are quite suggestive of the histrionic, obsessive-compulsive, and dependent personality disorders (respectively) that are defined in large part by the domains of extraversion, conscientiousness, and agreeableness, respectively ([Lynam & Widiger, 2001](#); [Saulsman & Page, 2004](#); [Samuel & Widiger, 2004, 2008](#)).

[Boudreax, Piedmont, Sherman, and Ozer \(2013\)](#) developed the Multi-Context Problems Checklist as a measure of personality-related problems in living, particularly with respect to employment and work. In the course of this effort they identified “specific personality-related problems associated with each pole of each trait of the five factor model of personality” (p. 62). It was not difficult to identify problems associated with high neuroticism, introversion, low openness, antagonism, and low conscientiousness. However, they did indeed identify problems associated with high extraversion (e.g., needing to be in control, imposing opinions and beliefs on the partner), high openness (e.g., an overactive imagination), high agreeableness (not being able to say “no” and being too conforming), and high conscientiousness (e.g., pushing too hard to excel and being perfectionistic).

[Nettle \(2006a\)](#) provided an evolutionary model for understanding the emergence of the factors of the FFM. “Each of the Big Five dimensions of

human personality can be seen as the result of a trade-off between different fitness costs and benefits" ([Nettle, 2006a](#), p. 622). This helps explain the genetics of individual differences. "As there is no unconditionally optimal value of these trade-offs, it is to be expected that genetic diversity will be retained in the population" (p. 622). It is apparent across evolutionary models of psychopathology, personality, and personality disorder that there are both costs and benefits for what is generally considered normal and abnormal personality functioning ([Crespi, 2014](#); [Del Giudice & Del Giudice, 2014](#)).

[Nettle \(2006a\)](#), for example, suggested that extraversion, although largely adaptive with respect to exploration, activity, and sexual pursuit, also carries with it risk-taking and maladaptive sensation-seeking. "People falling at this end of the continuum are more likely to be sexually promiscuous, emotionally intrusive, and engage in excessive self-disclosure and thrill-seeking behaviors" (see also the chapter by [Wilt and Revelle](#)). The benefits of conscientious self-control, orderliness, and achievement-striving are self-evident, but [Nettle \(2006a\)](#) suggested that this domain of personality can also have significant costs, as in perfectionism and missed opportunities (due to excessive constraint). Agreeableness is generally quite desirable, but "very high agreeableness, if it led to an excessive attention to the needs and interests of others, or excessive trusting, would be detrimental to fitness" ([Nettle, 2006a](#), p. 627). Openness is a divergent cognitive style that seeks novelty, creativity, and complexity. "Though such a cognitive style might appear purely beneficial, it is conceptually very similar to components of schizotypy" ([Nettle, 2006a](#), p. 626). "The unusual thinking style characteristic of openness can lead to nonveridical ideas about the world, from supernatural or paranormal belief systems to the frank break with reality" ([Nettle, 2006a](#), p. 627).

Even low levels of neuroticism can be maladaptive, contributing to a failure to avoid hazards and anticipate negative outcomes ([Nettle, 2006a](#)). It can perhaps be difficult for some to recognize or appreciate the potentially maladaptive nature of low neuroticism. Certainly emotional stability is quite adaptive and desirable. However, imagine being incapable of feeling anxious. Neuroticism exists as a universal trait in part because it does have certain benefits for adaptive functioning ([Crespi, 2014](#); [Del Giudice & Del Giudice, 2014](#)). If neuroticism does have adaptive strengths, then clearly its absence would at times be experienced as maladaptive. For example,

anxiety is a useful trait for anticipating negative outcomes and risks. The absence of an ability to feel anxious would be analogous to the inability to feel physical pain, as in the case of congenital analgesia, a very debilitating and life-threatening disease. Persons who are abnormally low in anxiousness are unlikely to avoid dangerous activities or to respond to cues of social and physical harm. Explored in the follow sections will be the empirical support for maladaptive conscientiousness and maladaptive agreeableness.

Maladaptive Conscientiousness

It is self-evident that low conscientiousness is associated with maladaptive personality functioning. However, there is also research demonstrating that high levels of conscientiousness can also be problematic, interpreted as another instance of the “too-much-of-a-good-thing” phenomenon (Pierce & Aguinis, 2013). Indeed, there have been a number of studies demonstrating a curvilinear relationship of conscientiousness with problematic outcomes, indicating that both low and high levels of conscientiousness are associated with decreased performance (Carter et al., 2014, 2015; Le, Oh, Robbins, Ilies, Holland, & Westrick, 2011; Pierce & Aguinis, 2013; Whetzel et al., 2010).

Studies have also indicated a relationship of FFM conscientiousness with the OCPD symptomatology (e.g., Bastiaansen, Rossi, Schotte, & De Fruyt, 2011; Clark & Livesley, 2002; Clark, Livesley, Schroeder, & Irish, 1996; Clark, Vorhies, & McEwen, 2002; Markon et al., 2005; Saulsman & Page, 2004; Schroeder, Wormworth, & Livesley, 1992). In their meta-analysis of FFM-OCPD research Saulsman and Page (2004) had reported a relatively small (albeit still significant) association of OCPD with FFM conscientiousness. They concluded that “those [personality disorders] particularly characterised by [FFM] orderliness show positive associations with conscientiousness (e.g., obsessive-compulsive)” (p. 1075). O’Connor (2005), in his meta-analysis, had concluded that OCPD aligns well with conscientiousness (obtaining a loading of .72 on the respective factor), replicating two earlier meta-analytic studies by O’Connor and colleagues that also clearly aligned compulsivity with conscientiousness (i.e., O’Connor, 2002; O’Connor & Dyce, 1998). Samuel and Widiger (2008b) similarly concluded in their meta-analysis that “a predominant finding of the studies included within this meta-analysis was a positive correlation of

FFM conscientiousness facets with obsessive-compulsivity personality disorder” (p. 12).

The relationship of the full syndrome of *DSM-IV* OCPD with conscientiousness though will not always be strong in part because OCPD is a heterogeneous personality disorder that includes more than just facets of conscientiousness. Joint factor analyses of the FFM with the more specific components of OCPD, such as compulsivity (assessed, for example, by the DAPP-BQ; [Livesley & Jackson, 2009](#)) and workaholism and propriety (assessed by the SNAP; [Clark, 1993](#)), have provided clearer and consistent evidence for a strong association with conscientiousness in factor analytic studies by *DSM-5* work group members (e.g., Clark et al., [1996, 2002](#); [Markon et al., 2005](#); [Schroeder et al., 1992](#)). In reviewing their models together, [Clark and Livesley \(2002\)](#) had in fact concluded that “compulsivity (conventionality-rigidity) undoubtedly tapped conscientiousness” (p. 167). Livesley from the beginning of the presentation of his dimensional trait model aligned his domain of compulsivity with FFM conscientiousness. “Compulsivity resembles the conscientiousness domain of the 5-factor approach” ([Livesley, Jang, & Vernon, 1998](#), p. 945). In an early draft of the dimensional trait model for *DSM-5*, [Krueger, Skodol, Livesley, Shrout, and Huang \(2008\)](#) had included “orderliness” and “conscientiousness” as facets within the domain of compulsivity.

[Samuel and Widiger \(2011\)](#) explored the relationship of conscientiousness with compulsivity using six alternative measures of conscientiousness, seven alternative measures of OCPD, and three scales assessing specific components of OCPD (i.e., Compulsivity, Workaholism, and Propriety). They reported a robust relationship between DAPP-BQ Compulsivity and all six measures of conscientiousness. SNAP Workaholism and Propriety similarly related strongly with FFM conscientiousness, consistent with prior research that has related measures of perfectionism with FFM conscientiousness (e.g., [Stoeber, Otto, & Dalbert, 2009](#)). The relationship weakened somewhat with the broader measures of OCPD, likely due again to its inclusion of some components of personality beyond conscientiousness, such as high neuroticism and low openness ([Lynam & Widiger, 2001](#); [Samuel & Widiger, 2008b, 2010](#)).

[Samuel et al. \(2012\)](#) developed a measure of OCPD from the perspective of the FFM, the Five Factor Obsessive-Compulsive Inventory (FFOCI),

which includes six scales that were hypothesized to assess maladaptive variants of conscientiousness: Perfectionism, Fastidiousness, Punctiliousness, Doggedness, Workaholism, and Ruminative Deliberation. They reported that all six scales were moderately to strongly related to conscientiousness (as well as with measures of OCPD). [Crego, Samuel, and Widiger \(2015\)](#) replicated and extended their findings, including additional measures of conscientiousness, such as the Dependability scale from the Inventory of Personal Characteristics ([Tellegen & Waller, 1987](#)); Activity from the Zuckerman–Kuhlman–Aluja Personality Questionnaire ([Aluja, Kuhlman, & Zuckerman, 2010](#)); Conscientiousness from the International Personality Item Pool-NEO (IPIP-NEO; [Goldberg et al., 2006](#)); and Orderliness from the 5DPT (van Kampen, 2012). All six FFOCI maladaptive conscientiousness scales related robustly with all four alternative measures of conscientiousness. For example, the correlations with IPIP-NEO Conscientiousness ranged from .52 (for Ruminative Deliberation) to .70 (for Perfectionism). Their correlations with any one of the other four domains of the FFM were never higher than .26.

It is perhaps not really that difficult to understand that compulsivity, and thereby many of the traits of OCPD, are maladaptive variants of FFM conscientiousness. The essential feature of OCPD is “a preoccupation with orderliness, perfectionism, and mental and interpersonal control” ([American Psychiatric Association, 2013](#), p. 678), including within its diagnostic criteria traits such as perfectionism, preoccupation with order and organization, workaholism, and, quite explicitly, overconscientiousness. Similarly, FFM conscientiousness includes facets such as order, discipline, achievement-striving, and deliberation ([Costa & McCrae, 1992](#)). It would seem apparent that maladaptive and/or extreme variants of order, discipline, achievement-striving, and deliberation would be the OCPD traits of perfectionism, preoccupation with order and organization, workaholism, and overconscientiousness.

In sum, it is well accepted that low conscientiousness, characterized by disinhibition, laxness, irresponsibility, negligence, and rashness, includes maladaptive personality traits, and aligns closely with the domain of disinhibition within the *DSM-5* dimensional trait model ([De Fruyt et al., 2013](#); [Gore & Widiger, 2013](#); [Griffin & Samuel, 2014](#); [Thomas et al., 2012](#); [Wright et al., 2012](#)). However, it also appears to be apparent that high conscientiousness can also be associated with maladaptive personality

traits, such as perfectionism, propriety, fastidiousness, punctiliousness, doggedness, workaholism, and ruminative deliberation, which together can be identified as a domain of compulsivity (Crego, Samuel, et al., 2015; Livesley et al., 1998; Samuel & Gore, 2012). This domain of maladaptive personality functioning is not included within the *DSM-5* dimensional trait model, but it is one of the four fundamental domains of maladaptive personality functioning included within Livesley's DAPP (Livesley & Jackson, 2009) and the dimensional trait model proposed for ICD-11 (Tyrer et al., 2011).

Maladaptive Agreeableness

Agreeableness includes traits such as compliant, trusting, modest, and altruistic. It is evident that it is typically preferable to be characteristically agreeable than characteristically antagonistic. However, it would also seem evident that some persons are overly compliant, excessively trusting, inordinately modest, and/or excessively altruistic. Indeed, there are quite a few maladaptive trait terms within high agreeableness: gullibility, self-effacement, subservience, submissive, docile, servile, clinging, defenseless, selfless, and acquiescent (Coker et al., 2002). In fact, these are all traits that are quite suggestive of a dependent personality disorder. Leary (1957) devoted a chapter of his seminal IPC text to "the dependent personality" (p. 292), located in the lower-right ("docile-dependent") octant of the IPC, which is the precise location of FFM agreeableness (Gore & Pincus, 2013; Pincus & Hopwood, 2012). In its less severe form it was said to involve a "poignant or trustful conformity"; in its more severe form it was said to involve a "helpless dependency."

Quite a few studies have indeed confirmed a close relationship between dependency and the agreeableness octant of the IPC (e.g., Morey, 1985; Sim & Romney, 1990). For example, Soldz, Budman, Demby, and Merry (1993) reported that dependent personality disorder (DPD) was empirically located within the lower-right "exploitable" octant of the IPC. Trobst, Ayearst, and Salekin (2004) considered four alternative measures of DPD, and again located it within the lower-right quadrant, spread along the octants of unassured–submissive, unassuming–ingenuous, and warm–agreeable, depending upon which measure of DPD was used. Finally, Smith, Hilsenroth, and Bornstein (2009) likewise reported that the closer patients resembled the prototypic case of DPD, the more they described

their relational style as affiliative–submissive, nonassertive, and overly accommodating, all located again within the lower-right quadrant of the IPC.

Research concerned directly with the relationship of dependency and/or DPD with FFM agreeableness, however, has not always provided strong support, despite the consistent findings when agreeableness is understood to be a variant of the IPC. Some self-report inventory studies have confirmed the relationship between FFM agreeableness and DPD (e.g., [Bagby et al., 2001](#); [Mongrain, 1993](#); [Wiggins & Pincus, 1989](#); [Zuroff, 1994](#)). However, many self-report inventory studies have failed to obtain a strong relationship, as indicated in meta-analyses by [Bornstein and Cecero \(2000\)](#), [Miller and Lynam \(2008\)](#), [Saulsman and Page \(2004\)](#), and [Samuel and Widiger \(2008b\)](#). [Samuel and Widiger \(2008b\)](#) though did indicate a significant effect of the instrument on the strength of this relationship.

[Haigler and Widiger \(2001\)](#) reported that the NEO PI-R ([Costa & McCrae, 1992](#)), the most commonly used measure in FFM research, is heavily imbalanced in its assessment of adaptive and maladaptive variants of high versus low conscientiousness, neuroticism, extraversion, openness, and most relevant here, agreeableness. They indicated that 83% of the NEO PI-R Agreeableness items were assessing for adaptive rather than maladaptive agreeableness. Four meta-analyses of FFM dependency have been conducted. Seventeen of the 18 studies considered by [Bornstein and Cecero \(2000\)](#), 11 of the 15 samples considered by [Saulsman and Page \(2004\)](#), all of the studies considered by [Miller and Lynam \(2008\)](#), and all of the studies considered by [Samuel and Widiger \(2008b\)](#) used either the NEO PI-R or an instrument closely modeled after the NEO PI-R. [Haigler and Widiger \(2001\)](#) experimentally altered the NEO PI-R by inserting words in the test items to change the direction of the maladaptivity without otherwise changing the content of the items. For example, the NEO PI-R Altruism items “I try to be courteous to everyone I meet,” “Some people think of me as cold and calculating” (reverse keyed), “I think of myself as a charitable person,” “Some people think I’m selfish and egotistical” (reverse keyed), and “I go out of my way to help others if I can” ([Costa & McCrae, 1992](#), p. 72) all describe behavior for which it would be preferable (or adaptive) to endorse the item in the altruistic direction. The experimentally altered versions were “I am overly courteous to everyone I meet,” “I can be cold and calculating when it’s necessary,” “I am so charitable that I give more

than I can afford," "Most people think that I take good care of my own needs," and "I have sacrificed my own needs to help others" (respectively). NEO PI-R Agreeableness, prior to the manipulation, had correlations of .04, .17, and .04 with three independent measures of DPD. The correlations increased to .57, .66, and .45 (respectively) with the experimentally altered version.

[Lowe, Edmundson, and Widiger \(2009\)](#) replicated and extended the findings of [Haigler and Widiger \(2001\)](#), including three measures of DPD, eight measures of trait dependency, and two measures of dependency from alternative dimensional models of personality disorder (i.e., Diffidence from the DAPP-BQ and Dependency from the SNAP). They found that only 8% of the 13 measures of trait dependency and/or DPD in the student sample and only 15% of the 13 scales within the clinical sample correlated significantly with NEO PI-R Agreeableness. When the experimentally altered version of the NEO PI-R Agreeableness scale was administered, 77% of the 13 trait dependency or DPD measures correlated significantly with Agreeableness in the student sample and 92% of the 13 scales correlated significantly in the clinical sample.

Dependent personality traits are included within the domain of neuroticism (or negative affectivity) within some alternative dimensional trait models and measures, such as the PID-5 ([Krueger et al., 2012](#)), SNAP ([Clark, 1993](#)), and HEXACO PI-R ([Lee & Ashton, 2004](#)). For the PID-5 and SNAP this is due in part to the absence of an opportunity for dependent traits to be included within agreeableness, given the absence of this domain within the respective measure and model. [Harlan and Clark \(1999\)](#) and [Linde et al. \(2013\)](#) though did fail to replicate the location of Dependency within SNAP Negative Affectivity in their effort to replicate the factor analytic structure of the SNAP. However, even when a measure of agreeableness has been included within a respective factor analysis, dependent traits have at times still loaded within the domain of neuroticism (e.g., [Clark et al., 1996, 2002; Lee & Ashton, 2004](#)).

DPD does appear to be largely a mixture of the traits of neuroticism and agreeableness. [Blais \(1997\)](#) had clinicians assess their patients with respect to DPD and the FFM. He reported an essentially equal relationship of DPD to both neuroticism and agreeableness. Similar results were obtained by [Sprock \(2002\)](#) and [Mullins-Sweatt and Widiger \(2007\)](#). [Lynam and Widiger \(2001\)](#) asked researchers to describe prototypic cases of DPD in terms of

the domains and facets of the FFM. DPD included facets from both agreeableness (i.e., trust, compliance, and modesty) and neuroticism (i.e., anxiousness and self-consciousness). [Samuel and Widiger \(2004\)](#) surveyed clinicians in a similar fashion and again reported facets of both agreeableness (i.e., compliance and modesty) and neuroticism (i.e., anxiousness, depressiveness, self-consciousness, and vulnerability).

Submission and subservience are clearly a manner of interpersonal relatedness ([Leary, 1957](#)). However, DPD also includes feelings of neediness, insecurity, vulnerability, and helplessness. Self-report items that are said to be concerned with the interpersonal components of dependency (e.g., submissiveness) will at times conflate the assessment of the submissive, meek, and subservient manner of interpersonal relatedness with associated feelings of insecurity, helplessness, despondence, and dysphoria. Just as antagonistic behavior will often be accompanied by feelings of angry hostility (from neuroticism), submissive and dependent behavior will often be accompanied by feelings of anxiousness, insecurity, and helplessness. In other words, the extent to which a measure of dependency or submission aligns with agreeableness versus neuroticism may depend on the extent to which the measure is saturated with the feelings of inadequacy along with the submissive manner of interpersonal relatedness.

Conclusions

In sum, a considerable body of theory and existing research is consistent with the proposal that there are maladaptive variants of all 10 poles of all five domains of the FFM. The distribution of this maladaptivity is sorely disproportionate (e.g., there is considerably more maladaptivity for antagonistic traits than for agreeable traits and considerably more adaptivity for agreeable traits than for antagonistic traits), but that does not belie the existence of some degree of socially and clinically important maladaptivity within both poles. Working against the validation of this bipolarity, however, is the simple fact that measures of adaptive functioning will typically (if not invariably) correlate negatively with measures of maladaptive functioning, and measures of maladaptive functioning will often correlate positively with one another (regardless of the content). It will be important for future research addressing this bipolarity to recognize that a maladaptive variant of a normal trait may in fact correlate negatively with that trait due simply to this p-factor. However, there are measures in

which this bipolarity has been explicitly incorporated, which is discussed further in the next section.

Maladaptive FFM Scales

A common criticism of the FFM, with respect to its coverage of personality disorders, has been that the primary FFM measures have lacked adequate fidelity for the assessment of its maladaptive variants (e.g., Krueger et al., 2011; Reynolds & Clark, 2001). This concern no longer applies, as the field is now awash with measures to assess maladaptive variants of the FFM (Samuel, 2013; see also the chapter by Simms, Williams, and Simms).

However, it is important to appreciate that the NEO PI-R (Costa & McCrae, 1992) is not well understood as simply a measure of normal, adaptive personality functioning. It also provides an assessment of maladaptive variants of high neuroticism, low extraversion, low openness, high antagonism, and low conscientiousness (Haigler & Widiger, 2001) and these are the poles of the FFM that are primarily involved for most (but not all) of the *DSM-IV-TR* personality disorders (Lynam & Widiger, 2001). It is largely for this reason that the NEO PI-R has in fact been used quite effectively for the assessment of many of the personality disorders (Bastiaansen, Rossi, & De Fruyt, 2013; Miller, 2012). This fact alone, that the NEO PI-R, a measure of normal personality, provides a measure of (for instance) borderline, antisocial, and avoidant personality disorder that is comparable to direct measures of these personality disorders, is itself a testament to the validity of understanding these personality disorders from the perspective of the FFM (Miller, 2013). The exceptions tend to be for the assessment of the dependent, obsessive-compulsive, schizotypal, and histrionic personality disorders (Miller, 2012) as these include significant components of maladaptive agreeableness, conscientiousness, openness, and extraversion, respectively (Lynam & Widiger, 2001; Samuel & Widiger, 2004) and the NEO PI-R is very limited in its coverage of the maladaptive variants of these poles of the FFM (Haigler & Widiger, 2001). In addition, the NEO PI-R is also limited in its coverage of all possible maladaptive variants of the other poles. For example, absent from its assessment of neuroticism is affective instability (Miller & Pilkonis, 2006)

as well as the full range of helpless, vulnerable self-destructiveness, and angry rage ([Mullins-Sweatt et al., 2012](#)).

The Structured Interview for the Five Factor Model (SIFFM; [Trull et al., 1998](#)) was modeled after the NEO PI-R ([Costa & McCrae, 1992](#)) although it was developed in part to increase the coverage of maladaptive variants of low neuroticism, high extraversion, high openness, high agreeableness, and high consciousness. However, it has not been used that often, given perhaps the preference within general personality research for self-report inventories relative to structured interviews. In addition, the SIFFM does not in any case provide as much coverage of the maladaptive variants of the poles of the FFM as would be needed for an adequate assessment of all the *DSM-IV* (now *DSM-5*) personality disorders ([Bagby et al., 2005](#); [Trull, Widiger, & Burr, 2001](#)).

[De Clercq, De Fruyt, Van Leeuwen, and Mervielde \(2006\)](#) modeled the development of the Dimensional Personality Symptom Item Pool (DIPSI) after the SIFFM. They constructed items to assess maladaptive variants of the facet scales within the Hierarchical Personality Inventory for Children (HiPIC; [Mervielde & De Fruyt, 2002](#)). The HiPIC provides an assessment of FFM traits within children and adolescents; however, it is confined largely to the normal range, comparable to the NEO PI-R. The DIPSI provides an assessment of the maladaptive variants of HiPIC items and scales. Together they provide an integrative assessment of normal and abnormal personality functioning in children and adolescents from the perspective of the FFM ([De Clercq & De Fruyt, 2003, 2012](#); see also the chapter by [De Fruyt, De Clercq, and De Bolle](#)). The original version of the DIPSI did not include an assessment of maladaptive variants of high HiPIC Imagination. However, a revised version of the DIPSI now includes maladaptive variants of imagination ([De Fruyt & De Clercq, 2014](#)).

An additional measure of maladaptive variants of the FFM is provided by the Personality Inventory for *DSM-5* (PID-5; [Krueger, Derringer, Markon, Watson, & Skodol, 2012](#)). The PID-5 is a self-report measure of the dimensional trait model of *DSM-5*, which in turn is said to be coordinated with the FFM (see earlier section). However, a potential limitation of the PID-5 is that it is confined largely to just five of the 10 poles of the FFM. In this regard the PID-5 is well aligned with the NEO PI-R. Both the PID-5 and the NEO PI-R are confined largely to maladaptive variants of high neuroticism, low extraversion, low agreeableness, and low

conscientiousness, with little or no representation of maladaptive variants of low neuroticism, high extraversion, high agreeableness, or high conscientiousness. However, unlike the NEO PI-R, the PID-5 assesses for maladaptive high openness, rather than maladaptive low openness, contributing to the weaker convergence of PID-5 Psychoticism with NEO PI-R Openness (Gore & Widiger, 2013).

As noted earlier, the PID-5 does include some limited coverage of the bipolarity. For example, there is one trait scale for maladaptively high conscientiousness (i.e., Rigid Perfectionism). It also includes Restricted Affectivity as a maladaptive variant of low neuroticism (Krueger et al., 2012), but this scale is perhaps more accurately placed within introversion rather than low neuroticism (Watson, Stasik, Ro, & Clark, 2013; Widiger, Costa, & McCrae, 2013). Nevertheless, beyond these two scales there is little representation of maladaptively low neuroticism, extraversion, low openness, agreeableness, or conscientiousness, which limits its ability to cover significant traits of some personality disorders, such as the obsessive-compulsive (Crego, Samuel, et al., 2015) and psychopathy (Crego & Widiger, 2014). Because the model does not include maladaptively low neuroticism, *DSM-5* is unable to assess psychopathic fearlessness and glib charm directly (Lynam & Widiger, 2007). However, in *DSM-5* it is suggested to key the scale for anxiousness negatively to assess for fearlessness (American Psychiatric Association, 2013, p. 765). Anxiousness will indeed correlate negatively with fearlessness, but a scale for the assessment of anxiousness might not actually be able to assess effectively for or distinguish between levels of fearlessness (Crego & Widiger, 2014).

Simms et al. (2011) developed the Computerized Adaptive Test-Personality Disorder (CAT-PD; see also the chapter by Simms, Williams, and Simms). They initially worked from the set of five domains identified by Widiger and Simonsen's (2005) integration of alternative dimensional trait models, including the FFM: emotional dysregulation versus stability, extroversion versus introversion, antagonism versus compliance, constraint versus impulsivity, and unconventionality versus closedness to experience (see Simms et al., 2011, for a description of the rationale for and construction of the CAT-PD). They established an initial list of 53 candidate traits organized into five corresponding domains. Simms et al. (2011) then developed draft items, working from 2,413 items within the International Personality Item Pool (IPIP), many of which were written to assess domains

and facets of the FFM (Goldberg et al., 2006). Through factor, item response theory, and content analyses, the item pool was eventually reduced for a “static” version (CAT-PD-SF; Wright & Simms, 2014) to 212 items assessing 33 traits organized into five domains (i.e., negative emotionality, detachment, antagonism, disconstraint, and psychoticism). The final version of the instrument includes 33 scales, such as Manipulativeness (from antagonism), Romantic Disinterest (from introversion), Exhibitionism (from extraversion), and Perfectionism (from conscientiousness). Initial validation suggests that its scales align well with the FFM, albeit not surprisingly the convergence of the schizotypal thinking scales with FFM openness was relatively weaker (Wright & Simms, 2014).

The scales of the CAT-PD are very similar to those of the PID-5. In fact, all but three of the PID-5 scales are included in the CAT-PD. The CAT-PD has more coverage, in that it includes 33 scales, relative to the 25 of the PID-5, although the CAT-PD does not appear to have scales comparable to the PID-5 Attention-Seeking, Perseveration, or Distractability. The PID-5, in turn, does not appear to have scales comparable to the CAT-PD Cognitive Problems, Domineering, Exhibitionism, Fantasy Proness, Health Anxiety, Rudeness, Self-Harm, Norm-Violation, or Workaholism. Some of this reflects not only the greater number of scales within the CAT-PD, but also its inclusion of maladaptive variants of extraversion (e.g., Exhibitionism) and conscientiousness (e.g., Workaholism).

There is also a Clinician Rating Form for an assessment of the *DSM-5* dimensional trait model on the basis of an unstructured clinical interview (American Psychiatric Association, 2010). This measure is no longer posted on the *DSM-5* website, however, and so may not be readily accessed. There are other abbreviated measures of the FFM, such as the Five Factor Model Rating Form (FFMRF; Mullins-Sweatt, Jamerson, Samuel, Olson, & Widiger, 2006). The FFMRF is a one-page rating form that includes an assessment of all the 30 NEO PI-R facets of the FFM. The FFMRF has been used in a number of studies as a clinician rating form and as a self-report inventory (Samuel, Mullins-Sweatt, & Widiger, 2013).

A limitation of the FFMRF is that it does not provide adequate coverage of the maladaptive variants of the FFM. Rojas and Widiger (2014) therefore developed the Five Factor Form (FFF). The FFF is again a one-page rating form that can be used by clinicians to describe their patients or as a self-report. It includes all 30 NEO PI-R FFM facets and, unique to this measure,

maladaptive variants for all 60 poles of all 30 facets. For example, for the facet of modesty (from agreeableness), a score of 5 indicates “self-effacing, self-denigrating,” 4 is “humble, modest, unassuming,” 3 is neutral, 2 is “confident, self-assured,” and 1 is “boastful, vain, pretentious, arrogant.” For the facet of achievement-striving (from conscientiousness), a score of 5 indicates “workaholic, acclaim-seeking,” 4 is “purposeful, diligent, ambitious,” 3 is neutral, 2 is “carefree, content,” and 1 is “aimless, shiftless, desultory.” The FFF is comparable in structure and format to the Sliderbar Inventory ([Pettersson et al., 2014](#)), which also includes maladaptive variants at both poles of each item. A few of the FFF items are in fact aligned well with respective Sliderbar items. For example, one “aggressive/submissive” Sliderbar Inventory item contrasts “I get mad easily and often get into fights” (maladaptive) and “I stand up for myself if someone has done me wrong” (adaptive) at one pole, with “I rarely lose my temper” (adaptive) and “I am a meek person” (maladaptive) at the other pole. A comparable FFF item contrasts “combative, aggressive” and “critical, contrary” at one pole with “cooperative, obedient, and deferential” and “yielding, submissive, meek” at the other pole. However, a distinction between the two measures is that the Sliderbar Inventory was constructed to assess opposite components of the *DSM-IV-TR* personality disorders, whereas the FFF was constructed to assess the opposite poles of the FFM. [Rojas and Widiger \(2014\)](#) provided empirical support for the validity of the FFF as a measure of the FFM.

There are also eight self-report inventories constructed to assess the *DSM-IV-R* (now *DSM-5*) personality disorders from the perspective of the FFM, including psychopathy ([Lynam et al., 2011](#)), schizotypal personality disorder ([Edmundson et al., 2011](#)), and histrionic ([Tomiatti, Gore, Lynam, Miller, & Widiger, 2012](#)). A special section of the *Journal of Personality Assessment* ([Widiger, Lynam, Miller, & Oltmanns, 2012](#)) was devoted to the initial validation studies for five additional measures: the Five Factor Borderline Inventory (FFBI; [Mullins-Sweatt et al., 2012](#)), the Five Factor Avoidant Assessment (FFAvA; [Lynam et al., 2012](#)), the Five Factor Dependency Inventory (FFDI; [Gore, Presnall, Lynam, Miller, & Widiger, 2012](#)), the Five Factor Narcissism Inventory (FFNI; [Glover, Miller, Lynam, Crego, & Widiger, 2012](#)), and the Five Factor Obsessive Compulsive Inventory (FFOCI; [Samuel et al., 2012](#)). Each of these instruments was constructed by first identifying which facets of the FFM (as provided within

the NEO PI-R) appear to be most relevant for each respective personality disorder. The source for this information included researchers' descriptions of each respective personality disorder in terms of the FFM (i.e., Lynam & Widiger, 2001), clinicians' descriptions of each personality disorder (i.e., Samuel & Widiger, 2004), and FFM-personality disorder research (e.g., Samuel & Widiger, 2008b). Scales were then constructed to assess the maladaptive variants of each facet that were specific to each personality disorder (e.g., Perfectionism, Workaholism, Punctiliousness, and Doggedness as maladaptive variants of conscientiousness for the FFOCI). The scales were subsequently validated by demonstrating convergence with both their respective parent FFM facet scales and alternative measures of the respective personality disorder. Finally, each of the measures was shown to have incremental validity over alternative measures of these personality disorders. Additional validation studies have been published concerning the EPA (Miller et al., 2011; Wilson, Miller, Zeichner, Lynam, & Widiger, 2011), the FFNI (Miller, Few et al., 2013; Miller, Gentile, & Campbell, 2013; Miller et al., 2015), the FFOCI (Crego, Samuel, & Widiger, 2015), the FFDI (Gore & Widiger, 2015), and the FFBI (DeShong, Lengel, Sauer-Zavalva, O'Meara, & Mullins-Sweatt, 2015). It is important to note that factor analysis of Five Factor Model Personality Disorder (FFMPD) scales will not necessarily yield five factors. Each instrument has a very disproportionate representation of the FFM domains. However, each scale is appropriately described as an FFM-based measure because each was conceptually derived from an FFM domain and there has been consistently strong support for the convergent and discriminant validity of the alignment of each scale with its respective FFM domain.

The approach taken in the construction of these scales, to disambiguate *DSM-IV-TR* personality disorders in terms of FFM facets, helps to ensure that all of the maladaptive personality traits included within a respective *DSM-IV-TR* personality disorder are adequately covered. It is evident that there is still considerable interest in these personality syndromes (Mullins-Sweatt, Bernstein, & Widiger, 2012; Shedler et al., 2010). These FFM personality disorder scales therefore provide a bridge, or a means of translation, between the *DSM-IV-TR* (now *DSM-5*) and the FFM.

If future research with these FFM personality disorder scales is confined to just their total scores, these scales will recreate many of the problems that are currently present for the existing categories (e.g., heterogeneity of

membership and diagnostic overlap), but a strength of these measures relative to many other *DSM-IV* self-report inventories is that these instruments can also be broken down into their subscales, thereby dismantling the heterogeneous syndromes into more distinctive component parts. It is evident, for example, that clinicians, when treating a personality disorder, do not address the entire personality structure with each intervention (Paris, 2006). They focus instead on underlying components, such as the dysregulated anger, the fragility, or the oppositionality of persons diagnosed with borderline personality disorder. These components are assessed independently and specifically by the scales of the FFBI (Mullins-Sweatt et al., 2012), providing considerably greater utility in clinical practice than the more global measures of borderline personality disorder (Mullins-Sweatt & Lengel, 2012).

The coverage provided by the FFMPD scales is substantial, with 99 total scales. Therefore lack of adequate coverage is unlikely to be an issue for the FFMPD scales. However, there are clearly far too many scales to include within any one particular study. To facilitate usage, abbreviated versions have been validated for the EPA (Lynam et al., 2013), the FFNI (Sherman et al., 2015), and the FFBI (DeShong, Mullins-Sweatt, Miller, Widiger, & Lynam, 2015), and others are being developed as well.

The FFMPD scales were constructed in part to allow a respective personality disorder to be assessed from the perspective of the FFM (Lynam, 2012). However, they can also be understood as “measures to assess maladaptive variants of the five factor model” (Widiger et al., 2012, p. 450). It is anticipated that researchers and clinicians will want to select subsets of FFMPD scales for their particular interest. For example, a clinician or researcher might be interested in assessing only for maladaptive variants of agreeableness, and would thereby confine the test administration to the FFBI Gullibility, Selflessness, Subservience, and Self-Effacing scales. Alternatively, the clinician or researcher might wish to consider only maladaptive variants of extraversion, including, for instance, the EPA Dominance and Thrill-Seeking scales (Lynam et al., 2011), the FFNI Exhibitionism and Authoritativeness scales (Glover et al., 2012), and/or the FFHI Attention-Seeking, Social Butterfly, and Flirtatiousness scales (Tomiatti et al., 2012).

Table 20.3 provides scales from the PID-5 (Krueger et al., 2012), CAT-PD (Simms et al., 2011), and FFMPD (Widiger et al., 2012) for each of the

10 poles of the five domains of the FFM. Note that the PID-5 FFM locations are based on the original placements provided by Krueger et al. (2011, 2012); some locations may have since changed (American Psychiatric Association, 2013). In addition, not all of the FFMPD scales are included. Crego and Widiger (2015b) report the results of joint factor analyses of the PID-5, CAT-PD, and 36 of the FFMPD scales, addressing their convergent and discriminant validity.

An advantage of the CAT-PD, PID-5, and FFMPD scales is their conceptual and empirical coordination with the FFM. The PID-5 and FFMPD scales also include algorithms to assess a respective personality disorder, with a considerable body of research supporting these algorithms (Krueger & Markon, 2014; Widiger et al., 2012). These scoring algorithms allow researchers and clinicians to relate their findings for a respective personality disorder to the FFM. Considering personality disorders from the perspective of the FFM is useful in the development of a more integrative understanding of normal and abnormal personality (Clark, 2007; Widiger & Trull, 2007). To the extent that disorders of personality are understood as maladaptive variants of FFM personality structure, it is possible to bring to these personality disorders the extensive construct validity research concerning the genetics, childhood antecedents, course, universality, and positive and negative life outcomes identified for the FFM (Allik, 2005; Allik, Realo, & McCrae, 2013; Caspi et al., 2005; Mervielde et al., 2005; Roberts & DelVecchio, 2000; Yamagata et al., 2006).

Conclusions

The FFM of personality disorder provides a reasonably comprehensive integration of normal and abnormal personality within a common hierarchical structure. Advantages of the FFM of personality disorder include the provision of precise, individualized descriptions of the personality structure of each patient, the inclusion of homogeneous trait constructs that will have more specific treatment implications, and the inclusion of normal, adaptive personality traits that will provide a richer, fuller, and more appreciative description of each patient (Widiger et al., 2012). The FFM of personality disorder resolves the many fundamental limitations of the categorical model (e.g., heterogeneity within diagnoses, inadequate coverage, lack of consistent diagnostic thresholds, and excessive

diagnostic cooccurrence), and brings to the nomenclature a wealth of knowledge concerning the origins, childhood antecedents, stability, and universality of the dispositions that underlie personality disorder. It is indeed apparent that *DSM-5* is becoming much closer to the FFM through the inclusion of a five-domain dimensional model that aligns closely with the five domains of the FFM, and through an emphasis on FFM traits for the diagnosis of each respective personality disorder type being retained and/or deleted.

Table 20.3 Scales from Three Measures of Maladaptive Variants of the Five Factor Model

Maladaptive Trait Measure				
Five Factor Model Domain	Pole of Domain	PID-5 ¹	CAT-PD	FFMPD ²
Neuroticism	High	Anxiousness	Affective Lability	Affective Dysregulation
		Emotional Lability	Anger	Dysregulated Anger
		Hostility	Anxiousness	Helplessness
		Perseveration	Cognitive Problems	Need for Admiration
		Separation Insecurity	Depressiveness	Pessimism
		Submissiveness	Health Anxiety	Self Disturbance
			Mistrust	Separation Insecurity
			Relationship Insecurity	Shamefulness
			Self-harm	Social Discomfort
			Submissiveness	Urgency
Extraversion	Low	Restricted Affectivity		Indifference
				Invulnerability
				Unconcern
		High		Attention-Seeking
				Dominance
				Intimacy-Seeking
				Exhibitionism
				Thrill-Seeking
		Low		Detached Coldness
		Anhedonia	Anhedonia	
Openness	High	Depressivity	Emotional Detachment	Joylessness
		Intimacy Avoidance	Romantic Disinterest	Risk Aversion
		Suspiciousness	Social Withdrawal	Social Anhedonia
		Withdrawal		Social Isolation
				Unassertive
		Eccentricity	Unusual Beliefs	Aberrant Ideas
		Cognitive-Perceptual Dysregulation	Unusual Experiences	Aberrant Perceptions
		Unusual Beliefs and	Fantasy	Fantasies

		Experiences	Proneness
		Peculiarity	Odd and Eccentric
	Low		Dogmatic Constricted
Agreeableness	High		Gullibility
			Self-Effacing
			Selflessness
			Subservience
			Timorous
	Low	Attention Seeking	Callousness Arrogance
		Callousness	Domineering Callousness
		Deceitfulness	Grandiosity Entitlement
		Grandiosity	Hostile Aggression Exploitative
		Manipulativeness	Manipulativeness Manipulative
Conscientiousness	High	Rigid Perfectionism	Norm Violation Oppositional
			Rudeness Suspiciousness
			Perfectionism Acclaim-Seeking
			Rigidity Doggedness
			Workaholism Fastidiousness
	Low		Perfectionism Punctiliousness
			Ruminative Deliberation
			Workaholism
			Disorderliness
			Impulsivity Non-Planfulness Impersistence
			Irresponsibility Non- Perseverance Impressionistic Thinking
			Risk Taking Risk Taking Ineptitude
			Negligence
			Rashness

Note: PID-5, Personality Disorder Interview for DSM-5 ([Krueger et al., 2012](#)); CAT-PD, Computerized Adaptive Test of Personality Disorder ([Simms et al., 2011; Wright & Simms, 2014](#)); FFMPD, Five Factor Model Personality Disorder scales ([Lynam, 2012; Widiger et al., 2012](#)); Cog-Per, Cognitive–Perceptual; Exp, Experiences.

¹ Location of some PID-5 scales have shifted with DSM-5 ([American Psychiatric Association, 2013](#)).

² Not all of the FFMPD scales ([Widiger et al., 2012](#)) are included.

Acknowledgments

R. Michael Bagby, Amanda A. Ulaszek, Tara M. Gralnick, and Nadia Al-Dajani

Abstract

The purpose of this chapter is to summarize and discuss the complex relationship between Five Factor Model (FFM) personality traits and clinical (Axis I) psychopathology, including depressive, bipolar, anxiety, obsessive-compulsive, eating, schizophrenia and psychotic, trauma and stress-related, and substance use disorders. Considered herein will be the alternative forms of relationship, including vulnerability, common cause, pathoplasty, complication/scar, and spectrum. This chapter will highlight the necessity for well-designed, longitudinal studies aimed at elucidating the complex relationships between the FFM and clinical disorders. Consistent research supports Neuroticism as a vulnerability factor to certain disorders, even sharing genetic etiology. However, there are also important contributions for each of the other four domains. The majority of this research is in the area of mood and anxiety disorders. Expanding these studies to include other forms of psychopathology could help identify common personality vulnerabilities to psychopathology, as well as unique predictors of certain constellations of symptoms.

Key Words: Axis I psychopathology, depression, anxiety, substance use, eating disorder, trauma, vulnerability, common cause, pathoplasty, spectrum

There is an impressive literature examining the relationships between the Five Factor Model (FFM) of personality and clinical disorders (e.g., [Andersen & Bienvenu, 2011](#); [Kotov, Gamez, Schmidt, & Watson, 2010](#)), including several review articles summarizing these results. Many of these relationships are well established; for example, the relationship between Neuroticism and major depressive disorder (e.g., [Bagby, Quilty, & Ryder, 2008](#)) and between low Extraversion and social anxiety disorder (e.g., [Kotov, Gamez, Schmidt, & Watson, 2010](#)). In this article we aim not only to review this vast literature, but to summarize these results in terms of theoretical etiological models (see [Figure 21.1](#)) with the hope of furthering our understanding of such relationships beyond simple correlational findings. We aim to replicate the structure that other authors have taken when describing the relationships between personality and psychopathology in general ([Widiger & Smith, 2008](#)) and personality and depression in particular ([Bagby, Quilty, & Ryder, 2008](#)). Because these models are in no way mutually exclusive, we aim to describe research supporting each of

these models for all clinical disorders discussed. However, where no evidence exists, those sections have been removed from the respective disorder section.

In each of the following sections focused on groups of clinical disorders as described in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*, we will begin with a subsection on *cross-sectional relations*. Whereas longitudinal studies examining the dynamic relationships between personality and clinical disorders might be ideal to test the models described below, it is first necessary to establish correlational relationships between constructs. The majority of research for a given disorder often consists of these findings. These important initial steps will be described in each section below.

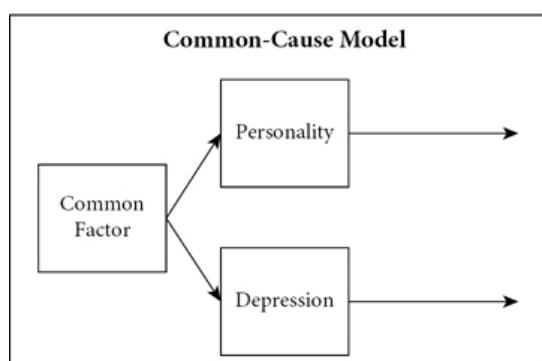
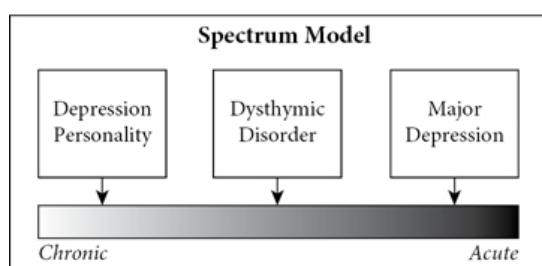
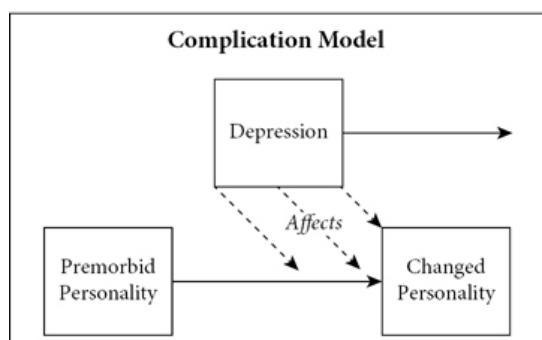
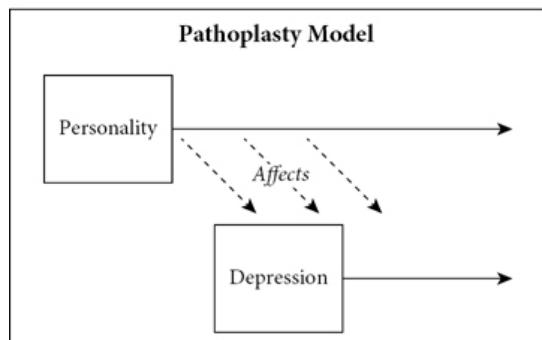
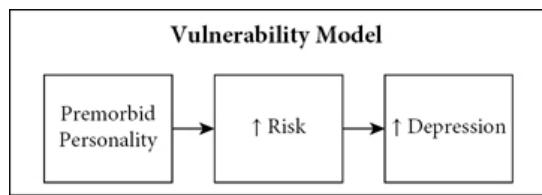


Figure 21.1. Etiological models of the association between personality and depression.

The first etiological model explored is the *vulnerability model*. In this model, premorbid personality traits contribute to the onset of a clinical disorder. Personality traits serve as a diathesis to the occurrence of one or more disorders. Research examining this model must be longitudinal in nature, assessing personality before the onset of a disorder (often in childhood or adolescence) and determine through regression or path analysis that personality predicts the disorder.

The second etiological model is the *common cause model*. In this model, both clinical disorders and personality traits are independent constructs that are caused by a shared diathesis. In this case, personality and psychopathology do not need to be assessed in a particular temporal sequence. Most frequently, the common causes examined are genetic or biological in nature.

The third etiological model is the *pathoplastic model*. This model posits that personality traits may not necessarily cause the onset of a disorder, but instead affect how a disorder is expressed. This relates to the severity, symptomatology, course, and/or prognosis of the disorder. In this case, the presence of certain personality traits may either ameliorate or exacerbate the distress or impairment associated with a disorder.

A fourth set of etiological models includes the *complication and scar models*. In these cases, the clinical disorder has an effect on personality traits (in essence, the opposite of the vulnerability model). In the case of a complication model, the disorder changes personality only during the course of the disorder. This is ideally assessed by examining personality before the onset of a disorder, again during the course of the disorder, and then after remission of the disorder. The complication model is supported when the design yields a definitive change in personality during the course of the disorder that returns to baseline after remittance. The scar model is assessed using the same methodology, but in this case personality never returns to baseline levels.

A final etiological model to be explored is the *spectrum model*. Here we assume an underlying dimension that cuts across both personality and psychopathology, ranging from normal processes (personality traits) to mild, moderate, and severe pathological processes (clinical disorder). Evidence supporting this model will demonstrate through taxometric analyses that constructs are best described as belonging to a single dimension, rather than belonging to separate classes.

Depressive Disorders

Cross-Sectional Relations

An extensive literature has accumulated examining the association between FFM personality domains and depressive disorders. In this regard, the [Kotov et al. \(2010\)](#) meta-analysis indicated that individuals with major depressive disorder (MDD) possess heightened levels of Neuroticism (N) and decreased levels of Conscientiousness (C) compared to healthy controls, as well as more robust effects of this nature found in dysthymic individuals. Because Extraversion (E) has demonstrated inconsistent associations with MDD across studies, it was not as highly related to the disorder in the context of the meta-analysis. Moreover, results did not support consistent relationships between MDD status and Agreeableness (A) or Openness (O) ([Kotov et al., 2010](#)).

Though high N, low C, and low E are common features of many psychological disorders ([Kotov et al., 2010](#)), high N and low E have been associated with MDD irrespective of comorbid diagnoses ([Spinhoven, van der Does, Ormel, Zitman, & Penninx, 2013](#)). In addition, N has been shown to be elevated in individuals with premenstrual dysphoric disorder compared to healthy controls ([Adewuya, Loto, & Adewumi, 2008](#)) and in atypically depressed patients compared to patients with other depressive subtypes ([Chopra et al., 2005](#)). O also has played a role in differentiating depressive subtypes, with elevations in this dimension found in individuals with seasonal affective disorder compared to individuals with nonseasonal depression ([Bagby, Schuller, Levitt, Joffe, & Harkness, 1996](#)). Importantly, although the aforementioned findings contribute to a preliminary understanding of the personality–MDD relationship, their cross-sectional designs do not allow the directionality of associations to be inferred.

Vulnerability Model

Prospective longitudinal studies of personality in never-depressed individuals provide an effective means of testing the vulnerability model. As such, this model would be supported by evidence demonstrating that personality dimensions predict the onset of depressive disorders ([Klein, Kotov, & Bufferd, 2011](#)). In this regard, [De Graaf, Bijl, Ravelli, Smit, and Vollebergh \(2002\)](#) conducted a prospective epidemiological study investigating the determinants of the first lifetime incidence of depressive disorders in a large sample of Dutch adults. Individuals high in N (as measured by the *Groningse Ne Questionnaire*; [Ormel, 1980](#)) were more likely to experience a first lifetime incidence of a depressive disorder over a 12-month time period, irrespective of negative life events. In addition to the main effect of N, there was also an interaction between N and life events, wherein individuals high in N were more likely to have a depressogenic response to a negative life event. [Uliaszek et al. \(2010\)](#) extended this research by demonstrating that N (assessed as a composite of two FFM measures and one non-FFM measure) partially accounted for the longitudinal relationship between

interpersonal chronic life stress and depressive disorders in adolescents. Such findings suggest that N in combination with stressful life events may confer a risk for depression, supporting the diathesis–stress model. Findings also support the stress generation model (Hammen, 1991) by suggesting that N increases vulnerability toward depression, which in turn increases interpersonal chronic life stress (Uliaszek et al., 2010).

To our knowledge, no study to date has prospectively investigated the effect of E, C, A, or O on the onset of a first lifetime incidence of depressive disorders. Weiss et al. (2009) conducted a prospective study examining whether the FFM domains predicted the incidence of depressive episodes in a sample of older adults. Individuals were categorized on NEO style graphs (Costa & McCrae, 1998), which plotted each possible combination of two FFM domains. The graphs specified whether individuals were high or low on the first and second domains for each trait pairing. High N and low C were found to predict a major or minor depressive episode over a 22-week time period, suggesting that low impulse control may play a role in depression onset. Moreover, high N interacted with low E (denoting a *gloomy pessimistic* style), with high E (denoting an *overly emotional* style), and with high O (denoting a *hypersensitive* style) to confer a risk for a major depressive episode. Low C also interacted with low E (denoting a *lethargic* style), with high E (denoting a *fun-loving* style), with low A (denoting an *undistinguished* style), with low O (denoting a *reluctant scholarly* style), and with high O (denoting a *dreamy* style) to serve as risk factors for major or minor depression. Although this investigation provides novel insight into the role of personality traits and their combinations in the development of depressive episodes in older adults, the study design is not an ideal test of the vulnerability model as it did not specifically address first lifetime depressive episodes. As such, it may be that previous episodes of depression have influenced personality scores at baseline (supporting the complication/scar model) or personality influenced the chronicity of depression across the lifespan (supporting the pathoplasty model).

In light of consistent cross-sectional evidence demonstrating that N is heightened during MDD (Kotov et al., 2010), it is reasonable to question whether baseline N scores are inflated by subthreshold depressive symptoms. In this regard, whereas Uliaszek et al. (2010) did account for baseline depressive symptoms, De Graaf et al. (2002) did not. In a subsequent study using the same sample as De Graaf et al. (2002), Ormel, Oldehinkel, and Vollebergh (2004) noted that although baseline N scores may conceivably reflect subthreshold depressive symptoms, this is unlikely given that heightened N was observed in their sample more than 1 year prior to the onset of the first lifetime episodes of major depression. The authors further suggested that since subthreshold depressive symptoms were present long before and after the onset of major depressive

episodes, it may be warranted to consider such symptoms as expressions of a deeper-rooted personality vulnerability.

This “state trait issue” (Costa, Bagby, Herbst, & McCrea, 2005) has been the subject of contentious debate in the field, with many researchers asserting that personality scores are systematically confounded by depressive symptoms and therefore have no meaning when assessed in the presence of depression (Hirschfeld, Klerman, Clayton, & Keller, 1983; Joffe & Regan, 1988; Liebowitz, Stallone, Dunner & Fieve, 1979; Wetzler, Kahn, Cahn, van Praag, & Asnis, 1990). This perspective implies that many tests of the etiological models described in this chapter may yield inflated and biased results. Costa et al. (2005) empirically addressed this issue by demonstrating that the reliability, validity, and factor structure of the Revised NEO Personality Inventory (NEO PI-R; Costa & McCrae, 1998) in acutely depressed patients were maintained following successful antidepressant medication (ADM) treatment. They interpreted the findings as suggesting that personality levels assessed during episodes of major depression should be regarded as accurate assessments of an individual’s existing condition instead of as meaningless distortions. Uliaszek et al. (2009) examined whether the predictive relationship between N and depression was artificially inflated by content overlap (specifically in the depression facet of the FFM). Structural equation modeling techniques did reveal a slight inflation between the depression facet and symptoms of depression; however, the primary relationship was driven by general N variance suggesting that results supporting a predictive relationship between N and depression may be only mildly inflated.

Common Cause Model

Whereas evidence supporting the vulnerability model suggests that personality features influence the development of depressive disorders, the common cause model is supported by evidence suggesting that the same etiological features that predispose individuals to develop certain personality features predispose individuals to develop depressive disorders (Bagby, Quilty, & Ryder, 2008). To this end, in light of findings suggesting that both MDD (Kendler, Gatz, Gardner, & Pedersen, 2006; Sullivan, Neale, & Kendler, 2000) and personality variation (Loehlin, 1992; Loehlin, McCrae, Costa, & John 1998) are genetically rooted, Kendler and Myers (2010) investigated the extent to which genetic factors account for the personality–MDD relationship in a large-scale twin study. They found evidence suggesting that E, A, and O are minimally and negatively associated with genetic risk for MDD, whereas high N and low C exhibit moderate genetic associations with the lifetime onset of the disorder. These results directly support the common cause model.

Considering that a number of earlier prospective twin studies have suggested that N, as defined by models other than the FFM, is linked to MDD through a shared genetic diathesis (Fanous, Neale, Aggen, & Kendler, 2007; Kendler, Gatz, Gardner, & Pedersen, 2006; Kendler, Neale, Kessler, Heath, & Eaves, 1993), evidence has accumulated elucidating the nature of this shared genetic factor in the context of FFM defined N. Though the serotonin transporter gene polymorphism is a frequently studied candidate gene underlying personality constructs and psychopathological outcomes (for a review see Margoob & Mushtaq, 2011, as well as the chapter by Jarnecke and South), evidence is mixed regarding its association with depressive disorders (Margoob & Mushtaq, 2011) and N (Takano et al., 2007; Terracciano, Löckenhoff, Crum, Bienvenu, & Costa, 2008). Another gene variation, the brain-derived neurotrophic factor val66met polymorphism, has been independently found to be associated with elevated depressive symptoms and N (Gatt et al., 2007; Sen et al., 2003). Given that this gene variation is implicated in decreased hippocampal volume (Bueller et al., 2006; Nemoto et al., 2006; Pezawas et al., 2004; Szeszko et al., 2005), Joffe et al. (2009) investigated its relationship with FFM personality traits, depressive symptoms, and gray matter volume of the hippocampus (see also the chapter by Allen and DeYoung). Increased N and depressive symptoms were related to lower hippocampal volume only in individuals who carried a certain allele of the gene variation (met carriers).

Variations in the cannabinoid receptor 1 gene have also been shown to confer a risk for depressive symptoms (particularly in the context of recent stressful life events), with additional associations found between this gene and FFM personality traits (positive associations for N and negative associations for A; Juhasz et al., 2009). They suggest that the cannabinoid receptor 1 gene may be a marker of vulnerability to depression through a high N and low A phenotype (Juhasz et al., 2009). In this regard, it is commonly theorized that personality serves as an intermediate phenotype between biological markers and psychopathological outcomes, a perspective that concurrently supports the vulnerability and common cause models. Importantly, prospective genetic research is needed to test this perspective.

Pathoplasty Model

Although the vulnerability and the common-cause models are supported by investigations describing the role of personality features in the development of depressive disorders, the pathoplasty model is supported by evidence suggesting that personality features predict the severity, chronicity, and prognosis of such disorders (Bagby, Quilty, & Ryder, 2008; Klein et al., 2011). To this end, Vrshek-Schallhorn, Czarlinski, Mineka, Zinbarg, and Craske (2011) investigated the role

of N and E (as assessed by composite scores including both FFM and non-FFM measures) in prospectively predicting suicide ideation in adolescents and young adults experiencing depressive episodes. Low baseline E was associated with suicidal ideation across a 3-month time period in males only. Results suggest that males low in E may be less inclined to seek social support during times of distress compared to females, placing them at particular risk for suicidal ideation ([Vrshek-Schallhorn et al., 2011](#)).

In another prospective investigation, [Spinhoven, de Rooij, Heiser, Smit, and Penninx \(2012\)](#) examined the prognostic value of FFM traits in predicting changes in comorbidity patterns of emotional disorders. Individuals with depressive and/or anxiety disorders who were low in N or high in C were more likely to transition to a more favorable comorbidity class over the course of 2 years (analyses corrected for baseline symptom severity and other FFM personality dimensions). These findings are in line with evidence from prospective investigations implicating N in the relapse/recurrence of depressive episodes ([Ormel, et al., 2004](#)) and implicating C in improved follow-up outcomes in inpatients with MDD who have been discharged ([Anderson & McLean, 1997](#)). To this end, [Spinhoven et al. \(2012\)](#) suggested that C may be particularly instrumental in facilitating the successful implementation of problem-solving tasks associated with positive outcomes. These conclusions are in line with prospective studies supporting the role of C in predicting return to work following an MDD-related absence ([Hees, Koeter, & Schene, 2012](#)) and in help-seeking engagement over the long-term course of the disorder ([Schomerus et al., 2013](#)).

Importantly, a number of treatment studies have demonstrated that FFM personality dimensions predict treatment responsiveness in patients with MDD (e.g., [Bagby, Joffe, Parker, Kalemba, & Harkness, 1995](#); [Bagby, Levitan, Kennedy, Levitt, & Joffe, 1999](#); [Bagby, Quilty, et al., 2008](#); [Canuto et al., 2009](#); [Du, Bakish, Ravindran, & Hrdina, 2002](#); [Quilty et al., 2008](#)), though the specific dimensions related to treatment responsiveness have been shown to vary across studies. It is of note that a majority of these investigations examined the role of personality in the context of a treatment regimen involving ADM (e.g., [Bagby et al., 1995, 1999](#); [Canuto et al., 2009](#); [Du et al., 2002](#); [Quilty et al., 2008](#)). Moreover, one investigation ([Blom et al., 2007](#)) did not support the predictive utility of any FFM dimension across ADM as well as psychotherapy for MDD, with only severity of depressive episode, duration of depressive episode, and use of medical services (to a lesser degree) predictive of treatment outcomes.

A general evaluation of the literature supports all five factors as holding predictive utility in the context of treatment for MDD ([Bagby et al., 1995, 1999](#); [Bagby, Quilty, & Ryder, 2008](#); [Canuto et al., 2009](#); [Du et al., 2002](#); [Quilty et al., 2008](#)), with N most consistently predicting poor responsiveness ([Bagby et al.,](#)

2008; Canuto et al., 2009; Quilty et al., 2008). For example, Canuto et al. (2009) investigated the role of FFM personality dimensions in predicting the response to day hospital treatment (consisting of a combination of group therapy, individual therapy, ADM, as well as family and network meetings) in older adults with either MDD or a depressive episode of bipolar disorder. N was the only domain predictive of treatment outcomes, indicating that this domain may be associated with reduced or slower improvement in depressive symptoms over the course of treatment.

Bagby, Quilty, et al. (2008) examined the role FFM personality dimensions in a differential treatment response to either cognitive-behavioral therapy (CBT) or ADM for MDD. Patients with low levels of O showed a reduced response to both treatments. Moreover, patients with high levels of N showed an improved response to ADM compared to CBT. They suggested that O, reflecting a need to contemplate experience and a tendency to maintain a flexible position toward novel ideas (McCrae & Costa, 1997), may interfere with the necessity of accepting the treatment rationale (Bagby, Quilty, et al., 2008). In addition, patients with high levels of N may lack the regulative capacity needed for effective engagement in CBT. As such, they may be more responsive to ADM because this treatment targets affective symptoms associated with MDD without relying on the patient's attentional capacity (Knutson, Burgdorf, & Panksepp, 1998). Results highlight the importance of considering differential influences of treatment types when examining associations between personality and treatment response (Bagby, Quilty, et al., 2008).

It is of note that in an earlier investigation, Bagby et al. (1995) did not find that N predicted the response to ADM after controlling for baseline depression severity. Such findings are consistent with those of Petersen et al. (2002), who also reported a null relationship between N and responsiveness to ADM in patients with MDD. Instead, Bagby et al. (1995) found that low E predicted poor treatment outcomes. They suggested that although N appears to have stronger relations to the nature of MDD (regarding affect and behavior), low E in the context of treatment may potentiate social withdrawal, which is an essential behavioral component of MDD (Bagby et al., 1995). Conversely, in a prospective examination of the relationship between FFM dimensions and ADM adherence in patients with MDD, high E predicted reduced treatment compliance (Cohen, Boggio, & Fregni, 2009). These findings were interpreted as indicating that patients high in E may be too engaged in other activities to prioritize their medication.

Du et al. (2002) found A to be the only domain predictive of the response to ADM, with high A positively related to treatment outcomes. Their analyses indicated that pretreatment A accounted for 18% of the variance in posttreatment

depression while controlling for baseline depressive symptoms and the five domains. In this regard, agreeable patients may be more inclined to believe in the possibility of improvement, potentially increasing responsiveness (Du et al., 2002). In light of theoretical accounts proposing that A is related to treatment outcomes by way of its affect on therapeutic alliance (Feeley, De Rubeis, & Gelfand, 1999; Klein et al., 2003; Orlinsky, Grawe, & Parks, 1994), Kushner, Quilty, Uliaszek, McBride, and Bagby (2015) examined the role of therapeutic alliance on the relationship between personality and depressive symptoms following ADM or psychotherapy for MDD. Mediational analyses supported the notion that A is associated with treatment outcome by way therapeutic alliance, irrespective of treatment modality.

In a related study, Quilty et al. (2008) examined the association between FFM personality domains and treatment response following a combined ADM and psychotherapy regimen for MDD. Patients were randomly assigned to the ADM condition and deliberately designated to receive either supportive, cognitive-behavioral, or psychodynamic interventions. Analyses that accounted for shared variance across domains indicated that low N and high C were uniquely predictive of treatment response. Additional analyses indicated that C interacted with E in the prediction of treatment response, such that patients high in C were more likely to respond to treatment when they were also high in E (Quilty et al., 2008). It was suggested that high C and E may reflect a particularly useful combination of characteristics required for treatment gains, perhaps facilitating the ease with which patients foster a therapeutic relationship, maintain involvement in therapy sessions, and/or fulfill treatment requirements (Quilty et al., 2008).

Overall, studies examining the predictive capacity of personality in the expression of depressive disorders across time and treatments demonstrate the clinical utility of the FFM domains, though mixed findings suggest that the relationship may be largely determined by the research design and statistical analyses employed. Importantly, although the pathoplasticity model is generally evaluated by way of longitudinal studies examining the associations between personality traits and clinical features of depressive disorders, an alternative explanation of findings from these investigations is that personality traits reflect markers of an etiologically separate subgroup of depressive disorders, rather than having a contributory impact on the expression of depression (Klein et al., 2011). Multiwave follow-up investigations may provide a means of evaluating this possibility. In this regard, if personality directly predicts disorder course (instead of predicting a latent disorder class), changes in personality would be expected to influence consequent changes in clinical features (Klein et al., 2011).

Complication/Scar Model

The complication/scar model describes the potential causal influence of depressive disorders on personality. This general model is therefore supported by evidence suggesting that depressive disorders predict changes in personality features. More specifically, the complication model is supported by evidence suggesting that personality is restored to premorbid levels following remission, whereas the scar model is supported by evidence suggesting that state depression induces lasting personality change, irrespective of remission status.

Importantly, although FFM personality features have originally been described as remaining stable in adulthood (McCrae & Costa, 1999; Terracciano et al., 2008), evidence suggests that they are amenable to gradual change over time (Roberts, Walton, & Viechtbauer, 2006; Srivastava, John, Gosling, & Potter, 2003;) and to acute change in the advent of depressive disorders (with changes generally up to one standard deviation in magnitude; e.g., Costa et al., 2005; De Fruyt, van Leeuwen, Bagby, Rolland, & Rouillon, 2006; Santor, Bagby, & Joffe, 1997).¹ Supporting the concomitancy of change in depressive symptoms and N, findings from the multiwave prospective investigation of Ormel et al. (2004) on a large community sample indicated that mean-level N scores increase during major depressive episodes. Given that N returned to premorbid levels after remission, findings support the complication model rather than the scar model. Ormel et al. (2004) cautioned against using short time intervals in between assessments when conducting prospective research of this nature, as this increases the risk of erroneously perceiving scar effects that reflect residual MDD symptoms likely to resolve in time (Ormel et al., 2004).

Weber et al. (2010) found further support for the complication model in their study examining the stability of personality traits, cognitive processes, and brain volumes in older adults with and without early-onset depression across a 2-year time period. Although cognitive performance and volumetric magnetic resonance imaging (MRI) results were preserved in remitted individuals, heightened N scores observed in this group at baseline were shown to decrease to levels comparable to healthy controls at follow-up. The findings of Karsten et al. (2012) also indicated that recovery from depressive disorders is associated with decreases in N over a 2-year period, though they reported additional associations with E and C. These three personality dimensions also showed change in the opposite direction in the advent of a depressive disorder, providing additional evidence in support of the complication model. It is of note that although results indicated that personality scores of recovered individuals assessed at follow-up were less than one-half standard deviation above normative scores (Hoekstra, Ormel, & De Fruyt, 1996), personality scores in this group continued to differ from individuals without a previous depressive disorder (with heightened levels

of N and decreased levels of E and C maintained). Moreover, although both depressive and anxiety disorders (corrected for one another) were associated with changes in N, depressive symptoms demonstrated stronger associations with changes in E and C compared to anxiety symptoms ([Karsten et al., 2012](#)).

Similarly, treatment studies have indicated that N decreases and E increases in response to successful ADM for MDD ([Bagby et al., 1995, 1999; Costa et al., 2005; De Fruyt et al., 2006; Du et al., 2002; Santor et al., 1997; Tang et al., 2009](#)) and seasonal affective disorder ([Jain, Blais, Otto, Hirshfeld, & Sachs, 1999](#)). Such changes have generally exhibited modest associations with depressive symptom change, suggesting meaningful shifts in personality rather than temporary self-reports ([Costa et al., 2005; De Fruyt et al., 2006; Santor et al., 1997](#)). Changes in N and E have also been observed following a treatment involving ADM alone, psychotherapy alone, or a combination of both modalities in patients with depressive disorders ([Griens, Jonker, Spinhoven, & Blom, 2002](#)). It is of note that whereas most studies have not included a placebo control group, [Tang et al. \(2009\)](#) found a greater personality change associated with ADM than with placebo.

Whereas changes in N and E are fairly consistent across treatment studies, some evidence suggests that C ([Costa et al., 2005; De Fruyt et al., 2006](#)), A ([De Fruyt et al., 2006](#)), and O ([Costa et al., 2005; De Fruyt et al., 2006](#)) increase in response to ADM for MDD. Shifts in all five personality dimensions were also observed following a combined ADM and psychotherapy treatment regimen in patients with the disorder ([Quilty et al., 2008](#)). The aforementioned findings support the synchrony of change in depressive symptoms and FFM dimensions, countering the commonly held misconception that after the age of 30 years personality “has set like plaster and will never soften again” (James, as cited in [Costa & McCrae, 1994](#), p. 21). Although findings support the complication/scar model, studies assessing the stability of personality following treatment are needed in order to tease apart complication and scar effects.

Spectrum Model

Although the aforementioned four etiological models imply that personality is qualitatively distinct from depressive disorders, the spectrum model posits that depressive disorders denote an extreme manifestation of personality features ([Bagby, Quilty, & Ryder, 2008](#)). Given that relevant personality features and depressive disorders are posited to lie on the same continuum, the spectrum model is supported by findings indicating that the personality–depression relationship is reasonably specific ([Klein et al., 2011](#)). As such, the aforementioned evidence specifying common etiological factors underlying N and depressive symptoms can also be regarded as supporting the spectrum model (e.g., [Joffe et al., 2009](#);

Juhasz et al., 2009). However, although cross-sectional (Kotov et al., 2010) and longitudinal (e.g., Karsten et al., 2012; Ormel et al., 2004) evidence consistently suggests that individuals with MDD possess heightened levels of N (in both acute and remitted phases of the disorder), this domain is elevated in almost all psychological disorders (see below). Although findings support some overlap between the genotypic and phenotypic features underlying N and depressive disorders, evidence does not support the distinctive expression of extreme N as a manifestation of depression.

Importantly, the applicability of the spectrum model to MDD is deterred by the fact that MDD is more episodic in nature compared to personality features. In this regard, this model may be most applicable to chronic or subclinical manifestations of depression (Klein et al., 2011). In support of this perspective, N has been more strongly associated with dysthymia compared to MDD (Kotov et al., 2010). Moreover, the potentially overlapping depression facet of N only minimally explained the association between depressive symptoms and N, with a general N factor largely accounting for this association (Uliaszek et al., 2009). Although results suggest that the depression facet of N likely falls on the same spectrum as depressive disorders, they directly counter the spectrum model by suggesting that content overlap minimally accounts for the N–depressive symptom relationship. Overall, N and depression appear to be qualitatively, rather than quantitatively, distinct.

Bipolar Disorders

Cross-Sectional Relations

Several studies have examined the association between FFM and bipolar disorder. Bagby, Young, et al. (1996) found that, in comparison to individuals with unipolar depression, patients with bipolar disorder scored significantly higher on O and higher on a facet of E (i.e., positive feelings). Contrary to these findings, Furukawa et al. (1998) found no differences between bipolar patients, healthy controls, and unipolar patients on any of the FFM domains. This aberrant finding is likely due to a small sample size ($n = 8$) and lack of power to detect a meaningful difference between groups. Additionally, comparisons between individuals with seasonal affective disorder and individuals with bipolar disorder revealed that the latter scored significantly higher on N and significantly lower on E, O, and C (Jain et al., 1999). In another study that compared FFM scores across a series of disorders, individuals with bipolar disorder were found to exhibit higher scores on O in comparison to all other disorders investigated, and higher scores on E in comparison to all other disorders investigated with the exception of pathological gambling and psychotic disorders (Uliaszek, Al-Dajani, & Bagby,

2014). Although most studies investigate bipolar disorder as a categorical construct, Quilty, Sellbom, Tackett, and Bagby (2009) were interested in examining personality correlates of a unidimensional construct of bipolarity, in comparison with a two-dimensional construct of mania and depression. When investigated as one dimension, bipolarity was associated with high N and low A. When investigated as two dimensions, however, depression was associated with high N and low E, whereas mania was associated with high N, high E, and low A. Such findings illustrate that personality is characteristically distinct during a depressive episode compared to a manic episode, which may support the complication model. This hypothesis can be tested through prospective designs in future research.

Common Cause Model

To date, there is only one study that examined an underlying common cause between personality traits as described by the FFM and bipolar disorder. Probands diagnosed with bipolar disorder and their siblings were recruited for this study. Siblings had to meet the criteria for bipolar disorder or schizoaffective bipolar type. Three distinct phenotypes were investigated: narrow, which consisted of subjects with full manic episodes and patients with a *DSM-IV* diagnosis of either schizoaffective disorder or bipolar I; intermediate, which consisted of the same subjects as above plus those with bipolar II; and broad, which consisted of the same diagnoses as above plus individuals with recurrent depression (i.e., a general affective disorder phenotype). The influence of personality traits based on genetics and based on the environment was investigated. Low levels of E and the narrow phenotype were related via shared genetic material, whereas low A, low C, high N, and high O were related to this phenotype through environmental factors. The same pattern was observed for the intermediate phenotype. For the broad phenotype, low levels of A, C, and E and high levels of N were related through shared genetic material, whereas low levels of A and C and high levels of N were also related through environmental factors (Hare et al., 2012). It seems that the genes shared by E and a bipolar diagnosis are vulnerability factors for the development of this disorder, regardless of the breadth of the investigated phenotype.

Pathoplasty Model

The expression and frequency of the disparate affective states in bipolar disorder have been linked to several outcomes, including suicidal risk, treatment nonadherence, and morbidity rates (see Goodwin & Jamison, 2007). In an effort to elucidate the reasons behind mixed states (i.e., depression and mania

simultaneously present) and rapid cycling (i.e., four or more episodes/switches from one pole to the next in a given year) in bipolar disorder, [Koszewska and Rybakowski \(2008\)](#) investigated associations between personality traits and these two forms of bipolar disorder. In patients with mixed state episodes, N was significantly elevated in comparison to patients without mixed episodes. On the other hand, no differences were found between patients with rapid cycling versus those without rapid cycling. Based on these findings, high rates of N may predispose individuals to mixed episodes, whereas personality traits are not related to rapid cycling. It should be noted that this was a cross-sectional study and that the interpretation of these data should be viewed with caution. Similarly, [Kim, Joo, Kim, Lim, and Kim \(2011\)](#) examined the total number of hospitalizations for depression, mania, and mixed episodes and their relationship to personality traits. Additionally, they were interested in examining whether personality characteristics are related to patients who experience affective switches (e.g., depression to mania) without a euthymic period versus those who do experience a euthymic period. Overall, the number of hospitalizations for depression was related to high N, low E, and low O. Patients who did not experience a euthymic state between affective switches showed elevated levels of N in comparison to patients who did experience this euthymic state. No other relationships were found between personality and affective state. Again, these results are cross-sectional and should be interpreted with caution.

In considering high suicide risk for individuals with bipolar disorder ([Angst, Stassen, Clayton, & Angst, 2002](#)), risk factors related to suicidal ideation in bipolar disorder may provide useful information for prevention strategies. [Allen et al. \(2005\)](#) were interested in examining correlates of suicidal ideation in patients with bipolar disorder who have either attempted suicide in the past or have never attempted suicide. High rates of O and low E were related to suicidal ideation in individuals who have previously attempted suicide, whereas high rates of N were related to suicidal ideation in individuals who have never attempted suicide. Similarly, the role of lipid profiles and personality traits in suicidal history in bipolar patients has also been investigated. Previous research has shown that lipid profiles, particularly low n-3 polyunsaturated fatty acids, are related to past suicide attempts ([Huan et al., 2004](#)), and fluctuations in n-3 intake are related to violent suicides ([De Vriese, Christophe, & Maes, 2004](#)). Generally, specific lipid profiles of interest were found to be positively related to O and A and to past suicide attempts. This suggests that manipulation of lipid profiles through diet may alter personality profiles and reduce the risk of suicide in patients at risk ([Evans et al., 2012](#)). As mentioned previously, these two studies are cross-sectional in nature, and should therefore be interpreted with caution. [Marangell et al. \(2006\)](#) conducted a 2-year prospective study with 1,556 patients with bipolar

disorder in order to elucidate nonoverlapping relationships between a series of variables (e.g., past suicide history, the NEO PI-R Neuroticism subscale, and frequency of depression) and suicide attempts/completions. Of note, only past history of suicide attempts uniquely predicted prospective suicide attempts/completions, with no relationship found between N and subsequent suicidal behavior.

Anxiety Disorders

Cross-Sectional Relations

The meta-analysis of [Kotov et al. \(2010\)](#) indicated that individuals with a diagnosis of social anxiety disorder (SAD), generalized anxiety disorder (GAD), panic disorder, and agoraphobia possess heightened levels of N and decreased levels of E and C compared to healthy controls. A specific phobia diagnosis, however, did not follow this pattern, with personality profiles in this group remaining within one standard deviation of healthy controls. Such findings suggest that specific phobias may have an externally rooted etiology that may be more influenced by conditioning than by personality dysfunction.

Given that the majority of psychological disorders have been found to be associated high N and low C (with many also associated with low E; [Kotov et al., 2010](#)), [Spinhoven et al. \(2013\)](#) investigated whether comparable personality profiles across disorders can be explained by disorder comorbidity. Their investigation of patients with SAD, panic disorder, MDD, and healthy controls partially supported this perspective. Individuals with a panic disorder diagnosis had heightened levels of N at baseline, without exhibiting significant differences in E and C compared to controls. On the other hand, individuals with a pure panic disorder diagnosis had reduced levels of N and heightened levels of E at baseline compared to individuals with SAD and MDD. Individuals with SAD and MDD exhibited a baseline profile of high N and low E, irrespective of comorbid disorders.

[Rosellini and Brown \(2011\)](#) examined the latent structure of the NEO Five Factor Inventory (NEO FFI; [Costa & McCrae, 1994](#)) in relation to anxiety (SAD, GAD, and panic disorder/agoraphobia) and depressive disorders in a large clinical sample. Structural equation modeling suggested that a five factor solution fit the structure of the data. N was positively associated with SAD and GAD, E was negatively associated with SAD and panic disorder/agoraphobia, C was positively associated with GAD, and O was negatively associated with panic disorder/agoraphobia. The relationship between O and panic disorder/agoraphobia may suggest that decreased curiosity and heightened conservativeness influence the situational avoidance associated with a fear of experiencing a panic attack. In

addition, the heightened levels of C found to be associated with GAD are consistent with the clinical picture of the disorder, possibly denoting perfectionist tendencies (Brown & Barlow, 2009) resulting from intolerance of uncertainty (Dugas, Gagnon, Ladouceur, & Freeston, 1998).

Vulnerability Model

Barlow (2000, 2004) posited the *triple vulnerability model* of emotional disorders, suggesting that a general biological vulnerability (i.e., temperament/personality variables of N and E), general psychological vulnerability (i.e., a perception of control over stress and emotions), and disorder-specific psychological vulnerability (e.g., intolerance of uncertainty for GAD; anxiety sensitivity for panic disorder) may contribute to the etiology of mood and anxiety disorders. Brown and Naragon-Gainey (2013) tested this structural equation model in a large clinical sample, focusing on SAD and GAD among the anxiety disorders. Findings indicated that the general biological vulnerability dimensions of N and E exhibited the strongest effects on such diagnoses. Consistent with Rosellini and Brown (2011), increased N was associated with both disorders (with the largest effects found for GAD), and decreased E was associated with SAD. E also demonstrated a direct positive relationship with GAD, although zero-order associations were not significant. Such relationships between personality characteristics and anxiety disorder diagnoses remained significant after general and disorder-specific psychological vulnerability factors were added to the model. Moreover, general psychological vulnerability factors contributed to the prediction of GAD, but not SAD, suggesting that this posited universal factor may not cut across disorders. Proposed disorder-specific vulnerability factors also did not exert unique effects on their respective diagnoses, with intolerance of uncertainty contributing to the prediction of SAD but not GAD. Findings nonetheless provided some support for the vulnerability model, suggesting that personality factors interact with cognitive factors to predict GAD and SAD. Although Rosellini and Brown (2011) employed mediational analyses on a large clinical sample, the study's cross-sectional design limits its capacity to directly evaluate the vulnerability model.

In this regard, Hong and Paunonen (2011) investigated the role of FFM personality traits and affective-cognitive vulnerabilities (e.g., anxiety sensitivity, intolerance of uncertainty, and social-phobic inferential style) on a range of psychopathological symptoms (including anxiety, worry, and social anxiety) in a sample of undergraduates using a longitudinal experience-sampling method (across a 1-month time period). Results indicated that affective-cognitive vulnerabilities mediated the relationship between personality and anxiety-related symptoms. Specifically, individuals with high levels of N and (to a lesser extent)

low levels of E were found to be at greater risk of developing anxiety-related symptoms, with such a risk likely amplified by negative interpretations of bodily sensations of anxiety, ambiguous situations, and negative self-perceptions in social contexts. It is of note that only N conferred a risk for depression, with this relationship mediated by a depressogenic inferential style, dysfunctional attitudes, and ruminative tendencies.

Relatedly, [Ułaszek et al. \(2010\)](#) found that both N and E partially accounted for the longitudinal association between interpersonal chronic life stress and SAD in adolescents. Given that only N accounted for this association in the context of MDD, such findings also highlight potential similarities and differences in the etiological role of personality across SAD and MDD. [Watanabe, Nakao, Tokuyama, and Takeda's \(2005\)](#) 5-year cohort study of factors contributing to the onset of panic attacks similarly broadened our understanding of the role of personality and life events in the development of anxiety-related symptoms. Specifically, they found evidence supporting the predictive role of both N and recent stressful life events on the first onset of panic attacks in their sample of white-collar Japanese workers.

Common-Cause Model

In support of the common-cause model, cross-sectional associations have been found between hypothalamic–pituitary–adrenal (HPA) axis functioning and N ([Ormel et al., 2013](#)), as well as HPA functioning and anxiety disorders ([Kirschbaum & Helhammer, 2000](#); [Adam et al., 2008](#)). Given that HPA dysfunction is commonly believed to serve as a risk factor for MDD ([Ehlert, Gaab, & Heinrichs, 2001](#); [Herbert, 2013](#); [Thase et al., 2002](#)), [Adam et al. \(2014\)](#) investigated whether the cortisol awakening response (one feature of the daily rhythm of cortisol) prospectively predicted the first onset of specific anxiety disorders in a 6-year longitudinal study. Even after controlling for MDD and other variables, an increased cortical awakening response predicted anxiety disorder onset, with SAD diagnoses largely driving this finding. In support of the vulnerability model, baseline N also approached significance in predicting anxiety disorder onset, although the study did not report whether N was related to HPA axis functioning. Evidence that HPA axis functioning predicted both N and anxiety disorders would be direct support for the common-cause model.

In addition, a single nucleotide polymorphism in the COMT gene [which results in a methionine (Met) to valine (Val) substitution in the codon 158 (COMT Val158Met) polymorphism] has been found to be related to anxiety (e.g., [Enoch, Xu, Ferro, Harris, & Goldman, 2003](#)). However, cross-sectional relations between this gene variant and FFM personality are inconsistent in the literature ([Harris et al., 2005](#); [Hoth et al. 2006](#); see also the chapter by [Jarnecke and South](#)). In this

regard, [Lehto, Akkermann, Parik, Veidebaum, and Harro \(2013\)](#) investigated the relationship between COMT Val158Met polymorphism and personality traits in a birth cohort sample of white participants (assessed at ages 15, 18, and 25 years). Findings indicated that the COMT Val158Met polymorphism predicted N in females, and C decreased over time in individuals with a Val/Val genotype. This study therefore supports the common cause model when taking into account previous research establishing a relationship between this gene variant and anxiety disorders. With that said, COMT Val158Met polymorphism was not associated with anxiety disorders in this investigation ([Lehto et al., 2013](#)).

Pathoplasty Model

[Carrera et al. \(2006\)](#) investigated the relationship between personality traits and the expression and course of panic disorder. Specifically, they examined whether personality traits were associated with agoraphobia, panic disorder severity, and response to pharmacological treatment. Individuals with agoraphobia demonstrated lower levels of E compared to healthy controls, suggesting that low levels of E may contribute to the development of agoraphobia in individuals with panic disorder. Personality, however, was unrelated to panic disorder severity and treatment response.

[Smits et al. \(2013\)](#) investigated whether personality traits influence responsiveness to group CBT for SAD and/or moderated effects of pharmacotherapy (*d*-cycloserine) in augmenting this treatment. Personality did not directly influence outcomes of group CBT for SAD. However, the addition of pharmacotherapy improved outcomes only in patients with low levels of C and high levels of A. It was noted that findings related to C may have a biological explanation. Specifically, low C has been found to be associated with the brain-derived neurotrophic factor Val66Met genotype Met-allele ([Hiio et al., 2011](#)); this gene variant has been found to be associated with deficits in extinction learning ([Soliman et al., 2010](#)), and impairments in extinction learning have been found to be countered by the administration of *d*-cycloserine in mice ([Yu et al., 2009](#)). [Smits et al. \(2013\)](#) did not provide a biological explanation for the observed moderator effect of A, but noted that high A likely also serves as a marker for an impaired capacity for extinction learning (e.g., [Harcourt, Kirkby, Daniels, & Montgomery, 1998](#)). Such findings support the pathoplasty model by suggesting that personality influences the course of anxiety disorders.

Complication/Scar Model

[Glinski and Page \(2010\)](#) investigated whether personality traits change following group CBT for SAD, and found N that decreased and E increased

following treatment. Importantly, although SAD symptoms diminished following treatment, analyses did not control for symptom severity or report associations between changes in symptoms and changes in personality. As such, it may be that changes in N and E capture changes in SAD symptoms, as opposed to reflecting independent changes in personality that manifest on account of symptom change.

To this end, [Karsten et al. \(2012\)](#) examined state effects of anxiety disorders (specifically, SAD, GAD, panic disorder, and agoraphobia without panic) and depressive disorders on personality over the course of 2 years. Individuals were divided into four groups: (1) disorder absent at baseline and follow-up, (2) occurrence of a disorder, (3) recovery from a disorder, and (4) disorder present at baseline and follow-up. Changes in N were found to be associated with the occurrence and recovery of anxiety disorders. In addition, changes in E and C were only marginally related to the occurrence and recovery of anxiety disorders, with stronger associations of this nature associated with depressive disorders. Findings suggest that fluctuations in anxiety disorders likely influence levels of N, but fluctuations in depressive disorders may have a greater influence on levels of E and C as compared to anxiety disorders. It is of note, however, that all associations demonstrated at most small effect sizes, suggesting a limited (but existing) capacity for personality change in individuals with anxiety disorders.

Using the same sample as [Karsten et al. \(2012\)](#), [Spinhoven, Penelo, de Rooij, Penninx, and Ormel \(2014\)](#) further studied the association between changes in N and changes in anxiety and depressive disorders by including an additional assessment 2 years following the original 2-year longitudinal investigation. Results from structural equation modeling revealed that the associations between anxiety and depressive disorders and N were likely explained by three elements. The first consisted of a strong association between the stable components of psychopathology and the stable components of N; the second consisted of a modest concurrent association between changes in psychopathology and changes in N; and the third consisted of small to modest lagged effects of psychopathology on changes in N. Moreover, premorbid and postmorbid N levels did not significantly differ following the occurrence of an anxiety or depressive disorder, providing evidence countering the scar model. Because the occurrence of a disorder influenced morbid levels of N, findings support the complication model.

Spectrum Model

Cross-sectional investigations examining unique associations between FFM facets and anxiety disorders provide evidence countering the spectrum model. As an example, [Rector, Bagby, Huta, and Ayearst \(2012\)](#) found that individuals with SAD possessed heightened levels of self-consciousness and decreased levels of assertiveness compared to individuals with a diagnosis of other mood and anxiety

disorders. With only one facet of N and one facet of E demonstrating unique associations with SAD, findings counter the notion that the personality domains in the FFM are merely extreme manifestations of the disorder.

Additionally, cross-sectional investigations examining symptom-level associations between personality domains and anxiety disorders provide some evidence opposing the spectrum model. To this end, [Watson and Naragon-Gainey \(2014\)](#) found that N was strongly correlated with anxious mood and worry, was moderately correlated with panic, symptoms of social phobia, and checking, and was modestly correlated with agoraphobia and specific phobia. Moreover, E was negatively associated with symptoms of SAD. C, A, and O provided limited predictive information beyond that of N. Although N findings demonstrated specificity at the symptom level (reflecting a degree of overlapping content with anxiety disorders), it is important to consider that this domain was differentially related to various symptoms of certain anxiety disorders. For example, although anxious mood, panic, and agoraphobia are symptoms of panic disorder with agoraphobia, N was highly related to anxious mood, moderately related to panic, and modestly related to agoraphobia. As such, findings suggest that anxiety disorders, each of which is composed of clusters of symptoms, may be distinct constructs from N.

Obsessive–Compulsive Disorders (OCD)

Cross-Sectional Relations

Several studies have examined the cross-sectional relationships between the FFM and obsessive–compulsive disorder (OCD; [La Salle-Ricci et al., 2006](#); [Rector, Hood, Richter, & Bagby, 2002](#); [Rosellini & Brown, 2011](#); [Watson & Naragon-Gainey, 2014](#)). Rector et al. (2002) compared relationships between FFM and patients with OCD versus those with depression. Higher scores on E, A, and C and lower scores on N differentiated individuals with OCD from those with depression. Furthermore, [Kotov et al. \(2010\)](#) have recently synthesized some of these findings in a meta-analysis that investigated associations between the FFM and anxiety, depressive, and substance use disorders. In relation to OCD, they found strong significant relationships between OCD and N, low E, and low C.

Vulnerability Model

[Brown and Naragon-Gainey \(2013\)](#) conducted a series of structural regression models to test the hypothesis that N and E were general vulnerability factors in the development of depression, OCD, SAD, and GAD. N was found to predict all the disorders, whereas E was not significantly related to GAD or OCD. However,

they point out that there were suppression effects, such that holding N constant resulted in a positive correlation between E and these disorders. It is important to mention that these data were cross-sectional in nature. Therefore, it is possible that these findings provide evidence for other models, such as the scar model.

Spectrum Model

In an effort to elucidate differential relationships between FFM traits and several mood and anxiety disorders, [Rector et al. \(2012\)](#) investigated personality trait profiles of individuals with MDD, posttraumatic stress disorder (PTSD), SAD, panic disorder (with or without agoraphobia), and OCD. Overall, differential relationships were found at the facet level of the FFM. OCD emerged as having only one unique association in comparison to the other disorders, with an elevation on the order facet of C. As such, OCD may represent an extreme expression of order, as defined by the NEO PI-R facets. In another investigation, [Rector, Richter, and Bagby \(2005\)](#) found differential relationships between specific symptoms of OCD and NEO PI-R facets: low openness to ideas was related to higher obsession severity, whereas low openness to actions was related to higher compulsive severity. Both facets are subsumed by the O domain. Based on these results, it can be hypothesized that symptoms of obsession and compulsions are extreme (low) variants of the above O facets. [Rees, Anderson, and Egan \(2006\)](#) also investigated unique associations between NEO PI-R facets and individuals with OCD in comparison to individuals with anxiety/depressive disorders. Lower scores on actions (O facet), competence (C facet), and self-discipline (C facet) were differentially related to OCD. Again, this may suggest that the facets above, along with OCD, fall on a continuum of severity. It is important to mention that the above studies are all cross-sectional in nature. Therefore, the possibility that the above FFM facets fall on a continuum of OCD traits is speculative. Researchers can provide clarification by obtaining data from longitudinal studies, which would parse out the relationships between the FFM and OCD. For example, it is possible that the above facets represent a vulnerability to developing OCD. Future research should attempt to parse out these relationships more clearly.

Trauma and Stressor-Related Disorders

Cross-Sectional Relations

Given that a diagnosis of trauma and stressor-related disorders necessarily involves a history of exposure to a traumatic event, a central focus of personality and trauma research is to determine whether personality successfully predicts

trauma reactions or if traumatic experiences tend to overpower any personality influence (Jakšić, Brajković, Ivezić, Topić, & Jakovljević, 2012; Johnson & Thompson, 2008). Importantly, marked individual differences in trauma reactions suggest that traumatic experiences are unlikely to be the sole etiological factor involved in the development of this class of disorders. To this end, although exposure to traumatic events is relatively common, only between 8% and 20% of individuals develop (for instance) PTSD following traumatic exposure (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Most of the cross-sectional studies examining the personality–trauma relationship have therefore aimed to ascertain whether personality traits play a key role in differentiating individuals who develop a trauma reaction following a traumatic event from those who do not.

In the Jakšić et al. (2012) review of the literature, N was the only FFM trait that was consistently found to relate to PTSD at a cross-sectional level. In an attempt to delineate the influence of trauma exposure and personality in the development of PTSD, Talbert, Braswell, Albrecht, Hyer, and Boudewyns (1993) divided Vietnam veterans with combat-related PTSD into three groups related to their degree of trauma exposure. Although there were no observed differences in the personality profiles of each trauma-exposed group, PTSD patients demonstrated heightened levels of N and decreased levels of A compared to the general population. N was also associated with PTSD symptoms among veterans of Iraq and/or Afghanistan (Clark & Owens, 2012), emergency management professionals (La Fauci-Schutt & Marotta, 2011), and heart attack survivors (Chung, Berger, Jones, & Rudd, 2006). Although findings support an influence of personality in trauma reactions, they either imply that N confers a risk for PTSD following a traumatic event (supporting the vulnerability model) or that experiencing PTSD following a traumatic event increases N (supporting the complication/scar model). As always, prospective designs are needed in order to tease apart such possibilities.

Vulnerability Model

To our knowledge, no study to date has directly examined the effect FFM personality dimensions have on the development of PTSD using a prospective design. Nightingale and Williams' (2000) posttrauma longitudinal study, however, found evidence supporting an indirect role of personality in the development of PTSD. In their investigation examining the impact of attitudes about emotional expression and personality on PTSD development 1 week and 6 weeks following a road traffic accident, they found that negative attitudes about emotional expression prospectively predicted PTSD and was also negatively associated with E, A, and O. Though the causal influence of personality in developing attitudes about emotional expression and PTSD was not directly evaluated, findings shed

light on possible mechanisms by which personality may confer vulnerability to trauma reactions.

The distinct requirement of a traumatic experience for a PTSD diagnosis also provides a unique opportunity to examine personality resilience in the absence of trauma reactions. In this regard, [Yuan et al. \(2011\)](#) prospectively assessed factors that protect against PTSD symptom development in police officers. Although white race, lower exposure to critical incidents, greater assumptions of benevolence of the world, and greater social adjustment during academy training predicted lower PTSD symptoms after 2 years of employment, the FFM traits were not associated with protection against PTSD symptom development.

Common Cause Model

Though no study to date has directly investigated the associations between biological markers of PTSD and FFM dimensions, associations of this nature have been indirectly examined using physiological proxies of PTSD symptoms. Specifically, given that it has been shown that the process of consolidating extinction learning is disrupted in individuals with PTSD ([Wessa & Flor, 2007](#)) and rapid eye movement (REM) sleep deprivation is known to impair this process ([Silvestri, 2005](#)), [Spoormaker et al. \(2010\)](#) investigated associations between REM sleep disturbances, failure to consolidate extinction learning, recall of fear extinction, and personality in healthy individuals undergoing a conditioning/extinction task followed by a recall of the extinction task. Functional magnetic resonance imaging and skin conductance response measurements were taken during each task, and participants were instructed to sleep for 90 minutes between conditioning/extinction and recall sessions. Individuals who did not experience REM sleep demonstrated a decreased capacity to habituate to extinction learning and a heightened physiological response to the extinguished stimulus. They also exhibited lower levels of A and O scores compared to individuals who experienced REM sleep. These findings suggest that REM sleep deprivation may serve as a shared etiological factor underlying PTSD symptoms and personality.

Pathoplasty Model

N has not only been implicated as a potential vulnerability factor in the development of PTSD, but has also been shown to play a role in the expression of PTSD symptoms. In this regard, [Kuijer, Marshall, and Bishop \(2014\)](#) prospectively investigated the relationship between proposed pretrauma variables (N, optimism, self-control, and depression) and PTSD symptoms 1 month and 3 months following two large-scale earthquakes in New Zealand. Not only did

heightened N, heightened pretrauma depression, reduced self-control, and reduced optimism predict postearthquake PTSD symptoms (while controlling for perceived life threat and objective trauma severity), all the aforementioned pretrauma variables with the exception of optimism also predicted increased PTSD symptoms over time. Such results suggest that N likely influences both the etiology and course of PTSD.

Importantly, earthquake-related hassles also mediated the relationship between N and postearthquake PTSD symptoms and PTSD symptom change over time (Kuijer et al., 2014), supporting earlier findings suggesting that individuals high in N likely experience stressors as more impairing than individuals low in this trait (e.g., Suls & Martin, 2005). Moreover, when the relative contribution of each pretrauma factor was examined, N robustly predicted PTSD symptoms whereas optimism no longer served as a significant predictor (Kuijer et al., 2014). Such results suggest that the effects of optimism on adaptation following traumatic experiences may primarily be manifested because of negative associations between optimism and N. It is of note, however, that such conclusions are countered by cross-sectional findings examining personality predictors of posttraumatic growth. In this regard, Wang, Wang, Wang, Wu, and Liu (2013) found that N was unrelated to posttraumatic growth in accidentally injured patients, with O instead demonstrating associations with this experience.

In a related longitudinal study, Lee, Sudom, and Zamorski (2013) examined factors contributing to psychological resilience in postdeployment Canadian military personnel. They found that military personnel who reported higher baseline levels of emotional stability and C demonstrated improved postdeployment mental health outcomes (as assessed using the Mental Health Component Summary; Ware & Sherbourne, 1992). Moreover, high levels of A strengthened the association between combat experiences and postdeployment mental health difficulties. It was suggested that agreeable individuals who hold trust in others and in the world are more likely to have their world views challenged by difficult experiences. Although similar explanations have been provided to account for the influence of secure attachment on trauma reactions (Kanninen, Punamäki, & Qouta, 2003), Clark and Owens' (2012) cross-sectional investigation found evidence suggesting that secure attachment interacts with high C to instead protect against PTSD symptom severity. Such findings highlight the complex role of personality factors in reactivity and resilience following traumatic experiences.

To our knowledge, one study to date has prospectively investigated the associations between personality traits and response to treatment for PTSD. In this regard, van Emmerik, Kamphuis, Noordhof, and Emmelkamp (2011) hypothesized that high levels of N would predict dropout in trauma-focused CBT,

and that low levels of O, A, and C would be associated with decreased treatment responsiveness. Although personality traits did not directly influence treatment outcomes or dropout, lower baseline scores on O were more strongly associated with posttreatment PTSD symptoms in patients receiving the active treatment compared to patients in the wait-list control condition. Expectedly, heightened baseline PTSD symptoms strongly predicted PTSD symptoms at posttreatment. These findings may indicate that patients with higher levels of O are particularly amenable to exposure and cognitive restructuring exercises, though baseline PTSD symptoms have been shown to influence treatment outcomes more directly than personality traits.

Complication/Scar Model

Although no study to date has prospectively investigated personality change following PTSD, [Kamphuis, Emmelkamp, and Bartak \(2003\)](#) compared personality profiles of females experiencing PTSD symptoms following postintimate stalking with those of female undergraduates. Lower O was associated with PTSD symptoms in women who have endured postintimate stalking, suggesting that women's personalities may adapt to become more guarded following such an experience. Although findings lend some support to the complication/scar model, longitudinal designs are needed in order to directly evaluate the model and to ultimately tease apart scar and complication effects.

Schizophrenia and Psychotic Disorders

Cross-Sectional Relations

Studies examining the relationship between schizophrenia, psychosis, and the FFM are limited and tend to be cross-sectional. For this reason, cross-sectional studies that may fit into the other models (e.g., the pathoplasty model) are placed in those sections, despite their methodology. Please keep in mind that only when otherwise stated, these studies are cross-sectional and their placement in the models is hypothetical and should be considered with caution. Generally, findings investigating the relationship between the FFM and schizophrenia tend to find rates of high N and low C (for a review see [Andersen & Bienvenu, 2011](#)). Comparisons between patients with schizophrenia, unipolar depression, or bipolar depression on the FFM revealed that patients differed on E, A, and O. Closer examination of these differences showed that patients with bipolar depression scored higher than those with unipolar depression on a facet of E, with no differences between schizophrenia and bipolar depression. Additionally, patients with schizophrenia scored significantly lower on a facet of O in comparison to

patients with bipolar depression, and significantly lower on another facet of O in comparison to unipolar and bipolar patients. These relationships were no longer significant after controlling for demographic variables (e.g., years of education, socioeconomic status). Finally, patients with unipolar depression scored significantly higher on A than those with schizophrenia, with no differences between bipolar and schizophrenia on this domain (Bagby et al., 1997). When compared to healthy individuals, patients with schizophrenia scored higher on N, and lower on E, O, A, and C (Camisa et al., 2005), with another study showing higher rates of N and lower rates of C in schizophrenia, in comparison to healthy controls (Gurrera, Nestor, & O'Donnell, 2000). Interestingly, individuals with psychotic disorders were found to have low N scores in comparison to individuals with other psychiatric conditions, with the exception of pathological gambling, PTSD, and somatoform disorders (Uliaszek et al., 2014). As such, it may be that individuals with psychotic illnesses exhibit higher scores on N in comparison to healthy individuals, whereas their scores on N are significantly lower than individuals with other psychiatric conditions (e.g., bipolar disorder, panic disorder, and social phobia).

Vulnerability and Scar Models

To investigate whether personality is a vulnerability factor for the onset of psychosis, Krabbendam et al. (2002) examined a large sample of individuals with no history of psychosis at baseline, and then 1 and 3 years following initial assessment. They utilized the Gronigen Neuroticism Scale (Ormel, 1980) to assess for the predictive value of N in psychosis onset. High rates of N at baseline predicted psychotic symptoms at the 3-year follow-up, with higher rates of N exhibiting a stronger association with the presence of psychotic symptoms. Of note, the association between N and the presence of psychosis did not change after adjusting for self-esteem, depression, and anxiety levels.

Due to the nature of the current literature, we could not tease apart findings that were in support of the vulnerability model from those that were in support of the scar model. These two models can be separated from one another only by examining personality before and after illness onset to ascertain if there were any changes. However, the following studies do provide some evidence for the stability of personality in patients with schizophrenia after illness onset. Individuals with first-onset psychosis were examined at baseline and then at 3-month follow-up after undergoing CBT. In comparison to healthy individuals, those with first onset psychosis had higher N, O, and A and lower E and C scores. Although symptoms improved within the 3-month follow-up, personality traits were stable, suggesting that these patients either had a vulnerable personality style that was present before illness onset or that the presence of schizophrenia altered

personality ([Beauchamp, Lecomte, Lecomte, Leclerc, & Corbiere, 2006](#)). In another study, individuals with schizophrenia were assessed at intake and at a 6-month follow-up period. Low scores on C and high scores on N were observed in patients, in comparison to healthy controls. Additionally, personality remained stable during the 6-month period. Although positive psychotic symptoms had no bearing on personality stability, negative symptoms were related to personality stability and were considered “trait-like,” again providing evidence for either the vulnerability or the scar models ([Kentros et al., 1997](#)).

Pathoplasty Model

Studies examining neuropsychological deficits associated with psychotic disorders have attempted to shed light on the moderating role of personality traits through cross-sectional designs. Although these studies are summarized under the pathoplasty model, we acknowledge that longitudinal studies are needed. It has been consistently found that error-related negativity (ERN) is blunted in schizophrenia (for a review see [O'Donnell, Salisbury, Niznikiewicz, Brenner, & Vohs, 2011](#)), reflecting impairments in error detection. In a recent study, blunted ERN was found across an array of psychotic disorders, illustrating that it is not specific to schizophrenia. Of note, higher rates of N were associated with increased ERN after controlling for extraneous variables. Blunted ERN was also associated with unemployment and two or more hospitalizations during the early phase of the illness ([Foti, Kotov, Bromet, & Hajcak, 2012](#)). The findings from this study illustrate that higher rates of N may actually protect against blunted ERN, which is associated with impaired functioning. Along these lines, severity of delusions was positively associated with rates of N in a sample of individuals with either schizophrenia or schizoaffective disorder, again illustrating a relationship between personality and symptom severity ([Lysakar, Lancaster, Nees, & Davis, 2003](#)). In addition, measures of visual attention in individuals with schizophrenia were found to be negatively related to N and A, whereas measures of executive function were negatively related to both C and N. Furthermore, neuropsychological performance in both healthy controls and patients was found to be related to personality, with N showing the most consistent relationships across groups and with A and C showing the most divergent relationships ([Gurrera, Nestor, O'Donnell, Rosenberg, & McCarley, 2005](#)).

As previously mentioned, personality has been shown to moderate impairment in individuals with schizophrenia. Low N is negatively related to the number of social contacts and employment, and higher rates of E, O, and A are positively related to the number of social contacts ([Kentros et al., 1997](#)). Similarly, higher rates of social interaction were found to be related to higher rates of A, whereas capacity for intimacy was related to higher rates of both A and O in a sample of

patients with schizophrenia or schizoaffective disorder (Lysaker & Davis, 2004). Couture, Lecomte, and Leclerc (2007) also investigated the association between personality traits and social functioning in a sample of individuals diagnosed with a schizophrenia spectrum disorder. High A was negatively associated with greater social and independent living skills, whereas it was positively associated with more inappropriate community behavior. Johansen, Melle, Iversen, and Hestad (2013) examined personality traits related to interpersonal problems and those related to therapeutic alliance. High N and low E, A, and C were all related to interpersonal problems, whereas high A and low N were related to a stronger therapeutic alliance.

In addition to impairments in interpersonal functioning, the relationship between personality, symptomology, and treatment outcomes has been investigated in this population. For example, associations between personality and suicidal behaviors in patients with schizophrenia followed for 5 years show that high C was found to protect against suicide attempts/completions (Pillmann, Balzuweit, Haring, Blöink, & Marneros, 2003). Considering the importance of treatment adherence in this high-risk population, Lecomte et al. (2008) investigated correlates of medication adherence and service management in individuals with early psychosis; they found that those with higher A scores had poorer medication adherence, and those with low N and high A scores had poorer service management. In line with these findings, Beauchamp, Lecomte, Lecomte, Leclerc, and Corbiere (2011) examined the relationship between behavioral change during treatment and personality in a sample of individuals with early psychosis. Active coping strategies were linked to higher rates of E, whereas passive coping strategies were linked to higher rates of N. Additionally, personality profiles based on the FFM revealed that active coping strategies were most closely linked to a personality profile with high O scores and another profile with high E scores. In addition, Beauchamp et al. (2013) investigated the relationship between personality traits, coping strategies, and symptom measures for individuals with a first episode psychosis. Individuals were randomized into three groups: cognitive-behavioral therapy, skills training for symptom management, and a wait-list control. High rates of C were linked to therapeutic changes in active coping strategies in individuals in the cognitive-behavioral therapy group, high E was related to changes in active coping strategies in the skills training group, and high rates of O were related to changes in active coping strategies in the control group. Such findings illustrate the need to examine personality prior to treatment in order to ensure that patients are placed in a treatment program that is conducive to their personality profile and is likely to engender positive change.

Gleeson, Rawlings, Jackson, and McGorry (2005) prospectively examined the association between personality profile and symptom recurrence in first-episode psychosis patients. Recurrence was predicted by high N and A and premorbid conditions. After controlling for other factors, the relationship between recurrence and A remained significant, although this was not the case for N. Based on these findings, it is possible that high A improves the prognosis for those experiencing first-episode psychosis.

Spectrum Model

Studies investigating the spectrum hypothesis in schizophrenia are scant. In this section, a study examining personality traits of patients, their siblings, and healthy controls will be summarized, followed by a brief summary of the current debate on the relationship between O and psychosis (see also the chapter by Widiger, Gore, Crego, Rojas, and Oltmanns). Boyette et al. (2013) examined the relationship between FFM personality traits and individuals with schizophrenia, their siblings, and healthy controls. Individuals with schizophrenia reported the highest levels of N, followed by siblings, followed by healthy controls. Additionally, high N and O levels were related to increased levels of subclinical psychotic symptoms in all the groups assessed, but levels of O were not related to clinical symptoms. Based on these findings, levels of N seem to increase with familial risk of psychosis, whereas levels of O do not follow a dimensional pattern. In considering this finding, we turn next to the debate concerning the relationship of O with symptoms of psychosis.

To date, the relationship between psychotic symptoms and the O domain has been inconsistent, with some studies finding a positive relationship (Ross, Lutz, & Bailley, 2002), others finding a negative relationship (Gurrera et al., 2000), and still others finding no relationship between these two variables (Bagby et al., 1997). These inconsistencies have resulted in a debate in the current literature as to whether there is a psychopathological variant of O and whether normative personality can capture psychotic symptoms. Although the majority of studies cited above showed relationships between high N, low C, and psychotic disorders, there is still criticism that these traits do not fully capture positive symptoms of psychosis (e.g., hallucinations and delusions). Proponents of the use of O in describing psychotic symptoms suggest that O must be reconceptualized to include psychopathological characteristics (for a review see Chmielewski, Bagby, Markon, Ring, & Ryder, 2014). Peculiarity is one such trait that has been shown to be related to O (Ross, et al., 2002) and has been shown to be related to psychoticism (Tackett, Silberschmidt, Krueger, & Sponheim, 2008). Additionally, De Young et al. (2011) established associations between O and increased dopamine release, a biological marker implicated in psychotic disorders (for a

review see [Davis, Kahn, Ko, & Davidson, 1991](#)). On the other hand, researchers opposed to the use of O have suggested the inclusion of a new trait, most commonly labeled psychoticism (e.g., [Harkness, McNulty, & Ben-Porath, 1995](#); [Krueger, Derringer, Markon, Watson, & Skodol, 2012](#)).

Eating Disorders

Cross-Sectional Relations

A number of researchers have examined the relationships between eating disorders and several different personality traits (for review, see [Cassin & von Ranson, 2005](#)). [Podar, Hannus, and Allik \(1999\)](#) examined personality traits in three distinct groups: patients with eating disorders, individuals in a weight-reduction program, and healthy controls. The eating-disordered group scored significantly higher than the two latter groups on N, and significantly lower on E and C. The weight-reduction group scored similarly to controls on all domains except for O, on which they scored significantly lower than controls (and the same as the eating-disordered group).

Vulnerability Model

In a 2-year longitudinal study, the personality traits (as measured by Goldberg's unipolar Big-Five Markers; [Goldberg, 1992](#)) of participants with a lifetime eating disorder, those with a first onset eating disorder (at the 2-year follow-up), and healthy individuals were assessed. Personality profiles for individuals with a lifetime eating disorder resembled those with first-onset eating disorder before the onset of the disorder, with low scores on A and C and high scores on O. Of note, individuals with a lifetime eating disorder also scored lower on emotional stability (i.e., the opposite pole of N). This suggests that individuals with a similar personality profile may be more vulnerable to developing an eating disorder, and that developing an eating disorder may decrease the levels of emotional stability, thereby partially supporting the scar/complication model ([Ghaderi & Scott, 2000](#)).

Pathoplasty Model

In an effort to examine differences and similarities between subtypes of anorexia nervosa (AN), [Bollen and Wojciechowski \(2004\)](#) examined the personality profiles of individuals with AN restricting subtype and AN binge-eating/purging subtype. Although high scores on N characterized both groups, the former was also related to higher rates of C and A. This may illustrate the role that personality plays in symptom expression ([Widiger & Smith, 2008](#)). Additionally, personality profiles of female patients with an eating disorder have

been found to be related to severity of psychopathology and specific behavioral characteristics. Cluster analyses of FFM scales revealed three personality profiles: (1) resilient/high functioning (i.e., no elevations), (2) undercontrolled/emotionally dysregulated (i.e., high N scores, low A and C scores), and (3) overcontrolled/constricted (i.e., high N and C scores, low O scores). Although these personality profiles were not related to eating disorder subtype, they were related to disorder comorbidity (resilient individuals exhibited less comorbidity than others) and those falling into the undercontrolled cluster exhibited more impulsive traits and behaviors ([Claes et al., 2006](#)). This illustrates the role that personality may play in disorder manifestation. It is important to note that both studies are cross-sectional and interpretation of the results as supporting the pathoplasty model should be taken with caution.

Substance Use Disorders

Cross-Sectional Relations

A meta-analysis examining the relationship between alcohol-related problems and the FFM found that low C, low A, and high N were most associated with alcohol-related problems ([Malouff, Thorsteinsson, Rooke, & Schutte, 2007](#)). In addition, relationships between substance use and other health-related problems (i.e., overall health and elevated body mass index) reveal that all three problems are characterized by low C. Of note, high N was related to greater severity of health-related problems, whereas high E was differentially associated with substance use ([Atherton, Robins, Rentfrow, & Lamb, 2014](#)). Another disorder that commonly cooccurs with substance-related issues is antisocial personality disorder ([Grant et al., 2004](#)). [Ruiz, Pincus, and Schinka \(2008\)](#) were interested in examining personality as a common factor between substance use disorders and antisocial personality disorder. A meta-analysis was conducted and revealed that both disorders were characterized by low C, low A, and high impulsivity. Impulsivity was defined as a constellation of facet scores that cuts across FFM domains (i.e., NEO PI-R Impulsivity, Excitement Seeking, low Deliberation, and low Self-Discipline). However, the NEO PI-R denotes impulsivity specifically as a facet of N. Of note, individuals with antisocial personality disorder scored significantly lower on N than those with a substance use disorder or with a comorbid substance use disorder and antisocial personality disorder. It is possible that high N is a vulnerability factor for developing a substance use disorder, whereas low N is a vulnerability factor for developing antisocial personality disorder, in the presence of the personality profile that describes both disorders. This hypothesis can be tested through a longitudinal design that investigates personality before and after illness onset.

Vulnerability and Scar/Complication Models

To date, longitudinal studies that examine the vulnerability or scar/complication models do not exist. The study that is placed in this section is a cross-sectional study that may be interpreted as supporting either model. Hopwood et al. (2007) examined the relationship between personality and past substance use disorders, those with a current substance use disorder, and patient controls who never met the criteria for a substance use disorder. Of note, the past and current group differed only on a facet of E (i.e., excitement-seeking), such that individuals who never endorsed criteria for a substance use disorder scored the lowest, those with a current diagnosis scored the highest, and those with a past diagnosis fell in between these two groups. Otherwise, the past and current group had elevated scores on facets of N, and lower scores on A and C, in comparison to the control group. It is possible that N, A, and C are either vulnerability factors for developing a substance use disorder or that development of the disorder results in this personality profile, which is forever altered (i.e., supporting the scar hypothesis). The facet that differentiated the past and current groups supports the complication model, such that disorder presence results in elevation in excitement-seeking. It is not possible to ascertain whether this study supports the scar or vulnerability hypothesis, since patients were not examined prior to the first onset of the illness.

Pathoplasty Model

Although most studies examining the relationship between the course of substance-related problems and personality are cross-sectional, these studies seem to support the pathoplasty model by identifying differential relationships between heavy and moderate users, and by identifying differences in substance use characteristics between personality profiles. For instance, high E was found to be associated with number of drinks in the past month in a university sample, whereas high N was associated with alcohol-related problems. Low C was associated with the number of drinks in the past month and alcohol-related problems. Additionally, high N and low C were related to coping-anxiety drinking motivation, only high N was related to coping-depression drinking motivation, and high E and low C were related to enhancement drinking motivation (Mezquita, Stewart, & Ruiperez, 2010). Similarly, low C was found to be related to elevated levels of weekly alcohol use in a university sample (Clark et al., 2012). Walton and Roberts (2004) investigated differential relationships between heavy, moderate, and nondrug/alcohol users and personality traits, as measured by Goldberg's (1999) measure of the Big Five. Heavy users scored lower than the other groups on C and A, whereas abstainers scored lower on E in

comparison to the other groups. Finally, ter Bogt, Engels, and Dubas (2006) investigated differences between a nationally representative sample and a sample of party (i.e., rave) goers on personality traits, as measured by a Dutch version of Goldberg's Big Five questionnaire (Gerris et al., 1998). Party goers were divided into three groups: non-3,4-methylenedioxymethamphetamine (MDMA) users, light users (two pills per occasion), and heavy users (three or more pills per occasion). Both the representative sample and non-MDMA party goers scored lower on E than light and heavy users. Additionally, non-MDMA party goers scored low on A in comparison to the representative sample, but were not significantly different on A than light/heavy users. All three party goer groups scored lower on C than the representative sample, indicating a relationship between attending rave parties and levels of C. Non-MDMA party goers scored the lowest on emotional stability (i.e., the opposite pole of N), whereas the representative sample scored the highest on this domain. Light and heavy users did not differ from each other on emotional stability.

Differences in substance of choice and the relationship to personality have also been investigated. In one study, cigarette smokers had low C and high N levels in comparison to never smokers. Although heroine/cocaine users exhibited the same pattern, the scores were more extreme than those of cigarette smokers. Marijuana users had high O levels and low C and A levels, with average levels of N (Terracciano et al., 2008). In a similar study, three personality profiles were obtained through cluster analyses and their relationships to substance abuse characteristics (i.e., substance of choice, coping strategies, and depressive/impulsive/hostile tendencies) were investigated. The first profile, characterized by normal N levels, elevated E levels, and slightly lower A and C scores (although higher than the other two groups), was characterized by alcohol or cocaine substance use, with a large percentage of individuals using only one of these substances. This group had the highest percentage of cocaine-only users in comparison to the other groups. This group was also characterized by high planful problem solving and positive reappraisal coping strategies, and low escape-avoidance coping strategies. Finally, this group also exhibited lower depressive, impulsive, and hostile tendencies. Group three, which was characterized by the highest levels of N and the lowest levels of E, A, and C, consisted of polysubstance users (i.e., alcohol and cocaine; alcohol, cocaine, and another drug). This group had a relationship to the above variables that was the reverse of that found in the first profile. Finally, group 2, which was characterized by high N and low A and C, consisted of alcohol and cocaine users, with the largest percentage of alcohol only users. This group also fell in between groups 1 and 3 on all the aforementioned variables (Quirk & McCormick, 1998).

Summary

To ease interpretation, a table summarizing findings (see [Table 21.1](#)) has been provided. This table emphasizes research findings supporting the given models, as well as the personality traits typically implicated; it leaves absent models that have been tested only with correlational data when these data are insufficient to test the necessary parameters of the model. Of course, the most prolific findings are found in the category of cross-sectional relations; several of the disorders of interest have amassed such a body of literature in regard to cross-sectional relationships with the FFM that meta-analyses exist to combine the data. All disorders are characterized by high N, lending further support to the notion that N is a general risk factor for psychological distress and/or psychopathology. Several of the other disorders were also categorized by low C and A—highlighting cognitive difficulties with organization and responsibility, as well as interpersonal difficulties apparent in those with a psychiatric disorder.

Because pathoplastic models can often be assessed with cross-sectional data, there exists substantial research examining how personality traits affect the expression of psychopathology. Most often, personality traits are shown to be related to severity and treatment outcome. In several instances, high N is shown to negatively affect treatment outcome and is associated with an increase in the severity of disorder expression. This is the case for some mood and anxiety disorders as well as psychotic and substance disorders. E and A often serve as protective factors, improving treatment outcome or decreasing the severity of a disorder. This resilience may come from increasing social support and help-seeking behavior. For psychotic disorders, results were mixed regarding A; some research pointed to it as a protective factor, whereas other research showed it to be associated with pathological interpersonal behaviors. As a whole, these studies support research emphasizing the value of personality assessment at pretreatment stages to identify potential difficulties and likely prognosis.

In the limited longitudinal studies that have examined personality traits before the initial onset of a disorder, N was a common predictor of depressive, anxiety, and psychotic disorders. Some research examining biological and genetic markers of disorders have identified the shared etiology of N for mood and anxiety disorders, as well as low C for mood disorders. These cases, supporting a common cause model, highlight the complex, intersecting relationships between personality and psychopathology. There also exists limited evidence for high N as a complication to depressive and anxiety disorders, with studies examining N at preonset and postremission finding that N returns to premorbid rates after remission. Finally, much less research has been dedicated to examining the spectrum model of personality traits and clinical disorders compared to this etiological model for personality disorders. The only data approximating some

support for this hypothesis involved the relationship between O and psychosis. However, these findings are controversial, with some researchers suggesting the psychosis cannot be captured by normal personality traits.

Table 21.1 General Summary of Results Linking Etiological Models to the Classes of Psychopathology. Blank Boxes Indicate No Research, Null Findings, or Only Speculative Findings (i.e., Cross-Sectional Results Supporting Vulnerability, Common Cause, Complication/Scar, or Spectrum Models).

	Cross- Sectional Relations	Vulnerability Model	Common Cause Model	Pathoplastic Model	Complication/Scar Model	Spectrum Model
Depressive Disorders	N; low E, C	N	N; low C	N; low E, O, C, A	N; low E, O, C	
Bipolar Disorders	N, E, O; low A		N; low E, C, A	N; low E, O		
Anxiety Disorders	N; low E, O, C	N; low E	N	low C, A	N	
Obsessive-Compulsive Disorders	N; low E, C					
Trauma and Stressor-Related Disorders	N			N; low O		
Schizophrenia and Psychotic Disorders	N; low E, O, C, A	N		N, A; low E, O, C, A		O
Eating Disorders	N; low E, C	O; low A, C				
Substance Use Disorders	N; low A, C			N, E; low A, C		

Note: N = neuroticism; E = extraversion; O = openness to experience; C = conscientiousness; A = agreeableness.

In sum, this chapter highlights the necessity for well-designed, longitudinal studies aimed at elucidating the complex relationships between the FFM and clinical disorders. Consistent research supports N as a vulnerability factor to certain disorders, even sharing genetic etiology. However, the majority of this research is in the area of mood and anxiety disorders. Expanding these studies to include other forms of psychopathology could help identify common personality vulnerabilities to psychopathology, as well as unique predictors of certain constellations of symptoms.

Notes

- When interpreting findings relevant to personality change, it is necessary to consider the distinction between absolute stability and relative stability (De Fruyt et al., 2006; Santor, Bagby, & Joffe, 1997). In this regard, though mean levels of personality scores have been shown to significantly change in the

advent of MDD (i.e., absolute stability), individuals' relative positions to others with respect to their personality scores tend to be maintained (i.e., relative stability; [De Fruyt et al., 2006](#)). Zinbarg, Uliaszek, and Adler ([2008](#)) interpreted findings supporting absolute change in personality in the advent of MDD as reflecting a variable component of personality and findings supporting the relative stability of personality as reflecting a component of personality that naturally evolves throughout adulthood ([Fraley & Roberts, 2005](#)).

The Five Factor Model of Personality and Consequential Outcomes in Childhood and Adolescence

Filip De Fruyt, Barbara De Clercq, and Marleen De Bolle

Abstract

The validity of the Five Factor Model (FFM) to describe personality differences in childhood and adolescence is well established. Personality differences can be reliably assessed in children and adolescents, and available research converges on the validity of the FFM as the predominant model to provide a comprehensive and manageable account of these notable differences. In addition, there is strong agreement that personality traits in childhood/adolescence are related to a broad range of short- and long-term consequential outcomes, underscoring their utility in research and assessment. The aims of the present chapter are threefold: first, to review FFM measures developed for children and adolescents; second, to discuss parallels and dissimilarities obtained with adults; and finally to summarize the significance and validity of the model in gaining an understanding of a broad series of outcomes, including interpersonal relationships, psychopathology, health and well-being, learning and learning outcomes, and long-term outcomes manifested in adulthood.

Key Words: childhood, adolescence, measures, outcomes, relationships, psychopathology, health, education

The validity of the Five Factor Model (FFM) in describing personality differences in childhood and adolescence is now established. The developmental roots of this research approach were formed together with the construction of measures to assess the “Big Five”—or the FFM—in youth, measures that relied on primary caregivers and teachers as knowledgeable informants of personality. Eventually those assessment measures became supplemented with self-descriptions of adolescents themselves. This evolving research domain developed into a cumulative knowledge base that has been systematically compared to findings obtained in adults, pointing to personality similarities as well as differences across developmental stages of life (see also the chapter by [De Pauw](#)). From the

resulting evidence it is clear that personality differences can be reliably assessed in children and adolescents. Furthermore, the research demonstrates that the FFM is the model *par excellence* for providing a comprehensive and manageable account of notable personality differences. Finally, there is strong agreement that personality traits in childhood/adolescence are related to a broad range of short- and long-term consequential behaviors, underscoring the utility of those traits in research and assessment. The aim of the present chapter is threefold: to review FFM measures developed for children and adolescents, to discuss parallels and dissimilarities obtained in research with adults, and finally to summarize the significance and validity of the model to gain understanding of a broad series of outcomes, including interpersonal relationships, psychopathology, health and well-being, learning and implementation of learning, and long-term behaviors manifested in adulthood.

FFM Measures for Childhood and Adolescence

Although the study of individual differences in early childhood was mainly the domain of temperament researchers through the first six decades of the twentieth century, [John Digman \(1963\)](#) was among the first personality psychologists to examine the structure of teacher ratings providing initial evidence that the Big Five accounted for personality differences at much younger ages than had previously been thought. [Digman \(1963\)](#) examined the structure of teacher judgments of 102 first- and second-grade children on 39 scales using a Q-sort procedure and retained 11 factors labeled: superego strength, hostility versus social integration, surgent excitement versus desurgent apathy, autia (aesthetically sensitive and imaginative), general intelligence, premsia versus harria (emotional distress), sex, social confidence, neuroticism versus ego strength, an unidentified factor, and finally parental attitude: harshness versus permissiveness. From hindsight, it is clear that Digman probably retained too many factors, hampering replicability. In subsequent work, [Digman and Inouye \(1986\)](#) analyzed teachers' Q-sort ratings of 499 sixth-grade children on 43 scales, this time extracting fewer factors (7), five of which were clearly indicative of the Big Five—i.e., introversion-extraversion (surgency), consideration and conscientiousness (agreeableness), will (to achieve), emotional stability, and intellect (embracing also openness to

experience). The other two factors were an error factor loaded marginally by verbal expression items and a doublet factor loaded by the items imaginative and esthetically sensitive. The seminal work by Digman and his colleagues was followed by a stream of top-down research studies in which measures primarily developed for assessment with adults were used to assess the personality of younger age groups, eventually after slight item modifications to make them more appropriate.

[John, Donahue, and Kentle \(1991\)](#) developed the Big Five Inventory (BFI), a 44-item set assessing the Big Five. Given its fifth-grade reading level, the BFI was also used to describe the personality of children from 10 years of age onward ([Soto, John, Gosling, & Potter, 2008](#)), and it was used to study personality development from age 10 to age 65 ([Soto, John, Gosling, & Potter, 2011](#)). [Mervielde, Buyst, and De Fruyt \(1995\)](#) used the Big 5 Bipolaire Beoordelingschalen 25 (B5-BBS25; [Mervielde, 1992](#)) in their study of the structure and validity of teacher personality descriptions of 4- to 12-year-olds to predict grade point average (GPA). A four-factor structure, blending conscientiousness with adjectives tapping into intellect/openness, supplemented with the remaining Big Five factors, was found at kindergarten age, whereas the full five factor structure emerged from primary school age onward, with increasing predictive validity throughout primary school. [Barbaranelli, Caprara, Rabasca, and Pastorelli \(2003\)](#) re-designed the adult Big Five Questionnaire (BFQ; [Caprara, Barbaranelli, Borgogni, & Perugini, 1993](#)), expanding its coverage with trait adjectives that were judged by parents and teachers as suitable to denote personality differences observable in children and further translated into short behaviorally oriented phrases, into the Big Five Questionnaire—Children version (BFQ-C; [Barbaranelli et al., 2003](#)). They analyzed descriptions provided by the children themselves, their teachers, and their parents and demonstrated that the Big Five showed up in all rating sets. Conscientiousness was a consistent predictor of academic achievement; externalizing problems were associated with low conscientiousness and low emotional stability, whereas low emotional stability was associated with internalizing problems, as assessed with the Child Behavior Checklist (CBCL; [Achenbach, 1991](#)). Finally, [John, Caspi, Robins, Moffitt, and Stouthamer-Loeber \(1994\)](#) developed a set of markers for the FFM from the California Child Q-set, and they also examined relationships with the internalizing and externalizing syndrome scales of the CBCL.

Additional evidence for the validity of the FFM in childhood and adolescence came from a bottom-up approach toward personality description, examining the content, structure, and validity of parental free descriptions of children's personality conducted in multiple countries, including Belgium, China, Germany, Greece, the Netherlands, Poland, and the United States (Kohnstamm, Halverson, Mervielde, & Havill, 1998). This approach led to the development of two inventories to assess higher- and lower-order traits in children, i.e. the Hierarchical Personality Inventory for Children (HiPIC; Mervielde & De Fruyt, 1999; Mervielde, De Fruyt, & De Clercq, 2009) and the Inventory for Childhood Individual Differences (ICID; Halverson et al., 2003). The HiPIC assesses five higher-order factors: emotional stability, extraversion, imagination, benevolence, and conscientiousness, and 18 lower-order traits, whereas the labels for the ICID measure parallel the FFM nomenclature. Both bottom-up research lines converged with the results from the top-down analyses proposing the FFM domain traits as key dimensions to describe a youth's personality. In addition, this work contributed to establishing a lower-order structure of the FFM in childhood, enabling more refined predictions. A comparison of the domain and facet scales of both measures is provided in Table 22.1, which further lists the domains and facets from a re-analysis of Digman's original work (Goldberg, 2001), showing that there is also some convergence about what traits are salient at the lower-order trait level in childhood. Tackett, Kushner, De Fruyt, and Mervielde (2013) recently examined convergence among the HiPIC and the short version of the ICID (Deal, Halverson, Martin, Victor, & Baker, 2007), further examining their validity as predictors of internalizing and externalizing psychopathology syndromes.

Age and Sex Differences

Age and sex differences have been well-documented for adults (Costa, Terracciano, & McCrae, 2001; McCrae et al., 1999; McCrae & Terracciano, 2005; Roberts & DelVecchio, 2000) but were only recently systematically and comprehensively examined for childhood and adolescence. Given the validity of the FFM dimensions across developmental stages, the model enables examination of age and sex differences at different time points across the life cycle, both cross-sectionally and longitudinally. The research in adults has demonstrated that some facets show opposite age or gender

effects from the factor they define—see, e.g., [Roberts, Walton, & Viechtbauer, 2006](#); [Terracciano, McCrae, Brant, & Costa, 2005](#)—indicating the need to supplement domain-level research with a facet-level analysis to allow comprehensive understanding of childhood and adolescent age and gender differences in personality.

Age Differences

Both cross-sectional and longitudinal studies of adults generally agree in showing declines in neuroticism, extraversion, and openness to experience, and increases in agreeableness and conscientiousness from the mid-20s onward ([Roberts & DelVecchio, 2000](#)). In childhood and adolescence, individuals generally decrease in neuroticism, while increasing in agreeableness, conscientiousness, and openness to experience ([Branje, Van Lieshout, & Gerris, 2007](#); [De Bolle et al., 2016](#); [Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2009](#)). A somewhat divergent age trend for extraversion emerges from the literature for childhood and adolescence, possibly due to divergent age trends for the facets that make up extraversion ([Roberts et al., 2006](#)). More specifically, declining age trends are observed for extraversion cross-sectionally and cross-culturally ([De Bolle et al., 2016](#); [Soto et al., 2011](#)), whereas other longitudinal studies either could not detect age effects for extraversion or found increases ([Branje et al., 2007](#); [Klimstra et al., 2009](#)).

In childhood and adolescence, age effects of the facets generally follow those of the domain they belong to in terms of direction, but some deviations from this general pattern are observed, especially for extraversion and openness to experience. For extraversion facets, young individuals around the world are found to show increases in warmth but declines in activity and excitement-seeking. Likewise for the openness domain, declining age trends are found cross-culturally for fantasy and actions, while the remaining openness to experience facets show increases ([De Bolle et al., 2016](#)).

Personality development in childhood and adolescence generally moves in the direction of greater maturity and connects with general trends of personality development observed later in life. The rate of change, however, overall appears to be higher in childhood and adolescence than in adulthood, although there are cultural differences in the rate of personality development for some personality traits. The mechanisms behind these rate

fluctuations are still the subject of debate (De Bolle et al., 2016), with some researchers arguing that social investments, such as earlier movement into adult roles, serve as agents of accelerated change (Bleidorn et al., 2013).

Gender Differences

Contrary to the many popular books suggesting that gender differences in personality can be expected to be large, studies in adults have shown that gender differences are relatively modest in magnitude but consistent across studies (Costa et al., 2001). Women generally score higher on all of the Big Five factors, especially neuroticism and agreeableness. Overall, adult sex differences begin to appear in adolescence and, with increasing age, sex differences found at younger ages tend to develop—with respect to both direction and magnitude—toward those observed for adulthood, with females scoring higher than males on most traits. As in adulthood, sex differences in childhood and adolescence are modest in magnitude (De Bolle et al., 2016; Klimstra et al., 2009; McCrae et al., 2002). Divergent from this general trend is that adolescent girls score substantially higher on conscientiousness (De Bolle et al., 2016; De Fruyt, Van Leeuwen, de Bolle, & de Clercq, 2008), although boys and girls tend to converge on conscientiousness as they move into adulthood. This mean score discrepancy, specifically during adolescence, has been suggested as an explanation for girls' higher academic achievement, especially in secondary education (De Fruyt et al., 2008; Voyer & Voyer, 2014).

Table 22.1 Mid-level constructs of childhood personality

HiPIC (1)	Digman (2)	ICID (3)
Neuroticism		Neuroticism
Anxiety		Fearful/insecure
		Negative emotionality
Self confidence	Insecurity	Shy
	Resiliency	
Extraversion		Extraversion
Energy	Activity level	Activity level
Expressiveness		
Optimism		Positive emotionality
Shyness		
	Sociability	Considerate/sociable
	Self-assertion	Openness
Imagination	Imagination	Openness
Creativity		
Intellect		Intellect
Curiosity		
Benevolence		Agreeableness
Altruism		
Dominance		Strong willed
Egocentrism		
Compliance	Antagonism	Antagonism
Irritability		
	Hyperactive impulsivity	
Conscientiousness		Conscientiousness
Concentration		Distractible
Persistence	Perseverance	
Orderliness	Carefulness	Organized
Achievement		Achievement orientation
	Mannerliness	

Note.

(1) HiPIC: Hierarchical Personality Inventory for Children ([Mervielde & De Fruyt, 1999](#));

(2) Mid-level constructs proposed by [Goldberg \(2001\)](#) from a re-analyses of Digman's work;

(3) ICID: Inventory of Child Individual Differences ([Halverson et al., 2003](#)).

The literature on adults shows that women score higher on most personality facets (i.e., feminine-typed facets), whereas men typically score higher on assertiveness, excitement seeking, openness to ideas, and competence ([McCrae, Terracciano, & 78 Members of the Personality Profile of Cultures Project, 2005](#)). Before age 17, however, boys tend to score as high as girls on several feminine-typed facets (i.e., self-

consciousness, fantasy, actions, trust, straightforwardness, and modesty; De Bolle et al., 2016). Furthermore, adolescent girls score higher on the masculine-typed facet of assertiveness. From a review of the available evidence, one can generally conclude that (1) far fewer significant facet-level sex differences are found in childhood and early adolescence than in adulthood, and (2) girls start to display higher levels of sex-typed personality traits at an earlier age than boys (Costa et al., 2008; De Bolle et al., 2016; Soto et al., 2011).

Consequential Outcomes

Predictive validity of consequential outcomes is ultimately the most important criterion to judge on the value of psychological constructs. In this regard, the resurgence of trait psychology by the end of the twentieth century was to a large extent attributable to numerous validity studies in different applied areas, underscoring the utility and predictive validity of the trait concept, and the FFM in particular (Woods, Lievens, De Fruyt, & Wille, 2013). Although the validity of traits has been examined and reviewed primarily for adults (Ozer & Benet-Martinez, 2006), a similar review of consequential outcomes can be compiled for children and adolescents. For youth, the more short-term outcomes can mainly be situated in the family, interpersonal, and school contexts (De Fruyt & De Clercq, 2014), whereas long-term outcomes may include a much broader range of settings, including also (mental) health and socioeconomic outcomes, such as for example longevity (Bogg & Roberts, 2013), employability (De Fruyt & Mervielde, 1999), and career attitudes and success (Wille, De Fruyt, & De Clercq, 2013). The short-term consequential outcomes will be reviewed here.

Peer Interaction and Relationships

Extraversion and agreeableness are the two personality factors that are chiefly considered in the context of interpersonal relations (see also the chapters by Wilt and Revelle, and by Graziano and Tobin, respectively). Research has led to the conclusion that these two dimensions are sufficient to describe most types of social behavior (Wiggins & Broughton, 1991), with extraversion referring to individual differences in the frequency of social interaction, whereas agreeableness primarily taps into qualitative

aspects of interpersonal tendencies (Costa & McCrae, 1992a,b) representing the individual's orientation towards other people's experiences, interests, and goals. Agreeableness is most closely associated with processes and outcomes related to interpersonal conflict and adjustment in children, whereas the extraversion dimension has been studied frequently in the context of social anxiety and shyness. Less agreeable children and adolescents report higher levels of day-to-day conflict and greater acceptance of destructive conflict tactics; they also have poorer relationships with peers and teachers (Jensen-Campbell, Gleason, Adams, & Malcolm, 2003). These two interpersonal trait domains also play an important role in the study of sociometric status and bullying.

Developmental psychologists interested in children's social reputation often use sociometric methods to assign individuals to social status categories, including "popular," "controversial," "average," "neglected," and "rejected" children (Coie & Dodge, 1983). Usually a peer nomination procedure is used, in which members of a group nominate other group members whom they like or dislike playing with. Popular children are those receiving many positive nominations and few negative ones; "rejected" children receive many negative and few positive votes; "controversial" kids receive many nominations of both types, whereas "neglected" youths get few votes of either type. Average individuals are usually defined as those who receive intermediate numbers of positive and negative nominations. Although sociometric research has considerably advanced knowledge of children's interpersonal behavior and peer relationships, Mervielde and De Fruyt (2000) argue that the nomination procedure in itself does not shed much light on the reasons why children are liked or disliked. Indeed, from a FFM perspective, there may be multiple reasons why a child is nominated positively (e.g. "nominate the child you would like to play with"), i.e. the child may be chosen because s/he is extraverted, or agreeable, or reliable (conscientious), referring to very different personality traits in terms of their FFM position.

Research by Newcomb, Bukowski, and Pattee (1993) showed that three global categories of behavior—sociability, aggression, and withdrawal—are important to distinguish among groups. This meta-analytic review showed that children in each sociometric category had distinct behavioral repertoires that influence the quality of their social relations. Peer-perceived sociability seems to be most important for peer acceptance. Sociability

implies being perceived as friendly and considerate, but also as enthusiastic, intelligent, and imaginative. Adolescents who are perceived as self-confident are also more accepted, and those perceived as anxious, emotionally labile, insecure, and/or withdrawn are likely to be rejected by their peers, just as aggressive and inattentive adolescents are ([Scholte, van Aken, & van Lieshout, 1997](#)).

Bullying

Another form of interpersonal behavior that has received considerable attention during the past 20 years is bullying at school. Bullying is a form of verbal, physical, or social aggression involving repeated use of force against peers over extended periods of time. It includes name-calling, threatening, teasing, hitting, and exclusion ([Olweus, 1993](#)). Recent research has focused on the larger peer group's role in bullying situations, including peers' social role and personality traits. A number of studies specifically addressed the associations between the Big Five and specific measures of bullying/victimization ([Bollmer, Harris, & Milich, 2006](#); [Jensen-Campbell et al., 2003](#); [Tani, Greenman, Schneider, & Fregoso, 2003](#)).

[Salmivalli \(1999\)](#) investigated peer group dynamics identifying six roles in bully-victim situations: bully, victim, reinforcer of the bully, assistant of the bully, defender of the victim, and outsider. Bullying can thus be perceived as a group activity in which children might participate differently according to their intrinsic personal characteristics. [Tani et al. \(2003\)](#) reduced these six categories to four participant social role groups: pro-bullies, defenders of the victim, outsiders, and victims. They then examined their FFM profiles, with the following results:

Pro-bullies scored lower than defenders on agreeableness, reflecting their preoccupation with their own goals and interests and a lack of sympathy for other people's suffering. This finding is consistent with literature showing that bullies tend to use aggressive strategies for solving interpersonal problems ([Slee, 1993](#)), have a lack of empathy ([Olweus, 1993](#)), and manipulate and take advantage of others ([Sutton & Keogh, 2000](#)). The lower agreeableness scores may underlie their aggressive and manipulative tendencies. The pro-bullies also score higher on extraversion, suggesting that children who bully others or children who help the bullies are likely to assert themselves in social situations.

Defenders of the victim exhibited the highest agreeableness scores and obtained lower neuroticism scores than pro-bullies and victims.

A mixed picture for the *outsiders* was observed. They scored lower than pro-bullies and defenders on extraversion, lower than defenders on agreeableness, higher than victims on conscientiousness, and lower than victims on neuroticism. The low score on extraversion is in line with other studies that demonstrate that outsiders tend to refrain from getting involved in bullying situations, because low extraversion has been linked to reticence from social interactions.

Finally, [Tani and colleagues \(2003\)](#) found that *victims* have lower scores on agreeableness (low A) than either defenders or outsiders, lower scores on conscientiousness, and higher scores on neuroticism. This suggests that victims are less equipped to build warm and trusting relationships (low A) and are less purposeful and less strong-willed. The increased score on neuroticism is in line with the literature, suggesting that victimized children have difficulty regulating their emotions ([Shields & Cicchetti, 2001](#)), and this may act as a risk factor for further victimization. An alternative explanation could be that victimization leads children to be more inclined to look after and protect themselves (low A) at the expense of sympathy of their peers, and that these behaviors invite victimization from others ([Tani et al., 2003](#)). [Bollmer and colleagues \(2006\)](#) investigated the associations between victimization/bullying in 99 children 10 to 13 years of age and reported that bullies were described by their parents as being less agreeable and less conscientious. The prediction that bullies would also score higher on extraversion was not supported. Victims scored significantly lower on conscientiousness and higher on neuroticism.

More recently, [De Bolle and Tackett \(2013\)](#) adopted a person-centered approach for the study of bullying/victimization and personality. Person-centered approaches have an advantage in that they consider the constellation of personality traits characterizing an individual. Using latent-class analysis these investigators identified four groups: a resilient group (high on emotional stability and the other FFM trait dimensions), a moderately scoring group, an undercontrolled group (extraverted, but low on conscientiousness), and a mixed group (low on emotional stability, extraversion, and imagination, but comparable with the undercontrolled group for benevolence and conscientiousness). Personality class membership significantly predicted the bully/victim classification beyond

gender. Children with a mixed or an undercontrolled profile were four times more likely to be bully/victims than children assigned to the moderate class, whereas resilient children were .61 times less likely than children from the moderate class to be victims, rather than to be uninvolved in bullying or victimization. In sum, these various studies clearly underscore that children's personality traits are related to how they function interpersonally at school.

Learning Achievement and Outcomes

Educational, Learning, and Instruction (ELI) processes and outcomes have been traditionally studied from the perspective of differences in cognitive ability, but the past two decades have witnessed booming attention on noncognitive measures, including interests, motivational factors, and personality traits. Whereas interests have been mainly related to what people actually study ([De Fruyt & Mervielde, 1996](#)), abilities, motivational factors, and personality have been studied as predictors of performance in ELI contexts, with abilities conceptually considered as more maximal indicators of performance, and motivational and personality factors as more typical behaviors affecting ELI outcomes. [Strenze \(2007\)](#) reported a corrected $r = .56$ between intelligence and GPA, suggesting that almost a quarter of the variance in academic achievement can be explained by intelligence scores. Today, there is abundant evidence that personality traits considerably affect academic attainment, at least to a similar extent as cognitive measures do.

Traits and study performance. [von Stumm, Chamorro-Premuzic, and Ackerman \(2011\)](#) have described three different frameworks on how personality and intelligence may affect school achievement tests and grades. First, intelligence and personality may act independently on performance at school. Second, personality may affect performance on intelligence tests, hence affecting the performance level. For example, test anxiety may constrain an individual's test performance. Third and finally, personality traits may shape the conditions under which persons will apply and invest their intelligence. [von Stumm and Ackerman \(2013\)](#) meta-analytically examined the associations between groups of investment traits, including social curiosity, abstract thinking, intellectual thinking, absorption, openness, novelty-seeking and ambiguity, and intelligence and found mostly positive associations (with an average estimate of .30). Investment

traits may have an impact on cognitive development and the accumulation of knowledge and skills across the life course.

Although a series of specific traits have been examined with respect to educational outcomes, such as procrastination (Steel, 2007), grit (Duckworth & Seligman, 2006; Duckworth, Peterson, Matthews, & Kelly, 2007), and goal setting-engagement (Bipp & van Dam, 2014), most work has been accommodated in the framework of the FFM. Poropat (2009) meta-analytically investigated the relations between the dimensions of the FFM and academic performance. Some of the primary studies included in that meta-analytic summary also reported correlations between intelligence and academic performance, and were used as a point-of-reference. The sample weighted correlation corrected for scale reliability between intelligence and academic performance was .25, hence substantially lower than the .56 reported by Strenze (2007). The coefficient estimated by Strenze was probably larger due to the absence of range restriction, so the .25 reported by Poropat for intelligence provides a benchmark to interpret the relative weight of the FFM traits. The corrected correlations for the FFM scales and academic performance were .07, .22, .02, -.01, and .12 for agreeableness, conscientiousness, emotional stability, extraversion, and openness, respectively, with agreeableness, conscientiousness, and openness as significant explanatory constructs. The correlation found for conscientiousness almost equals that of intelligence. Academic level was found to moderate the FFM-academic achievement association significantly, with the largest coefficients found in primary education for both intelligence and all FFM factors; declines from primary to secondary and tertiary level for intelligence, agreeableness, emotional stability, and extraversion; and linear declines across the three levels for openness. The correlation for conscientiousness did not significantly alter across academic levels. The correlations in primary education were .58, .30, .28, .20, .18, and .24 between academic achievement and, respectively, intelligence, agreeableness, conscientiousness, emotional stability, extraversion, and openness. Poropat (2009) further found that conscientiousness added little to the prediction of tertiary GPA when partialled out for secondary GPA, although it still performed slightly better than intelligence. In a meta-analytic investigation of adult-rated child personality and academic performance in primary education (Poropat, 2014a), corrected correlations of .43, .18, and .50 were reported for openness, emotional stability, and

conscientiousness, respectively, significantly outperforming the effects observed for self-ratings in the case of openness and conscientiousness. These relationships were not moderated by age or year of education (grades 1 to 7). The positive associations between conscientiousness and openness on the one hand and academic achievement on the other were also extended to other-rated personality ([Poropat, 2014b](#)).

A broad series of studies have directly related personality traits to education performance outcomes, with the FFM conscientiousness, openness, and neuroticism factors as key dimensions to describe achievement-relevant personality ([Briley, Domiteaux, & Tucker-Drob, 2014](#)). Spengler and colleagues ([Spengler, Ludtke, Martin, & Brunner, 2013](#)), following a large representative sample of 15-year-old students and another sample of students in the ninth and tenth grades, showed that conscientiousness better predicted grades ($r = .15\text{--}.30$), whereas openness was more strongly associated with performance (.15–.32) on math and reading items culled from the Programme for International Student Assessment (PISA; [Organisation for Economic Co-operation and Development, 2009](#)).

[Costa and McCrae \(1998\)](#) acknowledged the prominence of both openness to experience and conscientiousness for the ELI area, describing a learning approach circumplex, formed by pairing these two FFM dimensions. The four quadrants of this circumplex describe different learning approaches among individuals. Students who score high on openness and conscientiousness are called the “Good Students.” They like to learn and have the diligence and aspiration level to excel. They are often creative in their problem-solving approach and are likely to go as far academically as their gifts allow. By contrast the “Reluctant Scholars” score low on both factors. They are described as students who need special incentives to start learning, have problems maintaining attention, and need help in organizing their work. Academic and intellectual pursuits are not their strength. “By-the-bookers” are diligent, methodical, organized, and abide by all the rules, but they lack imagination and prefer step-by-step instructions. They excel at rote learning and have a strong need for structure and closure. Finally, the “Dreamers” are attracted to new ideas and can develop them with imaginative elaborations, but they may get lost in fancy. They are less successful in completing their innovative projects and may need help to stay focused. Dreamers are able to tolerate uncertainty and

ambiguity. The previous narrative descriptions of the quadrants certainly have appeal, but to our knowledge, no study has explicitly examined the usefulness and validity of this learning approach circumplex representation relying on FFM traits.

Learning styles. Personality traits may also indirectly affect ELI outcomes, for example via particular ways of learning that serve as mediating constructs between traits and academic outcomes. Students differ in large part in the ways they perceive and learn, and this variability has been represented in models on learning styles or learning approaches. Learning style is mostly narrowly conceived, often as a learning strategy or a combination of different learning activities. When depth of information is emphasized, the concept “approach” is used. There are a number of learning style instruments that are fairly similar to one another ([Furnham, 1996](#)). Kolb’s theory ([Kolb, 1976, 1984](#)) received the most attention in the literature, and served as a basis for [Honey and Mumford’s \(1982\)](#) Learning Style Questionnaire (LSQ).

The LSQ has four scales: Activists, Reflectors, Theorists, and Pragmatists. Activists get fully involved without bias in new experiences. They enjoy the here and now, are open-minded, and are not skeptical, and this makes them enthusiastic about anything new. Reflectors like to stand back, thinking about experiences and considering these from many different perspectives. They inform themselves, collect data, and reflect and anticipate before concluding and acting. Theorists adapt and integrate observations into complex but logically sound theories. They think problems through in a vertical, logical way and assimilate distinct facts into coherent theories. They tend to be perfectionists and like to analyze and synthesize. Pragmatists are keen on trying out ideas, theories, and techniques to see if they work in practice. They positively search out new ideas and take the first opportunity to experiment with applications. [Entwistle and colleagues \(1995\)](#) developed an instrument for assessing learning styles, the Approaches to Studying Inventory (ASI), which focuses on the level of engagement or depth of processing applied during learning. The following learning styles were identified: deep (intention to understand, relating ideas, use of evidence, and active learning), surface (intention to reproduce, unrelated memorizing, passive learning, and fear of failure), and strategic (study organization, time management, alertness to assessment demands, and intention to excel).

The narrative descriptions of the learning approach and style scales suggest that they probably have variance in common with the FFM personality dimensions, especially with conscientiousness and openness, and this has now been well established in a series of studies (Diseth, 2003; Komarraju, Karau, Schmeck, & Avdic, 2011). Komarraju et al. (2011) demonstrated that the FFM traits together explain 14% of GPA variance, but learning styles explained an additional 3%. They further provided evidence that synthesis-analytic and elaborative processing learning styles mediated the relationship between openness and academic performance. Likewise, Rosander and Bäckström (2012) found that learning approaches increased the explained variance by 6% for girls and 16% for boys, after controlling for intelligence and FFM traits. More recently, Diseth (2013) demonstrated how the perception of the school environment by the pupil and deep, surface, and strategic learning approaches mediated the relationship between openness, neuroticism, and conscientiousness and examination grades.

Psychopathology

Paralleling findings obtained in adults (Krueger, 2005), FFM traits are strongly associated with a broad range of mental syndromes in childhood that can be grouped under the umbrella of internalizing and externalizing disorders. Recent work has demonstrated that these associations may be explained by four different etiological models. Evidence in support of these models has been comprehensively reviewed by De Bolle, Beyers, De Clercq, and De Fruyt (2012) and Tackett (2006). A first model posits that personality may serve as a risk factor for later psychopathology (vulnerability model), such as for instance shown in a very recent study including 1,195 adolescents from the TRacking Adolescents Individual Lives' Survey (TRAILS) whose temperament at age 11 predicted internalizing and externalizing disorders at age 19 (Laceulle, Ormel, Vollebergh, van Aken, & Nederhof, 2014). In addition, Laceulle et al. (2014) showed that changes in temperament between age 11 and age 16 had a predictive value for internalizing and externalizing psychopathology between age 16 and age 19 above and beyond the effect of basal temperament scores. Second, psychopathology may cause subsequent personality change (complication model). Martin-Storey, Serbin, Stack, Ledingham, and Schwartzman (2012) for instance recently reported that

peer-rated aggression in childhood caused higher levels of adult neuroticism. Self-perceived social withdrawal in childhood was in addition associated with lower rates of conscientiousness in adulthood, whereas peer perceived social withdrawal was related to lower levels of extraversion. Furthermore, [Klimstra, Akse, Hale, Raaijmakers, and Meeus \(2010\)](#) found evidence for the complication hypothesis asserting that adolescent problem behavior affected personality traits. Third, the pathoplasty model assumes that personality may shape the course and outcome of psychopathology. For example, a recent study ([de Haan, Deković, van den Akker, Stoltz, & Prinzie, 2013](#)) indicated that changes in children's self-reported personality between childhood and adolescence (i.e. decreasing scores of all personality traits) affected the scores on adjustment problems at age 17. More specifically, those showing decreasing extraversion and imagination, as well as increasing conscientiousness (referred to as the "overcontrollers") across time (i.e. between age 9 and age 17) had the highest scores on later internalizing psychopathology. The "undercontrollers," in contrast, displayed decreasing extraversion, conscientiousness, and imagination across time and showed the highest rates of externalizing behaviors at age 17. Also, children reporting an increasingly extreme personality configuration across childhood and adolescence experienced more internalizing and externalizing psychopathology in late adolescence, even when controlling for previous levels of psychopathology and personality ([van den Akker et al., 2013](#)). A fourth model, the spectrum model, assumes that personality and psychopathology are associated because of shared underlying etiological factors. It is closely related to the continuity model, referring to the systematic phenotypic covariation of traits and psychopathology. Evidence for the spectrum model in younger age groups was recently found by [Martel, Gremillion, Roberts, Zastrow, and Tackett \(2014\)](#) examining longitudinal relations between temperament traits and attention deficit hyperactivity disorder (ADHD) symptoms. From a more general perspective, [Tackett and colleagues \(2013\)](#) have underscored the existence of common genetic influences on a general psychopathology factor and the negative emotionality trait in young twin pairs, supporting the spectrum hypothesis in children and adolescents.

Throughout earlier reviews and more recent studies on these etiological relations, it is remarkable that empirical evidence has been generated primarily by relying on only a single model, without controlling for the

effects of other etiological associations. This methodological choice may have resulted in biased findings and complicates the transparency of the conclusions culled from these designs. From a more stringent perspective, [De Bolle and colleagues \(2012\)](#) showed that the effects of the continuity model preponderate in the general trait-psychopathology relation in childhood, with additional pathoplasty and complication effects. These findings highlight the dimensional nature of traits and psychopathology, suggesting that they primarily need to be understood as continuous and related constructs, although they also represent both a unique set of characteristics that appear to have a reciprocal influence from a more causally oriented pathway.

The literature that speaks to consequential outcomes of personality in childhood, however, is embedded within a vulnerability perspective on the trait-psychopathology relationship. Beyond the evidence that mainly addresses more traditional childhood outcomes such as anxiety, depression, or conduct problems, more recent studies have demonstrated that early temperamental or personality factors also have considerable value in understanding more specific maladaptive outcomes, such as risk behavior in terms of alcohol or marijuana use and risky driving behaviors. From a large representative sample, [Dick and colleagues \(2013\)](#) prospectively studied the role of temperament prior to age 5 for understanding adolescent alcohol use and found that there are multiple pathways through which early temperamental aspects lead to later alcohol use, mediated by different childhood personality traits. Their finding moreover endorses the mechanism of equifinality ([Cicchetti & Rogosch, 1996](#)), stating that various early vulnerabilities may lead to a single outcome, hence indicating that the dynamics of trait-outcome pathways cannot be understood within a one-to-one predictor-outcome framework. Together with other studies ([Conner, Hellemann, Ritchie, & Noble, 2010](#); [Masse & Tremblay, 1997](#)), this study demonstrated that childhood assessment at kindergarten age can be used for preventive efforts with regard to substance use prior to the onset of drug dependence. Focusing on risky driving behaviors, such as tailgating and joyriding, and shoplifting, prospective empirical evidence ([Begg & Langley, 2004](#)) has shown that low conscientiousness significantly predicts these risky behaviors and is an important characteristic to include in the development of preventive programs for young drivers. From a personality × situation perspective on early sexual risk behavior, [Cooper \(2010\)](#)

concluded from a prospective study of a large group of adolescents that some trait effects on risky sexual behaviors, such as low-agency, high impulsivity, and high negative affectivity, were invariant across both situational and relationship commitment contexts. However, the results also pointed toward significant moderating effects of traits on the relationship between specific contextual factors and sexual risk behavior, indicating that personality predicted such behaviors more strongly in contexts that were novel and ambiguous.

Pediatric Diseases

Personality traits are considered more and more in relation to the etiology, management, and treatment of pediatric diseases. A recent meta-analytical review showed for instance, that chronic fatigue syndrome in childhood can be linked to excessive scores on conscientiousness ([Lievesley, Rimes, & Chalder, 2014](#)). [Vollrath, Landolt, Gnehm, Laimbacher, and Sennhauser \(2007\)](#) empirically demonstrated that children with type 1 diabetes who showed high scores on agreeableness and conscientiousness, and low scores on neuroticism, maintained better glycemic control over time. Various studies also demonstrated that the quality of life and perceived health of children with conditions such as pediatric asthma ([Lahaye, Van Broeck, Bodart, & Luminet, 2013](#)), congenital heart disease ([Rassart et al., 2013](#)), cancer survivors ([De Clercq, De Fruyt, Koot, & Benoit, 2004](#)), and unintentional injuries ([Vollrath & Landolt, 2005](#)) can be explained in part by Big Five personality traits, both from a cross-sectional and a longitudinal perspective. Across these and other childhood studies, there are striking similarities in terms of which childhood personality traits positively predict the examined outcomes, with high conscientiousness and low neuroticism as primary positive predictors.

Although these studies on personality and health-related issues all served the pediatric field in terms of identifying significant child-related factors that play a role in health behavior or disease adaptation, hence broadening the scope from disease-related variables toward psychological constructs, most of these studies suffer from various methodological biases that result from self-report and single-informant designs. From this perspective, [Friedman and Kern \(2014\)](#) plead for the use of multi-method assessments of personality and more objective measures of health outcomes. In this regard, longevity can be considered as one of the most reliable and valid measures

of health, moreover representing the most vital consequential outcome of human existence. From various longitudinal studies that incorporated the assessment of childhood personality, it has been convincingly shown that childhood conscientiousness plays a key role in longevity (for a review see [Friedman & Kern, 2014](#)), both through a direct pathway as through mediating influences on a number of core biopsychosocial processes such as health behavior, risk behavior, and healthy interpersonal environments.

Long-Term Outcomes

In his paper titled “the child is the father of the man,” [Caspi \(2000\)](#) demonstrated that personality traits assessed in childhood and adolescence are related to a broad range of consequential outcomes, including personality development, mental health, forensic history, employment, and quality of intimate and peer relationships. The reported prospective relationships derived from a multi-assessment follow-up of the Dunedin birth cohort can be assumed to be an underestimate of the FFM traits’ predictive potential, given that early trait estimates were derived from ratings of a set of behavioral observations that were not designed to assess the FFM. More recently, [Kern et al. \(2013\)](#) analyzed caregiver ratings obtained from the Pittsburgh Youth Study when children were between 12 and 13 years old and criterion ratings when they were in their mid-twenties. These authors demonstrated similar findings, showing that the agreeableness facets of compliance predicted better long-term adaptability in terms of more schooling and less risk for unemployment, teenage fatherhood, and crime, whereas the compassion facet was predictive of longer committed relationships. The importance of early conscientiousness at age 16 for a range of socioeconomic outcomes in adulthood, including salary, health, crime, and savings behavior has been further documented by [Prevoo and ter Weel \(Prevoo & ter Weel, 2013\)](#). More specific traits from the conscientiousness domain, such as grit, describing engagement and perseverance for long-term objectives, were demonstrated to be valid predictors of retention in such varied contexts as school programs, the workplace, military special operations training courses, and marriage ([Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014](#)). The bottom-line across different research is that personality indices of manageability in childhood seem to predict how well people enter adulthood.

The [World Health Organization \(2014\)](#) recently launched a call for a stronger focus on adolescent health. The top three causes of adolescent deaths across 109 countries were road traffic injuries, HIV/AIDS, and suicide, and the predominant cause of illness and disability among adolescents aged 10 to 19 years was depression ([World Health Organization, 2014](#)). All these conditions are directly or indirectly strongly associated with children and adolescents' personality traits, with impulsiveness, self-control, and sensation-seeking related to unsafe sex in youth and careless and/or drunk driving, whereas there is abundant evidence that neuroticism is a vulnerability factor for depression and suicide. Given that traits can be reliably assessed in childhood and adolescence, and that half of all people developing a kind of mental disorder show an onset of symptoms in late childhood, it is clear that professionals and policy makers need to pay more attention to the developing personalities of individuals. The present chapter has provided concrete suggestions on how these traits can be measured in childhood and adolescence and what the potential of such measurements might be in predicting outcomes.

Clinical Utility of the Five Factor Model

Stephanie N. Mullins-Sweatt, Douglas B. Samuel, and Ashley C. Helle

Abstract

The purpose of this chapter is to discuss the clinical utility of the Five Factor Model (FFM). This chapter will consider the clinical application of the FFM for treatment in general, but its primary focus will be on the clinical utility of an FFM of personality disorders.

Discussed herein will be the three fundamental components of clinical utility: ease of usage, communication, and treatment planning. Empirical research concerning the clinical utility of the FFM also will be considered in terms of the three components. Finally, research and examination of clinicians' perspectives of the utility of categorical and dimensional models of personality will be discussed.

Key Words: clinical utility, treatment, Five Factor Model, personality disorder, communication

A number of studies have shown the Five Factor Model (FFM) of personality disorder (PD) to be a valid model for describing personality pathology ([Widiger & Mullins-Sweatt, 2009](#)). A significant strength of the FFM, relative to all other alternative dimensional models of personality and personality disorder, is the presence of a large body of basic scientific research to support its validity as a classification of personality, including childhood antecedents, temporal stability across the lifespan, multivariate behavior genetic support for the personality structure, molecular genetic support for neuroticism, and emic and etic cross-cultural support ([Mullins-Sweatt & Widiger, 2006](#); [Widiger & Trull, 2007](#)). As acknowledged by the Chair of the American Psychiatric Association's (APA) *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) Personality and Personality Disorders Work Group, "similar construct validity has been more elusive to attain with the current *DSM-IV-TR* personality disorder categories" ([Skodol et al., 2005](#), p. 1923).

It would have been a fundamental shift to the existing nomenclature to fully integrate the psychiatric classification of personality disorder with the FFM (Widiger & Trull, 2007). Nevertheless, the Personality and Personality Disorders Work Group for *DSM-5* recommended a significant revision to the personality disorders section of *DSM-IV-TR*, proposing a hybrid categorical-dimensional model that described PDs as combinations of core personality impairment (e.g., identity, self-direction) and maladaptive personality traits, the latter representing “an extension of the Five Factor Model” (American Psychiatric Association, 2012, p. 7). Ultimately, however, the Board of Trustees of the American Psychiatric Association did not endorse this proposal, instead placing the Work Group’s model to *DSM-5* Section III with other measures and models needing additional research.

In addition to limited research on the proposed model, another barrier to such an integration of personality disorders with dimensional models such as the FFM is concerns regarding clinical utility. A special section of the *Journal of Abnormal Psychology* was devoted to the discussion of shifting the entire *DSM* to a dimensional model of classification. In his commentary, First (2005) argued that clinical utility was “the most important obstacle standing in the way” (p. 561) of a dimensional model of personality replacing the diagnostic categories within the next version of the *DSM*.

Interestingly though, the personality disorders section of the diagnostic manual is perhaps the most fundamentally problematic set of diagnoses in terms of clinical utility (Livesley, 2001). Verheul (2005) systematically reviewed various components of clinical utility for categorical and dimensional models of personality disorder and concluded that “overall, the categorical system has the least evidence for clinical utility, especially with respect to coverage, reliability, subtlety, and clinical decision-making” (p. 295). Problems with the categorical diagnostic system have been well documented and include heterogeneity of diagnostic membership, lack of precision in description, excessive diagnostic cooccurrence, failure to lead to a specific diagnosis, reliance on the previous “not otherwise specified” wastebasket diagnosis, and the unstable and arbitrary diagnostic boundaries of the categories (Smith & Combs, 2010; Widiger & Mullins-Sweatt, 2010). These issues significantly reduce the usefulness of psychiatric diagnoses for clinicians. Therefore, it is not surprising that the personality disorders are among the diagnostic categories of the *DSM* with which clinicians have been least satisfied for many years (Bernstein et al., 2007; Maser, Kaelber,

& Weise, 1991). The purpose of this chapter is to discuss the concerns and issues of clinical utility specific to the FFM of personality disorder.

Clinical Utility

The authors of the previous iterations of the *Diagnostic and Statistical Manual of Mental Disorders* have suggested that clinical utility is the central and fundamental driving force for constructing a diagnostic manual: “There is unanimous agreement, even among those engaged in research, that the primary purpose of DSM-IV is to facilitate clinical practice and communication” (Frances et al., 1991, p. 410). This emphasis was again proclaimed in the first paragraph of the introduction to the *DSM-IV-TR*: “Our highest priority has been to provide a helpful guide to clinical practice” (American Psychiatric Association, 2000, p. xxiii). Clinical utility was noted as a significant priority for the *DSM-5* Task Force, stating that “the DSM is above all a manual to be used by clinicians, and changes made for *DSM-V* must be implementable in routine specialty practices” (Kendler, Kupfer, Narrow, Phillips, & Fawcett, 2009, p. 1). Finally, this priority was again reiterated in *DSM-5* itself: “All of [our] efforts were directed toward the goal of enhancing the clinical usefulness of *DSM-5*” (American Psychiatric Association, 2013, p. 5).

Clinical utility has been defined as “the extent to which DSM assists clinical decision makers in fulfilling the various clinical functions of a psychiatric classification” (First et al., 2004, p. 947). Mullins-Sweatt and Widiger (2009) reviewed existing models of clinical utility and suggested more specifically that there are three primary components: ease of usage, treatment planning, and communication. Each of these will be discussed as they pertain to the FFM dimensional classification of personality disorder (Mullins-Sweatt, 2013; Mullins-Sweatt & Lengel, 2012).

Ease of Usage

An often-expressed criticism of dimensional models of personality disorder is that clinicians might find them too complex and cumbersome to use (First, 2005). First et al. (2004) suggested that one aspect of the “user friendliness” of a diagnostic system includes the “length of time it takes to assess a particular criteria set” (p. 949). This is certainly a valid concern (Clarkin & Huprich, 2011; Widiger, 2011). A classification system that is

too hard or complex to use will clearly not be used, no matter how valid or informative it might be if it was in fact used.

Ease of usage, of course, should not be the sole arbiter for the optimal personality disorder classification. Perhaps the easiest form of personality diagnosis is provided by narrative prototype matching. Prototype matching, in which a one-to-three paragraph description of a prototypic case is subjectively matched to your subjective impression of a patient, requires very little time or effort. “Clinicians could make a complete Axis II diagnosis in 1 or 2 minutes” ([Westen, Shedler, & Bradley, 2006](#), p. 855) because there are no requirements to assess each of the diagnostic criteria (or each of the traits) of a respective personality syndrome. “To make a diagnosis, diagnosticians rate the overall similarity or ‘match’ between a patient and the prototype using a 5-point rating scale, considering the prototype as a whole rather than counting individual symptoms” ([Westen et al., 2006](#), p. 847).

Narrative prototype matching was in fact the initial proposal of the *DSM-5* Personality Disorders Work Group, replacing the time-consuming task of assessing diagnostic criterion sets with subjective impressions of a global match to a narrative paragraph description ([Skodol, 2012](#)). However, the proposal was eventually abandoned when it became apparent that the empirical support for its reliability and validity was at best questionable, if not in fact weak ([Pilkonis, Hallquist, Morse, & Stepp, 2011](#); [Widiger, 2011](#); [Zimmerman, 2011](#)).

A common criticism of the existing *DSM-IV-TR* (and now *DSM-5*) diagnostic criterion sets though is that they are indeed impractical to use in general clinical practice. The *DSM-IV-TR* diagnostic criterion sets were constructed by researchers primarily for use in research ([Frances, First, & Pincus, 1995](#)). Each *DSM-5* personality disorder diagnosis is a complex constellation of a variety of maladaptive personality traits ([Clark, 2007](#); [Lynam & Widiger, 2001](#)). A systematic assessment of these criterion sets typically requires approximately 2 hours ([Widiger & Boyd, 2009](#)), an amount of time that is unrealistic in general clinical practice. It is not surprising then that clinicians routinely fail to assess for all of a personality disorder’s respective criterion set ([Garb, 2005](#)), as it is simply impractical for them to do so.

It has been suggested that it would take considerably less time to assess the 25 traits within the *DSM-5* dimensional trait model than has been

required for the approximately 100 *DSM-IV-TR* diagnostic criteria (Skodol, 2012). Many of the individual *DSM-IV-TR* diagnostic criteria are comparable to *DSM-5* traits (Lynam & Vachon, 2012), albeit the latter tend to be considerably broader in their coverage (and hence fewer of them are perhaps needed to cover the same ground). The *DSM-IV-TR* criterion sets trace their history to an effort to provide behaviorally specific indicators of each syndrome (Frances, 1980; Spitzer, Williams, & Skodol, 1980) and thereby need quite a few more to adequately describe each syndrome.

This might not be the most accurate or fairest comparison though. The personality descriptions for *DSM-5* would typically be at the level of the 25 personality traits (many of which should perhaps have behaviorally specific diagnostic criteria for their optimal assessment), whereas *DSM-IV-TR* personality descriptions are at the level of the eight diagnostic categories. Perhaps the five domains of the *DSM-5* dimensional trait model are best compared to the three *DSM-IV-TR* clusters, and the 25 traits compared to the eight diagnostic categories, in which case the trait model is considerably more complex than the categorical system. In any case, there are studies comparing the *DSM-IV-TR* to the FFM and *DSM-5* trait models with respect to ease of usage that will be discussed later in this chapter.

The assessment of the sheer number of diagnostic criteria is further complicated by the complexity of the constructs. The *DSM-IV-TR* categorical syndromes are considerably more complicated to assess than any single, distinct trait or domain. The purpose of the diagnostic manual is to help a clinician identify which specific personality disorder is present, including a differential diagnosis section to help when the patient appears to meet criteria for more than one. However, different patients will have different and relatively unique constellations of traits, typically possessing features of more than one personality disorder (Clark, 2007; Widiger & Trull, 2007). Choosing just one diagnosis can be considerably arbitrary; yet providing multiple diagnoses significantly complicates the provision of a clear treatment plan. It does not help that many of the criterion sets overlap (e.g., social avoidance is a feature of both the schizoid and avoidant personality disorders; suspiciousness is a feature of both the schizotypal and paranoid; anxiousness is a feature of both the avoidant and dependent). In sum, clinicians are being asked to make differential diagnoses among categories that are not, in fact, distinct and to identify one specific personality disorder that optimally characterizes a patient's maladaptive

personality functioning when many patients do not fit well into any one of the options. Reflecting this, research has indicated that personality disorder not otherwise specified (PDNOS) is often the most commonly diagnosed personality disorder in previous diagnostic manuals ([Verheul & Widiger, 2004](#); [Zimmerman et al., 2005](#)). A dimensional trait model, in contrast, simply asks the clinician to provide a profile description in terms of a set of relatively homogeneous and distinct traits, with each profile relatively specific to each patient's individual personality structure.

Utilizing the FFM would require a clinician to learn a new classification model. Few psychologists and even fewer psychiatrists are familiar with the domains and facets of the FFM. However, the FFM structure is not difficult to learn as it reproduces the naturally occurring structure within one's language ([Ashton & Lee, 2001](#)). The lexical research concerning the FFM documents empirically that clinicians are already using the FFM when they think about a person's personality structure. In addition, the presence of one version of the FFM within Section III of *DSM-5* will also further familiarize clinicians, including psychiatrists, with this structure. Research has even indicated that sophisticated clinical constructs, included for example within the California Q-set ([McCrae, Costa, & Busch, 1986](#)), the Shedler and Westen Assessment Procedure-200 ([Mullins-Sweatt & Widiger, 2007](#)), and the *DSM-IV-TR* (and current *DSM-5*) personality disorder syndromes ([Samuel & Widiger, 2008](#); [Saulsman & Page, 2004](#)), are all well understood and articulated in terms of the FFM.

Communication

The primary purpose of an official diagnostic nomenclature is to provide a common language of communication ([Kendell, 1975](#)). The impetus for the development of *DSM-I* was the crippling confusion generated by the absence of an authoritative, common language ([Mullins-Sweatt & Widiger, 2009](#)). Medical centers, clinics, and clinicians were not using the same diagnoses, thereby substantially hindering meaningful communication and consistency in care ([Widiger, 2008](#)). “For a long time confusion reigned. Every self-respecting alienist, and certainly every professor, had his own classification” ([Kendell, 1975](#), p. 87).

Another recurring argument against shifting the American Psychiatric Association diagnostic manual to a dimensional classification is the ease of communicating the presence of diagnostic categories ([First, 2005](#)). A

diagnostic system should be useful for “communicating clinical information to practitioners, patients and their families, and health care system administrators” ([First et al., 2004](#), p. 947). As expressed by the Chair of *DSM-IV*, “there is an economy of communication and vividness of description in a categorical name that may be lost in a dimensional profile” ([Frances, 1993](#), p. 110).

It would indeed be clumsy and unmanageable for clinicians to list 20–50 traits each time they wanted to describe a client to a colleague. However, the clinical description can in fact be confined to just the five broad domains (e.g., emotional instability, antagonism, disinhibition, detachment, and oddity), which will provide quite a bit of differential treatment implications ([Presnall, 2013](#); [Widiger & Presnall, 2013](#)). Even at the trait level, in practice only a few key traits will actually be needed to convey the central or primary concerns with respect to any particular clinical decision ([Bach, Markon, Simonsen, & Krueger, 2015](#); [Widiger & Presnall, 2013](#)). Describing a patient in terms of three to five key traits will likely be considerably more clear and informative than two to three diagnostic categories, each of which only partially resembles the patient and refers to symptoms and traits that are not in fact present.

The *DSM-IV-TR* diagnostic categories fail to provide sufficient information for clinicians to make useful social and clinical decisions. This may be due, in part, to the fact that people who share the same PD diagnosis can vary substantially in what features of the respective disorder are present ([Clark, 2007](#); [Trull & Durrett, 2005](#); [Widiger & Trull, 2007](#)). For example, there are 256 different combinations of criteria from which it is possible to receive the same diagnosis of borderline personality disorder ([Ellis, Abrams, & Abrams, 2009](#)) and it is even possible for two individuals to meet the *DSM-IV-TR* criteria for borderline personality disorder yet have only one diagnostic feature in common. The situation is even more bizarre for obsessive-compulsive PD as two patients can obtain the diagnosis, but exhibit *none* of the same criteria.

[Kraemer, Noda, and O’Hara \(2004\)](#) argued that in the mental health profession “a categorical diagnosis is necessary” (p. 21), also stating that “clinicians who must decide whether to treat or not treat a patient, to hospitalize or not, to treat a patient with a drug or with psychotherapy, or what type, must inevitably use a categorical approach to diagnosis” (p. 12). Although seemingly compelling, this is not in fact an accurate

characterization of actual clinical practice. In most clinical situations the decision is more dimensional than categorical. Typically, there is a decision concerning a degree of medication dosage, a frequency of therapy sessions, and even a level of hospitalization (e.g., day hospital, partial hospitalization, residential program, and traditional inpatient hospitalization).

The simplicity of being able to use the same diagnostic category for all social and clinical decisions is also offset by the inconsistency in the needs and concerns of these different decisions. It is evident that the many clinical decisions are not well informed by a uniform diagnostic threshold. Medication, psychotherapy, disability, insurance coverage, and hospitalization are clinical options that can imply very different levels of impairment. The current diagnostic thresholds were not set to be optimal for any particular social or clinical decision, and yet they are used to inform all of them ([Regier & Narrow, 2002](#)). A dimensional system has the flexibility to provide different thresholds for different social and clinical decisions and would then be considerably more useful for clinicians and more credible for social agencies than the current categorical system. A more flexible (dimensional) classification could be preferable to governmental, social, and professional agencies because it would provide more reliable, valid, and explicitly defined bases for making these important social and clinical decisions. Precisely for this reason, the authors of *DSM-5* included supplementary dimensional scales of functioning across the diagnostic manual that can provide clinically useful information for predicting behaviors and guiding clinical decisions, for treatment planning, and for predicting the course of the disorder ([American Psychiatric Association, 2013](#); [Helzer et al., 2008](#)).

Communication in the public realm is also an important consideration for clinical utility as the APA diagnostic manual is used to communicate information to the general public concerning psychopathology. A recurring issue for the diagnostic manual has been the stigmatization of a mental disorder diagnosis. As expressed by [Hinshaw and Stier \(2008\)](#), “despite clear gains in public knowledge related to mental illness over the past half-century, levels of stigmatization as appraised by attitude surveys appear to have increased rather than decreased in the United States” (p. 368). Stigma contributes to lower rates of research funding, lower employment, poor housing, family burden, and personal shame. The personality disorders have indeed been among the most stigmatizing diagnoses ([Aviram, Brodsky, &](#)

Stanley, 2006) and a barrier to effective interventions (Fanaian, Lewis, & Grenyer, 2013). Personality disorders are relatively unique in concerning ego-syntonic aspects of the self, or one's characteristic manner of thinking, feeling, behaving, and relating to others throughout one's adult life (Millon, 2011). In this regard, a personality disorder diagnosis can be quite stigmatizing, such that the patient's fundamental views of the world, everyday behaviors and manner of interpersonal relatedness, as well as his or her sense of self are considered to be a mental disorder.

Dimensional continuums of maladaptive psychological functioning are associated with less stigmatizing attitudes, increased positive emotional reaction, and less desire for social distance (Schmoerus, Matschinger, & Angermeyer, 2013). An integration of a classification of personality disorder with the personality structure of the general population would similarly help offset some of the stigmatization, as personality disorders would no longer be conceptualized as qualitatively distinct from normal personality functioning. Instead, this framework views PDs as maladaptive variants of the same personality traits that are evident within all persons. The FFM of personality disorder provides a more complete description of a person that recognizes and appreciates that the person is more than just the personality disorder and that there are aspects to the self that can be adaptive, even commendable, despite the presence of the maladaptive personality traits. Some of these strengths may also be quite relevant to treatment, such as openness to experience indicating an interest in mindfulness, agreeableness indicating an engagement in group therapy, and conscientiousness indicating a willingness and ability to adhere to the demands and rigor of cognitive-behavioral therapy (Krueger & Eaton, 2010; Widiger & Mullins-Sweatt, 2009).

Treatment

“The ‘holy grail’ of clinical utility is the positive effect of a change in the diagnostic system on [treatment] outcome” (First et al., 2004, p. 951). As noted previously, the central and fundamental importance of treatment planning for the diagnostic manual was noted explicitly in the first paragraph of the introduction to *DSM-IV-TR*: “Our highest priority has been to provide a helpful guide to clinical practice” (American Psychiatric Association, 2000, p. xxiii).

In his argument against converting the diagnostic manual to a dimensional system, First (2005) suggested that the existing diagnostic categories have clear and compelling implications for treatment decisions. As he indicated more recently, “given that most treatment research is keyed to the DSM diagnostic categories, determination of a DSM-IV diagnosis for a particular patient facilitates the selection of evidence-based treatments” (First, 2010, p. 471).

Elsewhere, however, it has been suggested that the issue of treatment planning may be where the *DSM-IV-TR* categorical diagnoses are most problematic. As suggested by the Chair and Vice Chair of *DSM-5*, in their evaluation of the current success of the diagnostic manual, “With regard to treatment, lack of treatment specificity is the rule rather than the exception” (Kupfer, First, & Regier, 2002, p. xviii). It seems apparent that a diagnostic manual without clear or specific treatment implications is fundamentally flawed with respect to its purported highest priority.

Treatment utilizing the FFM. There are a number of texts based on clinical experience and theoretical speculation that are helpful in providing suggestions for the treatment of individual personality disorders (Millon, 2011). However, there has been very little development of empirically supported therapies or evidence-based treatment for the personality disorders. It has been well over 10 years since the American Psychiatric Association began publishing practice guidelines for the diagnostic categories of the diagnostic manual and, as yet, guidelines have been developed for only one of the 10 personality disorders (i.e., American Psychiatric Association, 2001). Similarly, the American Psychological Association (2006) identifies modest to strong research support for the treatment of only one personality disorder. Matusiewicz, Hopwood, Banducci, and Lejuez (2010) identified 45 publications that evaluated the outcome of cognitive-behavioral interventions for personality disorders. They suggested that only borderline and avoidant personality disorders have treatments with empirical support, whereas evidence for therapy for the others is limited to a small number of open-label trials and case studies.

The absence of strong empirical backing for treatments for personality disorders may be due to the problems inherent in the diagnostic categories themselves. The diagnostic categories of *DSM-IV-TR* (now *DSM-5*) are not well suited for specific and explicit treatment manuals as each disorder is a complex combination of an array of maladaptive personality traits. People

who meet the diagnostic criteria for the same personality disorder may have few to no traits in common, which is not at all conducive to developing a consistent, coherent, and uniform treatment program.

The FFM provides a conceptually and empirically coherent structure of homogeneous domains and traits that is far more suitable for specific treatment implications than the syndromal constellations provided by the diagnostic categories of *DSM-IV-TR* (Presnall, 2013). For instance, research has documented that the five domains of the FFM have considerably more specific implications for dysfunction and impairment than is provided by the *DSM-IV-TR* categories (Hopwood et al., 2009; Mullins-Sweatt & Widiger, 2010). Neuroticism is the domain of emotional and affective dysregulation, agreeableness and extraversion are the domains of maladaptive interpersonal relatedness, conscientiousness is the domain of work, career, and occupational dysfunction, and openness is the domain of cognitive-perceptual dysregulation (Mullins-Sweatt & Widiger, 2006). This specificity of dysfunction translates well into comparably specific treatment implications (Presnall, 2013).

Extraversion and agreeableness, as the domains of interpersonal relatedness (Costa & McCrae, 1992; Mullins-Sweatt & Widiger, 2006), will concern the social and interpersonal relationships within and outside the therapy office. Interpersonal models of therapy, marital-family therapy, and group therapy might be particularly relevant to these two domains.

In contrast, neuroticism provides information with respect to mood, anxiety, and emotional dyscontrol, often targets for pharmacologic interventions, as well as cognitive, behavioral, and/or psychodynamic. There are very clear pharmacologic implications for mood and anxiety dysregulation and emotional instability (e.g., anxiolytics, antidepressants, and/or mood stabilizers), but little to none for maladaptive antagonism or introversion, the interpersonal domains of the FFM. This is not to suggest a limitation of the treatment implications for the interpersonal domains. Quite the opposite, as it is an expression of the specificity of treatment implications of an FFM of personality disorder. Barlow, Sauer-Zavala, Carl, Bullis, and Ellard (2014) are indeed developing a specific and manualized treatment approach for neuroticism. Maladaptively high openness implies cognitive-perceptual aberrations, and so would likely have specific pharmacologic implications (i.e., neuroleptics) that are quite different from those for neuroticism. The domain of conscientiousness, in contrast to

agreeableness and extraversion, is the domain of most specific relevance to occupational dysfunction, or impairments concerning work and career. [Magidson, Roberts, Collado, Rodriguez, and Lejuez \(2014\)](#) discuss the substantial importance and value of treating low conscientiousness, given the importance of this domain of personality functioning for a wide variety of significant life outcomes (and provide treatment recommendations for increasing a person's level of conscientiousness). Maladaptively high levels involve workaholism, perfectionism, and compulsivity, whereas low levels involve laxness, negligence, and irresponsibility. There might be specific pharmacologic treatment implications for low conscientiousness (e.g., methylphenidates; [Nigg et al., 2002](#)) although, as yet, none for maladaptively high conscientiousness. This degree of specificity of treatment implications is nonexistent for the *DSM-IV-TR* (now *DSM-5*) syndromes that overlap with one another and cut across the FFM domains.

Impact of FFM on treatment decisions. The FFM can also provide a means with which to consider the contribution of personality traits with treatment planning in general (e.g., high conscientiousness that will suggest receptivity to rigorous cognitive-behavioral treatments) in addition to where maladaptive traits may lead to problems in treatment, such as introversion suggesting alienation from social support ([Mullins-Sweatt, 2013](#); [Porter & Risler, 2013](#); [Swickert, Rosentreter, Hittner, & Mushrush, 2002](#); see also the chapter by [Piedmont and Rodgerson](#) regarding marital-family therapy). There have indeed been several clinical papers based on anecdotal experience addressing the FFM's potential ability to assist in treatment decisions ([Chard & Widiger, 2005](#); [Harkness & McNulty, 2002](#); [MacKenzie, 2002](#); [Miller, 1991](#); [Sanderson & Clarkin, 2002](#); [Stone, 2002](#); [Widiger, 1997](#)). For example, [Stone \(2002\)](#) suggested that he used domains and facets of the FFM to guide treatment decisions for patients with borderline personality disorder. For instance, "Neuroticism and agreeableness scales picked up on the pathological aspects of the borderline patients (as did the DSM items) but the extraversion, conscientiousness, and openness scales yielded important information about ... issues of perseverance at work, social abilities, and openness to new ideas" (p. 412). As [Stone \(2002\)](#) suggested, "These qualities, or their comparative deficiencies, play a vital role in determining amenability to therapy" (p. 412).

A move toward a dimensional classification system could have implications for treatment more generally and would be consistent with interest in the development of transdiagnostic interventions (e.g., Barlow et al., 2014). As individuals often present with complex clinical presentations (which often includes personality pathology), clinicians may struggle with determining which clinical problem is the primary concern or if multiple problems should be addressed at the same time (Farchione et al., 2012). There has been little research to guide clinicians in such treatment decisions. Thus, “Transdiagnostic treatments may help eliminate the need for multiple diagnosis-specific treatment manuals and simplify treatment planning, overall” (Farchione et al., 2012, p. 675). More specifically, Westen, Novotny, and Thomas-Brenner (2004) suggest it would be useful to move beyond solely developing treatments for *DSM*-defined disorders and to investigate treatments that explicitly target personality processes. In a special issue of *Psychological Assessment* devoted to the relationship between personality and psychopathology, Harkness and Lilienfeld (1997) stated, “if treatment planning is to meet or surpass the standards mandated by the field, then the fundamental rule of treatment planning applies: The plan should be based on the best science available” (p. 349). Emphasized in particular was that personality traits should be assessed when constructing and implementing a treatment plan, given the considerable scientific support for the reliability and validity of personality traits in predicting and accounting for a wide variety of important life outcomes.

In the text by Lambert et al. (2004) on treatment research, *Bergin and Garfield’s Handbook of Psychotherapy and Behavior Change*, Clarkin and Levy (2004) likewise argued compellingly that “No two clients begin psychotherapy in the same condition ... many characteristics of the client may potentially influence the therapeutic venture ... the study of client variables may have much to offer for our understanding of psychotherapy’s effectiveness. Identification of premorbid clinical and personality characteristics predictive of outcome might help clinician’s guide treatment choices and revise treatment methods based on the needs of different types of clients” (pp. 194–195). Additionally, Lambert, Bergin, and Garfield (2004) concluded that “Client characteristics make a sizeable difference with respect to outcomes, and diagnosis per se may not be the key variable in understanding treatment response” (p. 813). Therefore, a focus on specific client characteristics, such as adaptive or maladaptive personality

traits of the FFM, should be a key consideration for treatment planning and decision making.

Treatment implications can be further identified at the level of the lower-order facets of the FFM. The literature suggests that treatment for personality disorders focuses on specific traits rather than the global personality structure (Paris, 2006). Therefore, clinicians are more likely to treat the affective instability, behavioral dyscontrol, or the identity disturbance of a person diagnosed with borderline personality disorder. Those traits are specific facets of the FFM that can be easily assessed in a variety of ways (Mullins-Sweatt et al., 2012; Widiger & Mullins-Sweatt, 2009). Effective change occurs with respect to these specific components, or traits, rather than the entire, global construct. Clinicians would likely benefit from a classification system that concerns specifically and explicitly their focus of clinical attention, such as cognitive-perceptual aberrations (from the domain of openness), anxiousness, depressiveness, and emotional dysregulation (from the domain of neuroticism), intense attachment (from the domain of extraversion), meekness (from the domain of agreeableness), or workaholism (from the domain of conscientiousness) (Widiger & Mullins-Sweatt, 2009).

In addition to treatment outcomes, personality disorders and the traits of the FFM may also be useful predictors of psychiatric treatment utilization and satisfaction with care. Research suggests that those with borderline personality disorder (for instance) utilize more services across all forms of psychiatric care (Bender et al., 2001) but report lower treatment satisfaction (Kelstrup, Lund, Lauritsen, & Bech, 1993). Recent research suggests that general personality traits may also play a role in these aspects of psychiatric care. For example, Miller, Pilkonis, and Mulvey (2006) suggested that the domain of agreeableness was positively related to psychotropic medication usage and other psychiatric services, extraversion was negatively related to medication use and other treatment modalities, and openness to experience and conscientiousness were related to the number of therapy sessions attended. In a similar study, Hopwood et al. (2008) found that while the FFM demonstrated limited validity in predicting prospective treatment utilization, extraversion and conscientiousness tended to negatively relate to some forms of treatment and neuroticism was related to utilization across treatment modalities (though this may have been due to its association with psychiatric diagnoses).

Clinical Utility Research

“Changes in DSM-IV were made with the explicit goal of improving clinical utility … [However,] no formal effort was made to empirically examine whether these changes actually improved clinical utility. Instead, the field trials and data reanalyses primarily evaluated proposed criteria sets in terms of reliability, validity (using clinical diagnoses as the standard), and the extent to which the proposed criteria set identified different individuals as having the disorder. Purported improvements in clinical utility were simply assumed to be the case” ([First et al., 2004](#), p. 947). Authors of proposed revisions (or opponents to these revisions) at times attempt to speak for the field, as if they know personally what the predominant opinion of practicing clinicians is ([Frances & Widiger, 2012](#)). More informative are studies that actually survey clinical opinion to determine objectively whether a proposed revision is likely to be poorly or well received and there indeed have been quite a few studies examining the potential clinical utility of the FFM, and dimensional trait models more generally.

In an international survey of clinical psychologists and psychiatrists, [Mullins-Sweatt, Smit, Verheul, Oldham, and Widiger \(2009\)](#) examined the potential utility of traits found within various dimensional models of general personality. Their results suggested that although clinicians considered abnormal personality constructs to be relatively more useful for clinical treatment decisions than normal personality constructs, a substantial number of normal personality constructs were also identified that the psychologists and psychiatrists believed should be included in a diagnostic manual. This finding is consistent with a survey of the membership of the International Society for the Study of Personality Disorders and the Association for Research on Personality Disorders, which reported that 80% of the respondents believed that the *DSM-IV-TR* personality disorders are best understood as maladaptive variants of normal personality traits ([Bernstein et al., 2007](#)).

These findings though are inconsistent with a commentary within the *American Journal of Psychiatry* ([Shedler et al., 2010](#)) that argued “clinicians find dimensional approaches significantly less relevant and useful, and consider them worse than the current DSM-IV system” (p. 1027). However, these authors referenced only two ([Rottman, Ahn, Sanislow, & Kim, 2009](#); [Spitzer, First, Shedler, Westen, & Skodol, 2008](#)) of

a number of studies that have examined directly the opinions of clinicians with respect to the clinical utility of the FFM ([Mullins-Sweatt & Lengel, 2012](#)).

The first study in which clinicians described patients in terms of the FFM was provided by [Blais \(1997\)](#). Blais obtained FFM ratings by 100 clinicians attending a workshop on the treatment of personality disorders. Each clinician was asked to describe one of his or her patients who carried a primary diagnosis of personality disorder. The clinicians rated the patient with respect to each of the *DSM-IV* personality disorders as well as the FFM. As indicated by [Blais \(1997\)](#), “it has been argued that the language of the FFM fails to capture clinically important aspects of personality functioning and that clinicians will have difficulty applying this model to their patients” (p. 388). However, he found that the clinicians had little difficulty with the FFM and considered the information to be clinically useful. [Blais \(1997\)](#) concluded that the “data suggest that clinicians can meaningfully apply the FFM to their patients and that the FFM of personality has utility for improving our understanding of the DSM personality disorders” (p. 392).

In another study examining the application of the FFM to personality disorders, [Srock \(2002\)](#) sent licensed psychologists brief descriptions of prototypic and nonprototypic cases of three personality disorders and asked them to describe the case in terms of the 30 facets of the FFM. Their descriptions converged significantly with FFM descriptions of the personality disorders ([Lynam & Widiger, 2001](#); [Widiger, Trull, Clarkin, Sanderson, & Costa, 1994](#)). [Srock \(2002\)](#) concluded that “practicing clinicians can directly apply the dimensions of the FFM to cases of disordered personality with a moderate level of reliability” (p. 417). [Samuel and Widiger \(2004\)](#) similarly found that clinicians could apply the FFM descriptions of PDs. Importantly, interrater reliability among diagnoses was good, suggesting that clinicians were able to conceptualize PDs in a consistent manner using FFM traits.

[Srock \(2003\)](#) was the first study to compare the potential clinical utility of the FFM to the *DSM*. She asked one group of psychologists to rate brief, fictitious case vignettes of prototypic and nonprototypic cases of three personality disorders with respect to the FFM (as well as other dimensional models of personality disorder), to indicate the confidence of their rating, and to estimate the potential usefulness of the descriptions for professional

communication, case conceptualization, and treatment planning. Another group of psychologists provided the same ratings for the *DSM-IV* personality disorder diagnostic categories. Diagnostic confidence was higher for the *DSM-IV* diagnostic categories, as were the ratings of utility for professional communication, case conceptualization, and treatment planning. However, Srock acknowledged that much of her results could simply reflect the fact that the clinicians had been trained with, and were much more familiar with, the *DSM-IV* diagnostic categories in comparison to the FFM. She suggested that “it may take a new cohort of clinicians, trained in a dimensional approach to diagnosis, to obviate the need to translate back to the categories” ([Srock, 2003](#), p. 1010).

[Srock’s \(2003\)](#) findings were addressed in a subsequent follow-up study by [Samuel and Widiger \(2006\)](#). They suggested that Srock’s negative results were due in large part to providing fictitious case vignettes that were written in terms of the categorical diagnoses’ criterion sets, including even the nonprototypic cases. The case vignettes used in Srock were composed of sentences confined largely to behavioral descriptions or illustrations of *DSM* diagnostic criteria. It is perhaps not surprising for clinicians to indicate that the *DSM-IV* system is more useful for conceptualizing, describing, and understanding persons who are described explicitly in terms of the *DSM-IV* diagnostic criteria. [Samuel and Widiger \(2006\)](#) provided lengthier descriptions of actual cases that were written in a more neutral manner (i.e., using the same language to describe the cases as was provided in the source materials). They reported that the clinicians rated the FFM higher than the *DSM-IV* with respect to its ability to provide a global description of the individual’s personality, to communicate information to clients, to encompass all of the individual’s important personality difficulties, and somewhat surprisingly, even to assist the clinician in formulating effective treatment plans.

[Spitzer et al. \(2008\)](#) examined the clinical utility of five dimensional diagnostic systems, including the FFM and the *DSM-IV*. A significant difference from the studies of [Srock \(2003\)](#) and [Samuel and Widiger \(2006\)](#) is that the alternative models were applied to actual clients currently being seen in clinical practice. [Spitzer et al. \(2008\)](#) reported higher utility ratings for a prototypal matching model based on current *DSM-IV* diagnostic criteria and the prototypal matching procedure of the Shedler and Westen Assessment Procedure (SWAP-200; [Shedler & Westen, 2004](#)) than

for the FFM profile description. However, this study confounded the dimensional models with the method of assessment. This was not by design as they used measures that were provided to them by respective authors of these instruments. Nevertheless, this procedure inadvertently resulted in using different methods for the assessment of each model that would likely have a differential impact on ratings of clinical utility. For example, the FFM assessment required the consideration and completion of five to six pages of material, whereas [Westen, Shedler, and Bradley \(2006\)](#) have suggested that with their prototypal matching “clinicians could make a complete Axis II diagnosis in 1 or 2 minutes” (p. 855). This is perhaps an exaggeration of how easy it is to conduct a prototypal matching, but it is evident that the prototypal matching procedure required considerably less time and effort than even completing an abbreviated measure such as the FFM rating form.

[Lowe and Widiger \(2009\)](#) also compared the clinical utility of the FFM, *DSM-IV*, and SWAP-200 personality dimensions with rating forms for each model that were comparable in length and time required for completion. They reported that the SWAP-200 and FFM dimensions obtained higher clinical utility ratings than the *DSM-IV* diagnostic constructs on five of six clinical utility questions, with no difference in the clinical utility ratings between the FFM and the SWAP-200.

[Samuel and Widiger \(2011\)](#) asked clinicians to describe their clients in terms of the *DSM-IV-TR* PDs as well as the FFM. The clinicians provided ratings of both models’ clinical utility at the beginning of treatment and again after 6 months. At baseline, they rated the FFM as more clinically useful across all domains, including ease of application, professional communication, client communication, and treatment planning. The authors suggested the strength of these results might have been due in part to actual clients being less prototypic for the *DSM-IV-TR* categories. What is particularly interesting about this study is that the clinicians also rated the FFM more clinically useful after 6 months of treatment, providing direct evidence of the utility for treatment planning.

Other studies examining clinical utility from the perspective of practicing clinicians have provided information on PDNOS. PDNOS is a diagnosis provided by clinicians when they believe that a person has a personality disorder but the person is not well described by one of the existing diagnostic categories (e.g., antisocial or borderline). Surveys of clinicians,

their clinical records, and structured interview studies have suggested that PDNOS can be the most common diagnosis in clinical practice and the most frequent diagnosis when it is considered in empirical studies (Verheul & Widiger, 2004). Recent research has provided evidence for the utility of the FFM in PDNOS cases. Mullins-Sweatt and Widiger (2011) asked practicing psychologists to describe one or two clients with personality pathology in terms of the FFM and *DSM* models. In some instances, the client was someone who met the criteria for one of the 10 *DSM-IV* personality disorders; in others, the client was someone who received a diagnosis of personality disorder, not otherwise specified. Across both cases, the clinicians rated the FFM as significantly more useful with respect to its ability to provide a global description of the individual's personality, to communicate information to clients, to encompass all of the individual's important personality difficulties, and, perhaps surprisingly, to aid in treatment planning. Notably, within the PDNOS case, clinicians also indicated that the FFM was significantly more useful in terms of ease of application and professional communication (i.e., clinicians described the FFM as significantly more useful across all six clinical utility questions).

Rottman et al. (2009) asked clinicians to produce *DSM-IV* personality disorder diagnoses on the basis of either an FFM profile for a prototypic case (obtained from Samuel & Widiger, 2004) or the presentation of the complete set of *DSM-IV* diagnostic criteria for the respective personality disorder. They reported the accuracy with which the *DSM-IV* diagnoses were obtained and the participants' ratings of clinical utility for each method of obtaining a *DSM-IV* personality disorder diagnosis. Although participants rated the FFM as more clinically useful than the *DSM-IV* in terms of communicating with clients, the *DSM-IV* criteria were rated as more clinically useful on three of six clinical utility questions (i.e., prognoses, treatment planning, and professional communication). The relevance of this study for an FFM diagnosis of personality disorder, however, is not entirely clear. If the FFM was to replace the *DSM-5* diagnostic categories, the task of the clinicians would not be to reproduce the *DSM-5* personality disorder diagnoses. Additionally, it is hardly surprising that clinicians find it much easier to produce a *DSM* diagnosis when provided with the respective diagnostic criteria than when provided with an FFM normal personality trait profile. The authors stated that "the methods used in our studies are not based on the assumption that the FFM,

if adopted, would be used without ... diagnostic information" ([Rottman et al., 2009](#), p. 432). However, this was in fact precisely the methodology of the study as no FFM diagnostic information was provided (whereas the full set of diagnostic criteria was provided for the *DSM-IV* personality disorders). As noted above, the FFM of personality disorder consists of four steps, the first being the obtainment of an FFM profile (which the clinicians were provided) and the second being the identification of the problems in living associated with each elevation (which the clinicians were not provided). It would naturally be very difficult to speculate as to which personality disorder is present in the absence of knowing the maladaptive variants of the FFM trait elevations.

To address those concerns, [Glover, Crego, and Widiger \(2012\)](#) replicated the methodology of [Rottman et al. \(2009\)](#) by asking clinicians to identify which *DSM-IV-TR* PD is present when provided with the respective *DSM-IV-TR* diagnostic criterion sets. However, rather than provide them with an FFM profile of normal personality traits, they provided them with the maladaptive FFM personality traits that are associated with each PD (comparable to the maladaptive traits in *DSM-5* Section III). In [Rottman et al. \(2009\)](#) clinicians identified the correct PD diagnosis using the FFM only 47% of the time. However, in the study by [Glover et al. \(2012\)](#) their accuracy improved to 89%, which was comparable to the 91% accuracy using the *DSM-IV-TR* criterion sets. The clinicians in [Rottman et al. \(2009\)](#) rated the *DSM-IV-TR* diagnostic categories as more useful than the FFM with respect to making a prognosis, devising treatment plans, and communicating with mental health professionals. No significant difference was obtained between the *DSM-IV-TR* and FFM with respect to describing all the important personality problems or describing the individual's global personality. However, when clinicians were provided with the maladaptive variants of the respective FFM traits, the *DSM-IV-TR* and FFM were rated equivalently with respect to communication with other professionals, description of all problems, formulation of intervention strategy, or description of global personality ([Glover et al., 2012](#)). The *DSM-IV-TR* was still considered to be easier to use than the FFM, but this is to be expected given that the task was to recover the *DSM-IV-TR* diagnostic categories. The FFM maladaptive traits were considered to be better for communicating with clients.

In sum, when direct comparisons of the FFM and the *DSM-IV-TR* have been empirically tested with respect to clinical utility, results have varied. What can be noted is that the FFM has fared best when using comparable methods of assessment (i.e., neutral case histories and/or presentation of diagnostic information and measures equivalent in terms of length and time for completion). In those studies, the results seem clear that the FFM has equivalent or better clinical utility than the current *DSM* categorical model. It would be useful for future research to go beyond clinical opinion studies to examine the utility of the FFM of PD in implementing diagnostic evaluations and treatment plans with actual clients and ease of usage in clinical settings ([Mullins-Sweatt, 2013](#); [Mullins-Sweatt & Lengel, 2012](#)).

DSM-5

The previously discussed research has focused on *DSM-IV-TR/DSM-5* categories. Given that *DSM-5* appears to be shifting toward dimensional models, and considerably closer to the FFM, research examining the clinical utility of this model may be applicable to the clinical utility of broad dimensional approaches while remaining relevant to the changing conceptualization of the disorders. The alternative *DSM-5* model attempts to address the criticisms and limitations of the categorical approach, resulting in a different route of direct clinical applications. The clinical application of the alternative model includes four steps, all of which are anticipated to add important clinically significant information ([Skodol et al., 2011](#)). The overall alternative model has been said to be “an efficient assessment approach with considerable clinical utility” ([Skodol et al., 2013](#), p. 188). This model takes into account impairments in functioning and pathological personality traits, both of which are anticipated to increase the clinical utility of the model ([American Psychiatric Association, 2013](#)). After determining whether the individual meets the general diagnostic criteria for personality disorders, the first step of the four-step model is to assess the level of personality functioning, which accounts for elements of impairment (i.e., self or interpersonal) and severity. The next step assesses dimensional pathological personality traits and the degree to which they are present. This step can determine whether the individual fits the criteria for one of the six PD types, selectively retained from *DSM-IV-TR*. If the individual does not fit within one of the six categories, he or she can be described by other personality traits, also known as personality disorder trait specified

(American Psychiatric Association, 2013). These revised steps and new dimensional aspects allow for more precise clinical utility including greater specification of problematic areas, targeted or tailored treatments, and identification of the individual's strengths that may impact treatment (Skodol et al., 2011). Thus, in terms of ease of usage and clinical applicability, it is important to consider how clinicians are collecting information from clients regarding dysfunction, severity, and traits. Recent research (e.g., Calabrese & Simms, 2014; Mullins-Sweatt & Widiger, 2010) has suggested that functioning cannot necessarily be distinguished from pathological traits. Calabrese and Simms (2014) examined this specifically and suggested that general self-report trait measures given at baseline (e.g., SNAP-2) can assess the type of personality pathology and the psychosocial functioning simultaneously; however, other follow-up assessments may require separate, additional measurements of functioning to best assess the types of impairment the client is experiencing (Calabrese & Simms, 2014). Recent research has also suggested that severity is related to neuroticism, conscientiousness, agreeableness, and extraversion, and furthermore, severity is a strong predictor of prospective dysfunction (Hopwood et al., 2011). However, the findings of Hopwood et al. (2011) also demonstrated that personality traits are more related to severity and may be less useful in identifying individual differences that we might see within the features and impairment of a specific personality disorder. Ongoing research should continue to determine the best way to assess personality disorders in terms of both parsimony and clinical utility.

Again, one of the most crucial aspects of a new classification model for personality disorders is clinical utility from the perspective of clinicians who will be utilizing the model. Crego, Sleep, and Widiger (2016) surveyed clinicians with respect to alternative lists of traits proposed for *DSM-5* in comparison to more extensive lists of traits derived from the FFM. They asked the clinicians which sets of traits were more useful for treatment planning. A consistent finding was that the clinicians preferred the more thorough, comprehensive lists. For example, when describing patients with dependent personality disorder, they preferred a more extensive list of traits (e.g., submissive, yielding, meek, anxious, gullible, helpless, self-effacing, and insecure) rather than simply the three traits proposed for *DSM-5* (i.e., separation insecurity, submission, and anxiousness). These results are in direct contrast to the presumption that clinicians would find a trait

description to be too complex and cumbersome to use (e.g., First, 2005; Shedler et al., 2010).

Morey, Skodol, and Oldham (2014) examined clinician's perspectives on the clinical utility of the current and alternative *DSM-5* model. Psychiatrists and psychologists provided an evaluation for each of the models, rating the current model preferable for professional communication. Psychiatrists viewed both classification systems as having higher utility than psychologists, which is consistent with previous research showing that psychiatrists may find greater utility in having diagnoses for a variety of reasons. The alternative model personality disorder types (six) and severity rating (Level of Personality Functioning scale) was preferred in regards to comprehensiveness, patient communication, and treatment formulation from the point of view of psychologists.

Psychiatrists viewed the current model as just as useful, or more useful than the alternative model (Morey et al., 2014). Across psychologists and psychiatrists, the dimensional trait ratings were preferred over the current model in all aspects except for professional communication. For communication in terms of the personality traits, the alternative model was rated similarly to the current model. Overall, psychologists preferred the alternative model, which was consistent with other studies examining clinical utility of dimensional approaches (Glover et al., 2012; Lowe & Widiger, 2009; Mullins-Sweatt & Lengel, 2012; Samuel & Widiger, 2006). Again, and consistent with previous research, the preference for the current categorical model in regard to communication with other professionals is not surprising as it is the system that has been used for many years, and clinicians are expected to be more familiar and comfortable with the current system than with the alternative model (Morey et al., 2014). This study provides further evidence for a preference for a dimensional model based on the FFM, in terms of comprehensiveness, patient communication, and treatment formulation.

Conclusions

Valid concerns have been raised with respect to the potential clinical utility of the FFM. The FFM is largely unknown to clinicians, it will include a substantial number of traits, and there is considerably less written on the treatment of maladaptive personality traits than on the treatment of

the *DSM-IV-TR* (now *DSM-5*) personality disorder syndromes. There have also been a few studies that have reported negative results with respect to the FFM's potential clinical utility, at least in comparison to other approaches to personality disorder diagnosis.

However, anecdotal and empirical evidence for the clinical utility of the FFM suggests that the FFM of PD is better than the existing categorical nomenclature in addressing nonprototypic cases of personality pathology. The FFM may also provide useful information for more prototypic cases, in terms of facilitating communication and perhaps planning more specific and distinct treatment decisions and interventions. Adopting a dimensional model, such as the FFM, can address the need for the development of effective treatments for PDs, as they can utilize and target personality traits rather than heterogeneous categories. With the lack of empirically supported treatments for most of the existing PDs, the potential for such treatments with a dimensional model would be consistent with the shift toward transdiagnostic approaches to psychological disorders. An FFM of personality disorder would also provide a clinician with a description of abnormal personality functioning within the same model and language used to describe general personality structure, thereby facilitating an integration of the predominant personality models within psychiatry and psychology.

SECTION 4

Conclusions

CHAPTER
24

A Five Factor Discussion

Thomas A. Widiger

Abstract

The purpose of this chapter is to pay homage to and provide a discussion of each of the chapters included within this text. The first section of the book provided a description of the Five Factor Model (FFM), followed by a chapter devoted to each of the five domains. The second section concerned construct validity support for the FFM. The third and final section considered various social and clinical applications of the FFM, as well as issues and concerns with respect to these applications. Each of the chapters included within each section is discussed in turn.

Key Words: Five Factor Model, personality, trait, clinical applications, extraversion, neuroticism, openness, agreeableness, conscientiousness

I must begin by saying that I am happy with how this turned out. I am certainly in a position of bias, but I do believe that this text serves a very useful purpose, bringing together in one place diverse areas of investigation concerning the Five Factor Model (FFM). Different versions of some of these chapters have appeared in other texts, but never have they all appeared together within the same text. This book may not only be useful in providing in one place much that is known about the FFM, but it may also potentially inform one field of FFM study about the methods and findings of another field of study, with representation across different disciplines of psychology and input by both young and senior investigators.

The authors of these chapters are not always in agreement with one another, nor are they necessarily advocates of the FFM. Representing diversity of opinion was intentional and indispensable. In any case, I consider the chapters that were obtained to be wonderful. I will discuss each of them, but I really cannot do justice to them. Their breadth of coverage and depth of coverage are just so impressive. Any effort to summarize or to highlight these chapters runs the risk of being superficial and neglectful of

the most pithy, key points. In fact, at times (actually much of the time) my comments reflect my own personal interests and vantage point with respect to the FFM. My apologies to those who do not share the same interests!

The first section of the book provides a description of the FFM, as it has been articulated by [Costa and McCrae \(1995\)](#), or at least organized in a manner consistent with their conceptualization. The second section concerns construct validity support for the FFM. The third and final section concerns the various social and clinical applications.

The Five Factor Model

The first chapter of this section is by [Costa and McCrae](#) (this volume) who, appropriately so, provide an historical overview of their work on the FFM (which was clearly quite extensive) along with an articulation of their particular Five Factor Theory for the existence and nature of the domains. The amount of research Costa and McCrae have conducted in support of the validity of the FFM is really quite remarkable! This was facilitated in part by their highly productive longitudinal study at the Gerontology Research Center within the National Institute on Aging, but I also want to note their tremendous skill as collaborators, marshalling many large-scale cross-national studies. Whereas the authors of a particular measure might devote one entire article to the replication of gender differences or to the replication of the factor structure within a new language or culture, McCrae and Costa would include 50 such replications within one publication (e.g., [McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005](#)).

One of the substantive issues discussed by [Costa and McCrae](#) (this volume) is that the FFM domains are not truly orthogonal and that some facets occupy to a degree interstitial space. I have always enjoyed using galaxies of stars as a metaphor for the clustering of trait terms within the language; that is, there are essentially five galaxies of trait terms, with the largest and most clearly defined being extraversion and the smallest and least clearly defined being openness. The metaphor is useful. The galaxies are vast, and they are real. Plus, it is naturally difficult to identify one word that summarizes or represents well all of the members of a trait galaxy. But the metaphor is also frankly quite misleading because in between galaxies

of stars there is a vast empty space, whereas the galaxies of trait terms shade into one another.

There was a period of time when there was a concern that the NEO Personality Inventory-Revised (NEO PI-R; Costa & McCrae, 1992c) was failing to obtain adequate results via confirmatory factor analysis. McCrae and colleagues defended the NEO PI-R in part by arguing that confirmatory factor analyses (CFA) included unrealistic assumptions of simple structure (e.g., McCrae, Zonderman, Costa, Bond, & Paunonen, 1996). This position has been largely vindicated (Hopwood & Donnellan, 2010; Marsh, Morin, Parker, & Kaur, 2014; see also the chapter by Wright). It is now questionable whether CFA is the optimal model for testing the validity of any model of personality structure. CFA presumes a simple structure that would not exist in nature, as if the Big Five had a perfect simple structure within the lexicon. Stars reside in one and only one galaxy, with empty space between them. The universe of trait terms does appear to be well organized by five axes, but the interstitial space is well packed with terms. This should not be at all surprising. Humans create words to describe themselves and other persons, and there will naturally be plenty of terms to describe combinations of the fundamental axes, as well as the axes themselves. With respect to the NEO PI-R, it is to be expected that an important construct such as angry hostility will correlate with both neuroticism (negative affectivity) and antagonism; that impulsivity will correlate with neuroticism as well as low conscientiousness; and that warmth will correlate with both extraversion and agreeableness (Costa & McCrae, 1992c). We could confine FFM facets to constructs that produce the best simple structure, but these are unlikely to be the best constructs for clinical, social, and/or business applications (Costa & McCrae, 1995). The interpersonal circumplex structure for FFM agreeableness and extraversion clearly embraces this interstitial space, representing each of the octants in between each domain (McCrae & Costa, 1989b; Wiggins & Pincus, 1989).

Costa and McCrae (this volume) are forthright though in their acknowledgment that their original selection of FFM facets (Costa & McCrae, 1995) may no longer represent the optimal choices. As they expressed elsewhere, “It is clearly not the case that these 30 [NEO PI-R] scales exhaust the full range of traits related to each of the factors; punctuality is a good example of a marker of conscientiousness that is not included” (McCrae & Costa, 2013, p. 23). Alternative facet choices for

neuroticism are presented in the chapter by Tackett and Lahey (this volume), for extraversion by Wilt and Revelle (this volume), for openness by Sutin (this volume), for agreeableness by Graziano and Tobin (this volume), and for conscientiousness by Jackson and Roberts (this volume). Allen and DeYoung (this volume) offer their own proposals for all five domains in their chapter on personality and neuroscience. Personally, I find the inclusion of the trait of volatility within the Big Five Aspects Scale (DeYoung, Quilty, & Peterson, 2007) to be a major strength of this measure (Mullins-Sweatt et al., 2012). And, of course, there are alternative facet choices for the FFM as applied to children and adolescents (De Fruyt, De Clercq, and De Bolle, this volume; De Pauw, this volume). Nevertheless, the NEO PI-R facets identified by Costa and McCrae have clearly held up reasonably well over the years.

Neuroticism

Neuroticism “reflects individual differences in tendencies toward negative affect (including sadness, anxiety, & anger)” (Tackett and Lahey, this volume). Neuroticism is an enduring tendency or disposition to experience negative emotional states. It is otherwise known as negative affectivity or negative emotionality (Watson & Clark, 1994), or simply as emotional instability (Goldberg, 1993). Persons high in neuroticism respond poorly to environmental stress, interpret ordinary situations as threatening, and can experience minor frustrations as hopelessly overwhelming (Widiger, 2009). They have difficulty controlling negative emotional states, including anxiousness, anger, and depression.

It is sorely tempting to propose that neuroticism is the most important domain of the FFM. However, to do so would be to suggest that one or more of the other domains is not as important, and a case can be made for the singular importance of each domain. There are also compelling reasons to argue that neuroticism is not among the most important domains of the FFM.

Neuroticism is typically the fourth domain to be extracted from a language (De Raad et al., 2010), suggesting that within the general population neuroticism is of lesser importance than extraversion, agreeableness, and conscientiousness. In fact, De Raad et al. (2010) suggest that this domain may not in fact be truly universal (see also the chapter by De Raad and Mlačić). A person’s degree of emotional stability though

would seem to be fundamentally important to all cultures. [Tackett and Lahey](#) (this volume) indeed make a very good case for the special significance and relevance of neuroticism. Neuroticism is certainly the predominant personality dimension with clinical populations, pervading many measures of psychopathology ([Widiger, 2009](#)). Neuroticism is arguably the first domain of personality assessed within psychology, via Woodworth's ([1919, 1920](#)) Personal Data Sheet ([Butcher, 2010](#)). Imagine if the description of personality structure was confined to just the three domains that have unambiguous, undebatable lexical universality ([De Raad et al., 2010](#)). We would just have a three-dimensional trait model of extraversion, agreeableness, and conscientiousness. Neuroticism would not be included. The loss of the personality domain of neuroticism to clinical psychology and psychiatry would be considerable, if not devastating.

Neuroticism has enormous public health care implications. It provides a dispositional vulnerability to a wide array of different forms of psychopathology. Neuroticism is comparably associated with a wide array of physical maladies, both subjective and objective, including cardiac problems, disrupted immune functioning, asthma, atopic eczema, irritable bowel syndrome, and mortality ([Tackett and Lahey](#), this volume). It is also associated with a variety of contributors to quality of life, including subjective well-being, occupational success, emotional exhaustion, and marital dissatisfaction. Given the contribution of neuroticism to so many negative life outcomes, [Lahey \(2009\)](#) and [Widiger and Trull \(2007\)](#) have recommended that the general population be screened for high levels of neuroticism, perhaps on the Internet or during routine medical visits. "Not only would such efforts help identify those at potentially high risk for a range of adverse outcomes, information about levels of neuroticism could be incorporated into more personalized &, ideally, more effective treatments" ([Tackett and Lahey](#), this volume). It is routine to screen for blood pressure and cholesterol levels, and would seem only natural and sensible to do the same for a trait with so many public health care implications. "Even if the indirect reduction in the prevalence of each individual adverse outcome were modest, it is possible that such a strategy could be cost-effective because of the sheer number of adverse outcomes associated with neuroticism" ([Lahey, 2009](#), p. 14).

[Lahey \(2009\)](#) had originally suggested that "to date, no interventions for reducing neuroticism have been identified" (p. 14). Screening in the

absence of available treatment would perhaps be problematic. This shortcoming though is perhaps no longer the case, as [Barlow and colleagues \(2011\)](#) have developed an empirically validated Unified Protocol (UP) for the transdiagnostic treatment of emotional disorders, which is essentially a treatment for neuroticism. Barlow et al. suggested that current psychological treatments, which have been driven largely by the fragmented categorical approach embodied in the American Psychiatric Association's (APA) *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; [APA, 2013](#)), have become overly specialized, focusing on disorder-specific symptoms ([Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014](#)). The UP protocol was initially designed to be transdiagnostic with respect to mood and anxiety disorders, but it has become evident that it is indeed “a cognitive-behavioral intervention designed to address core temperamental processes in emotional disorders” ([Barlow et al., 2014](#), p. 357). The UP targets identification and modification of the strong negative reactions to emotions that lead to problematic, avoidant coping across emotional disorders. “Amelioration of negative reactions to emotions in turn changes the frequency and intensity of future emotional experiences and thereby affects temperamental constructs” ([Barlow et al., 2014](#), p. 357). “The public-health implications of directly treating and even preventing the development of neuroticism would be substantial” ([Barlow et al., 2014](#), p. 344).

Extraversion

As indicated in the chapter by [Wilt and Revelle](#) (this volume), the personality domain of extraversion subsumes a wide array of related traits. Extraversion concerns the disposition to be energetic, outgoing, assertive, adventurous, gregarious, friendly, warm, poised, self-disclosing, talkative, sociable, enthusiastic, active, lively, expressive, excitement seeking, and bold. It is the predominant trait within most languages, the first to emerge in factor analytic explorations of the structure of language ([De Raad et al., 2010](#)). Extraversion versus introversion is then arguably the most important trait in personality description. Extraversion (versus introversion) is also among the very first traits to be assessed by psychologists, and included within the measures developed by [Bernreuter \(1931\)](#) and Jung ([Jung & Baynes, 1921](#)). Its polar opposite, introversion, was even included within

the original Minnesota Multiphasic Personality Inventory ([Hathaway & McKinley, 1943](#)).

[Wilt and Revelle](#) (this volume) document well that much is owed to Eysenck for further developing a strong scientific base for understanding the nature and mechanisms of extraversion. “Perhaps nobody has done as much for extraversion as Eysenck” ([Wilt and Revelle](#), this volume). He demonstrated the importance of extraversion as a fundamental dimension of personality in a series of both experimental and individual differences studies ([Eysenck, 1952](#)). There is at times a large divide between the individual differences and experimental laboratory approaches, with the former (or latter) even failing to correlate to any meaningful degree with the latter (or former). Many researchers confine their careers to just one of the two methods. Hans Eysenck was a very productive and innovative exception. With respect to the individual differences approach, he was also, of course, the principal author of a number of very influential and widely used personality inventories, including (for instance), the Eysenck Personality Inventory ([Eysenck & Eysenck, 1964](#)), the Eysenck Personality Questionnaire ([Eysenck & Eysenck, 1975](#)), and the Eysenck Personality Profiler ([Eysenck & Wilson, 1991](#)).

[Clark and Watson \(2008\)](#) have long proposed that positive emotionality is the temperament, or driving force, of extraversion (positive emotionality is one of the six facets of extraversion within the FFM of [Costa & McCrae, 1995](#)). I have always embraced this notion, and not only because of its theoretical and empirical support ([Clark & Watson, 2008](#)). Increased positive mood is readily understood as the engine that drives increased levels of talkativeness, gregariousness, adventurousness, boldness, and excitement-seeking. Furthermore, in a complementary fashion, severe deficits in positive emotionality equate well with the construct of anhedonia ([Widiger, Trull, Clarkin, Sanderson, & Costa, 1994](#)). Anhedonia, the inability (or at least severe deficit in the ability) to experience pleasure, has long been considered the central pathology of schizoid personality disorder ([Hopwood & Thomas, 2012; Kalus, Bernstein, & Siever, 1993](#)). Anhedonia is essentially having a dead, or severely depleted, furnace of the energy-driving positive emotionality of extraversion and, indeed, schizoid personality disorder is largely isomorphic to FFM introversion ([Hopwood & Thomas, 2012; Samuel & Widiger, 2008](#)).

[Wilt and Revelle](#) (this volume) also document well the benefits of extraversion (as well as the costs of introversion). There are numerous benefits for getting along and getting ahead ([Hogan, 1982](#)). Extraversion is associated with subjective well-being ([Ozer & Benet-Martinez, 2006](#)), having more sexual partners ([Nettle, 2006](#)), greater satisfaction with a marriage ([Watson et al., 2004](#)), satisfaction with a job ([Thoresen, Kaplan, Barsky, Warren, & de Chermont, 2003](#)), and higher levels of job performance ([Sackett & Walmsley, 2014](#)). However, [Wilt and Revelle](#) (this volume) also point out that there are potential costs associated with high levels of extraversion: “Extremely high extraversion poses risks for personality pathology as well, as people falling at this end of the continuum are more likely to be sexually promiscuous, emotionally intrusive, and engage in excessive self-disclosure and thrill-seeking behaviors.”

[Millon \(1981\)](#) referred to *DSM-III* ([APA, 1980](#)) histrionic personality disorder as the “gregarious pattern” (p. 131). Histrionic personality disorder largely represents a maladaptive variant of extraversion ([Lynam & Widiger, 2001](#)). Many of the traits (or symptoms) of histrionic personality disorder are clearly variants of extraversion. Persons diagnosed with histrionic personality disorder tend to be high-spirited, buoyant, and dramatic (positive emotions), to be flashy and seek strong stimulation (high excitement-seeking), to actively seek social contact, to be talkative and the center of attention (high gregariousness), to be outgoing and affectionate (high warmth), to be assertive and forceful (high assertiveness), and to be energetic, fast-paced, and vigorous (high activity). There is indeed compelling empirical support for the relationship between histrionic personality disorder and FFM extraversion ([Furnham, 2014; Gore, Tomiatti, & Widiger, 2011; Samuel & Widiger, 2008](#)).

However, if the *DSM-5* Personality and Personality Disorders Work Group had their way, there would no longer have been a histrionic personality disorder, and in the next edition of the diagnostic manual of the American Psychiatric Association it will likely be gone. The *DSM-5* Personality and Personality Disorders Work Group initially proposed to delete the narcissistic, dependent, schizoid, paranoid, and histrionic personality disorders. Many came to the aid of the narcissistic personality disorder (e.g., [Miller, Widiger, & Campbell, 2010; Ronningstam, 2011](#)), and some came to the aid of the dependent (e.g., [Bornstein, 2011, 2012; Gore & Pincus, 2013](#)). Nobody spoke on behalf of the histrionic.

It is admittedly difficult to defend histrionic personality disorder (see [Blashfield, Reynolds, & Stennett, 2012](#), for an excellent argument for its demise). There is some research explicitly concerned with histrionic personality disorder, but considerably less than for the borderline, antisocial, schizotypal, narcissistic, or dependent disorders. In addition, the diagnosis has a long problematic history of gender bias concerns ([Blashfield et al., 2012](#)).

Nevertheless, if histrionic personality disorder was eliminated from the diagnostic manual, we would lose the only personality disorder that represents well maladaptive variants of extraversion ([Lynam & Widiger, 2001](#)) and, concurrently, maladaptive variants of the extraverted octant of the interpersonal circumplex. There are well-established maladaptive variants of all eight octants of the interpersonal circumplex ([Pincus & Hopwood, 2012](#)), including the location occupied by extraversion. There are even well-established measures of the maladaptive variants for every octant of the circumplex, such as the Inventory of Interpersonal Problems ([Horowitz, Alden, Wiggins, & Pincus, 2000](#)). If we removed histrionic personality disorder from the diagnostic manual, along with the dependent, we would lose representation of literally half of the interpersonal circumplex ([Widiger, 2010a](#)).

Openness

[Sutin](#) (this volume) suggests that FFM openness is perhaps the most resilient domain within the FFM. In contrast to domains such as neuroticism or extraversion, which are well represented in most models of personality, openness has at times struggled to be recognized. It is the smallest and most troubled of the FFM domains, as it is typically the last to emerge within factor analytic studies of alternative languages ([De Raad et al., 2010](#)). There is less consensus over how it is best described or even labeled, alternatively being referred to as a domain of intellect, culture, imagination, and unconventionality, as well as openness ([Sutin](#), this volume). However, it could similarly be argued that openness is the most interesting and stimulating of the FFM domains because it is the most problematic, and perhaps even controversial. A special section of the *Journal of Personality Assessment* was devoted to its conceptualization and assessment ([Connelly, Ones, & Chernyshenko, 2014](#)).

Indeed, as [Sutin](#) (this volume) suggests, openness has survived and perhaps even thrived. Sutin documents well that the consequences of openness have stretched far beyond intellectual and artistic pursuits. One of the current questions concerning openness is whether high openness is associated with any potential costs or maladaptive variants. It is difficult to imagine that there would be no maladaptive variants associated with any pole of an FFM domain. [Nettle \(2006\)](#) suggests that high openness is associated with paranormal beliefs and schizotypal thinking, but this is precisely the controversy within the personality disorder field ([Watson, Clark, & Chmielewski, 2008](#)). It is noteworthy that [Costa and McCrae \(1980\)](#) did not conceptualize openness as having any maladaptive variants, considering it instead to concern ideal personality traits such as self-actualization, an open mind, and self-realization ([Coan, 1974](#); [Rogers, 1961](#); [Rokeach, 1960](#)). [Costa and McCrae \(1980\)](#) began with just a three-factor model, assessed by the NEO Inventory (e.g., [McCrae & Costa, 1983](#)). Shortly after the development of the NEO Inventory, they became aware of the Big Five and they extended their instrument to include agreeableness and conscientiousness. However, they did not revise their scales assessing neuroticism, extraversion, or openness, and they subsequently acknowledged that FFM openness does not align as well with the Big Five ([McCrae, 1990](#)).

The assessment of this domain by [DeYoung, Quilty, and Peterson \(2007\)](#) distinguishes between openness and intellect. [DeYoung, Grazioplene, and Peterson \(2012\)](#) suggest that their version of openness is associated with schizotypal thinking but intellect is not. The assessment of openness by [Lee and Ashton \(2004\)](#) includes a facet scale titled Unconventionality that assesses the disposition to be eccentric, weird, peculiar, odd, and strange, clearly aligning with schizotypal thinking. [Tellegen \(1993\)](#) in fact identifies the domain as “unconventionality,” the scale for which contains items that assess normal openness (e.g., curious, inquisitive, imaginative, and creative) as well as items that concern attributes such as having ideas or beliefs that have little basis within reality, dwelling upon fantasies, or often engaging in activities that are bizarre, deviant, or aberrant ([Tellegen & Waller, 1987](#)). [Tellegen \(1993\)](#) indeed suggested years ago with respect to his conceptualization of openness that “markers of this type are clinically suggestive, particularly of schizotypal personality disorder” (p. 126).

Agreeableness

Graziano and Tobin (this volume) acknowledge that FFM agreeableness has not received the recognition given to other domains of the FFM, such as neuroticism, extraversion, or conscientiousness, or at least this attention has been slower to come. They conducted a PsycINFO search of the keyword “agreeableness” and identified 2,872 peer-reviewed journal articles written in English from 1860 to February 7, 2015. More than 97% of these articles were written after 1992 (the year of the publication of the NEO PI-R; Costa & McCrae, 1992c). In a related search, they found 135 articles with “agreeableness” in the title between 1900 and 2014. For purposes of comparison, the corresponding numbers for titles during this same time frame were 1,600 for neuroticism, 1,398 for extraversion, 363 for conscientiousness, and 175 for openness. It might have been interesting to repeat this search using the word “antagonism,” the opposite pole of the same domain. Perhaps there is a much larger body of research concerning antagonism, which would nevertheless concern research addressing the same domain of personality.

Nevertheless, their point is well taken. As they indicated, De Raad (2000) described agreeableness as the Big Five dimension having “the shortest history” (p. 91). Neither agreeableness nor antagonism was included within the influential temperament model of Clark and Watson (2008), nor even within the initial, short-lived three-factor model of McCrae and Costa (1983), which, as noted earlier, was confined to neuroticism, extraversion, and openness. Yet agreeableness is the second domain to emerge from factor analytic studies of the language and is among the three domains that everyone would agree are lexically universal (De Raad et al., 2010). Agreeableness is second only to extraversion with respect to its lexical importance and when paired with extraversion, defines the highly influential interpersonal circumplex (Leary, 1957; Wiggins, 1991).

The discovery of the circumplex was an epiphany for Leary (1957). Finding that all manner of interpersonal relatedness falls neatly within a circumplex arrangement is indeed striking. The discovery is perhaps tempered somewhat by the possibility that a circumplex can be created by combining any two of the FFM domains (DeGeest & Schmidt, 2015; Goldberg, 1999; Hofstee, De Raad, & Goldberg, 1992). Costa and McCrae (this volume) suggest that not all combinations are equally compelling, empirically or conceptually, but certainly the most compelling illustration

of an additional example is provided by [Tellegen, Watson, and Clark \(1999\)](#). As extraversion is neatly combined with agreeableness to create an interpersonal circumplex, [Tellegen et al. \(1999\)](#) likewise created another circumplex by combining extraversion (reframed as positive affectivity) with neuroticism (reframed as negative affectivity) to form an affectivity circumplex.

[Graziano and Tobin](#) (this volume) document well various costs to being antagonistic and benefits to being agreeable. Areas of further investigation are the potential costs of being too agreeable and the potential benefits of being antagonistic. There is indeed a body of research supporting, to a degree, the cliché that nice “guys” finish last and antagonistic “guys” can finish first (e.g., [Ahmetoglu & Swami, 2012](#); [Doerrenberg, Duncan, Fuest, & Peichl, 2014](#); [Judge, Livingston, & Hurst, 2012](#); [Lin-Healy & Small, 2013](#)). This is consistent with the sociobiological view of [Nettle \(2006\)](#) that there are potential costs and benefits for all traits. [Leary \(1957\)](#) in fact referred to the agreeable octant of the interpersonal circumplex as the “docile-dependent” octant. In its less severe form it was said to involve a “poignant or trustful conformity,” in its more severe form a “helpless dependency” (p. 292). As reviewed in the chapter by [Widiger and colleagues](#) (this volume), and summarized as well by [Gore and Pincus \(2013\)](#) and [Samuel and Gore \(2012\)](#), there is a considerable body of research to suggest that maladaptive variants of agreeableness involve dependent personality traits (e.g., [Bagby et al., 2001](#); [Blais, 1997](#); [Haigler & Widiger, 2001](#); [Lowe et al., 2009](#); [Lynam & Widiger, 2001](#); [Mullins-Sweatt & Widiger, 2007](#); [Samuel & Widiger, 2004](#); [Srock, 2002](#); [Trobst, Ayearst, & Salekin, 2004](#); [Wiggins & Pincus, 1989](#)). [Oakley \(2012\)](#) in fact edited an entire text devoted to the illustration of variants of pathological altruism.

Conscientiousness

[Jackson and Roberts](#) (this volume) indicate that conscientiousness includes “a broad swath of constructs that reflect the propensity to be self-controlled, responsible to others, hardworking, orderly, and rule abiding.” The importance of conscientiousness as a domain of personality is unassailable. Conscientiousness is one of the three domains that is unambiguously universal across all languages ([De Raad et al., 2010](#)). Traits of conscientiousness are evident in most every personality trait model and measure ([John et al., 2008](#); [O'Connor, 2002, 2005](#)). [Jackson and Roberts](#)

(this volume) emphasize in particular the importance of conscientiousness in predicting a wide array of significant life outcomes, including occupational success (e.g., Dudley, Orvis, Lebiecki, & Cortina, 2006; Seibert & Kraimer, 2001), marital stability (e.g., Roberts, Harms, Caspi, & Moffitt, 2007), academic achievement (e.g., Noftle & Robins, 2007; Ozer & Benet-Martinez, 2006), and even health and longevity (e.g., Friedman & Kern, 2014; Moffitt et al., 2001). As they indicate, conscientiousness is a well-studied personality trait across other scientific disciplines (beyond psychology), including economics, political science, and public policy.

Comparable to the recommendation of Lahey (2009) and Widiger and Trull (2007) for mass screening for levels of neuroticism, given its considerable public health care implications, Magidson, Roberts, Collado-Rodriguez, and Lejuez (2014) have made a similar recommendation for improving persons' levels of conscientiousness. "Efforts to change conscientiousness may hold great public health significance in enabling changes across key outcomes related to health, functioning, and quality of life" (Magidson et al., 2014, p. 1443). Given the impact of the level of conscientiousness across such a wide array of important life outcomes, it would seem that even minimal to mild improvements would have substantial social, occupational, and personal benefits (Chapman, Hampson, & Clarkin, 2014; Reiss, Eccles, & Nielsen, 2014). And, just as Barlow et al. (2014) have developed a pandiagnostic treatment program for reducing the global level of neuroticism, Magidson et al. (2014) have been developing a treatment program for increasing persons' global level of conscientiousness, using a relevant behavioral intervention considered within the motivational framework of expectancy value theory (Hopko, Lejuez, Ruggiero, & Eifert, 2003).

The time is perhaps right for the development of a treatment manual for all of the domains of the FFM (Widiger & Presnall, 2013). There are studies supporting the responsivity of FFM traits to therapeutic intervention, including conscientiousness (e.g., Jorm, 1989; Krasner et al., 2009; Piedmont, 2001; Reiss et al., 2014), and there are suggestions for treatment from the perspective of the FFM (e.g., Stepp, Whalen, & Smith, 2013; Stone, 2013), but there is, as yet, no effort to develop a comprehensive treatment manual, let alone empirically validated therapies, for developing changes to all five domains of personality functioning.

However, it is worth noting that no such manual has also been developed for the *DSM-IV* (now *DSM-5*) personality disorders. It has been over 20 years since the APA has been developing practice guidelines for each of the mental disorders included within *DSM-5* and to date guidelines have been published for only one personality disorder: borderline (APA, 2001). The absence of manualized treatment programs does not appear to be due to an assumption that personality disorders are untreatable, as there is empirical support for change in personality secondary to pharmacologic and psychotherapeutic intervention (Leichsenring, & Leibing, 2003; Perry & Bond, 2000).

One good reason for the absence of empirically based manualized treatment plans is the complex heterogeneity of the *DSM-IV-TR* personality syndromes (Widiger & Mullins-Sweatt, 2009; Widiger & Presnall, 2013; Zapolski, Guller, & Smith, 2013). Each *DSM-IV-TR* personality disorder is a compound assortment of maladaptive personality traits (Clark, 2007; Lynam & Widiger, 2001; Widiger & Trull, 2007). Two patients, each meeting the diagnostic criteria for the same *DSM-IV-TR* personality disorder, can have few traits in common (Trull & Durrett, 2005). Given the substantial variability of the defining features within each diagnostic category, it would be understandably difficult to develop a uniform treatment program for persons sharing the same personality disorder diagnosis (Verheul, 2005). A uniform treatment plan could hardly be developed when the patients sharing the same personality disorder diagnosis vary tremendously in their personality trait profiles.

Presnall (2013) outlined what might be considered an initial draft of an FFM treatment manual, indicating potential psychotherapeutic and pharmacologic treatment recommendations for all 10 poles of all five domains. She suggested that the five domains of the FFM are much better suited for treatment planning than the *DSM-IV-TR* personality disorder diagnoses because they are considerably more distinct and homogeneous. Extraversion and agreeableness are the domains of interpersonal relatedness, neuroticism is a domain of emotional instability and dysregulation, conscientiousness is a domain of work-related behavior, constraint, and responsibility, and openness is a domain of cognitive intellect, curiosity, unconventionality, and creativity (Mullins-Sweatt & Widiger, 2006). Extraversion and agreeableness are confined specifically to social, interpersonal dysfunction, an area of functioning that is relevant to

relationship quality both outside and within the therapy office. Presnall (2013) suggested that interpersonal models of therapy, marital–family therapy, and group therapy might be particularly suitable for these two domains. There is currently no pharmacotherapy for this interpersonal dysfunction, which is not actually a criticism; it is simply a further indication of the specificity of the treatment implications. In contrast to agreeableness and extraversion, neuroticism concerns depressive, anxiety, and emotional dyscontrol, often targets for effective pharmacologic interventions, as well as cognitive, behavioral, and/or psychodynamic. Maladaptively high openness implies cognitive–perceptual aberrations, and so would likely have pharmacologic implications (i.e., neuroleptics) that are quite different from the anxiolytics, antidepressants, and mood stabilizers that would be used for neuroticism. The domain of conscientiousness is the domain of most specific relevance to occupational dysfunction, or impairments concerning work and career. Maladaptively high levels involve workaholism, perfectionism, and compulsivity, and low levels involve laxness, negligence, and irresponsibility. There might be specific pharmacologic treatment implications for low conscientiousness (e.g., methylphenidates; Nigg et al., 2002), although, as yet, none for maladaptively high conscientiousness. Perhaps there never will be a pharmacotherapy for high conscientiousness, but the point is that the structure of the FFM is considerably more commensurate with specific treatment implications than the heterogeneous and overlapping *DSM-IV-TR* personality syndromes.

Construct Validity

Construct validity is the validation of the theoretical model for a particular construct (Cronbach & Meehl, 1955; Strauss & Smith, 2009). There are many components to FFM theory. Included within this text was a consideration of its robustness, its universality, the lexical foundation, factor analytic support, childhood variants and antecedents, the application to animal personality, behavior and molecular genetics, and personality neuroscience. Each chapter will be discussed briefly in turn.

Robustness

One of the major strengths of the FFM is that it appears to capture or subsume the primary traits and dimensions that exist in other personality inventories. McCrae and Costa's (2003) initial FFM research was heavily devoted to this effort, indicating how one particular measure or model after another could be well understood in terms of the domains and facets of the FFM, including (but certainly not limited to) the constructs of the interpersonal circumplex (McCrae & Costa, 1989b), Henry Murray's 20 need dispositions (Costa & McCrae, 1988), the California Psychological Inventory (McCrae, Costa, & Piedmont, 1993), the Myers–Briggs Type Indicator (McCrae & Costa, 1989a), the Minnesota Multiphasic Personality Inventory (Costa, Zonderman, McCrae, & Williams, 1985) and many others (see also the chapter by Costa and McCrae). This was not always welcomed by the proponents of these alternative models. At times it did perhaps feel as if the Borg was assimilating all manner of individual differences (Widiger, 2010b). Resistance though was perhaps indeed futile.

O'Connor (2002, 2005) has arguably conducted the most informative studies demonstrating the robustness of the FFM, addressing numerous inventories and models within integrative factor analyses. In this chapter, O'Connor (this volume) extends these findings to address more nuanced questions concerning robustness, including robustness with respect to the dimensional structure. One of the intriguing aspects of the chapter is the suggestion for somehow reaching a consensus as to the optimal location of the axes or anchors, thereby providing even more clarity as to where other measures of personality are located within the five dimensional map. As O'Connor (this volume) expresses, "It seems clear that the field now has a powerful, robust dimensional model, that the disagreements are over specifics, and that even more progress could be made if the field agreed on the measurement anchoring points for the dimensions." There has long been disagreement with respect to the FFM and the interpersonal circumplex as to the optimal location of the axes that define the two interpersonal domains (e.g., McCrae & Costa, 1989b; Wiggins & Pincus, 1989).

O'Connor (this volume) also addresses the suggestion of Ashton and Lee (2010) that honesty–humility is a major, previously neglected, sixth dimension of personality (see also the chapter by de Raad and Mlačić). I would add the simple point that it is readily apparent that honesty and humility are closely aligned with the straightforwardness and modesty facets of the Costa and McCrae (1992c) version of the FFM. We can

separate them from agreeableness if we include enough indicators of their presence, but the benefits in doing so are unclear and there is perhaps much that might be lost. For example, there is considerable elegance and coherence in the circumplex structure of interpersonal traits (Benjamin, 1996; Horowitz, 2004; Pincus & Hopwood, 2012; Wiggins, 1991) that would perhaps be sorely maimed, if not dismantled, if honesty and humility were removed from the interpersonal circumplex.

Universality

There are two fundamental methods of cross-cultural validation, the etic and the emic (Cheung, van de Vijver, & Leong, 2011; Pike, 1954). The etic approach applies a particular model, variable, or measure across the universe of different cultures, testing whether it maintains consistent construct validity. The emic approach identifies and explores the constructs indigenous to a particular culture, seeking to determine whether the traits inherent or innate to one culture are also evident in all other cultures. The chapter by Allik and Realo (this volume) is largely an etic approach to the question of universality, and they clearly provide a very sophisticated and cutting edge understanding and conceptualization of this research.

As Allik and Realo (this volume) indicate, perhaps the largest cross-cultural study to date has been conducted by Schmitt et al. (2003, 2007, 2008) as part of the International Sexuality Description project, which included 100 scientists from 56 countries. In this project they administered the Big Five Inventory (Benet-Martinez & John, 1998), translated into 29 languages and administered to 17,837 participants from 56 different countries. The results indicated that the five-dimensional structure was highly robust across major regions of the world, including North America, South America, Western Europe, Eastern Europe, Southern Europe, the Middle East, Africa, Oceania, South-Southeast Asia, and East Asia (Schmitt et al., 2007).

The emic approach though can at times be considered the more compelling (Church & Katigbak, 1988). It is indeed quite striking to know that extraversion is the predominant individual differences domain across all languages studied to date (De Raad et al., 2010). In addition, the etic approach can at times be perceived as perhaps imposing from outside a particular construct onto a local perspective that should be given credible

respect. On the other hand, a very compelling case can also be made for the fundamental importance of the etic approach.

The etic–emic comparison applies as well to other models of classification and description. Consider, for example, the classification of psychopathology, and even personality disorders in particular. An emic universal diagnostic system (i.e., one in which the members of all cultures and countries agree on the existence of the syndrome) will have an international social utility and consensus validity (Kessler, 1999), but even if a syndrome is not recognized within one or more particular cultures that does not necessarily mean that it should not be recognized. Cultures, like any belief systems, will vary in their veridicality. Recognition of and appreciation for alternative belief systems are important for adequate functioning within an international community, but respect for alternative belief systems does not necessarily imply that all belief systems are equally valid (Widiger, *in press*). Perhaps a particular cultural perspective is relatively inaccurate in its failure to recognize the presence of a particular syndrome, such as schizophrenia or alcohol abuse. The FFM can be difficult to replicate within preliterate or less educated populations (Church, 2016; Gurven, von Rueden, Massenkoff, Kaplan, & Lero Vie, 2013), but the implications of this for the validity of the FFM, even within that group, are not really clear.

Yamagata et al. (2006) examined whether the etic universality of the FFM is genetically supported. They conducted factor analyses of matrices of phenotypic, genetic, and environmental correlations estimated in a sample of 1,209 monozygotic and 701 dizygotic twin pairs from Canada, Germany, and Japan. Five genetic and environmental factors were obtained for each sample. High congruence coefficients were observed when phenotypic, genetic, and environmental factors were compared in each sample as well as when each factor was compared across samples. If the genetic structure appears to exist within a particular culture, would it matter that one of the domains was not well recognized within that culture?

Lexical

De Raad and colleagues are arguably conducting the most authoritative lexical research (e.g., De Raad et al., 2010). The lexical paradigm stands on a very compelling foundation. Many alternative models of personality structure have relied on the insight and brilliance of a compelling theorist,

such as Millon (1981, 2011) or Cloninger (2000). However, the lexical paradigm is more purely empirical. It is guided by the hypothesis that what is of most importance, interest, or meaning to persons will be encoded within the language. Language can be understood as a sedimentary deposit of people's observations over thousands of years during the language's development and transformation. The most important domains of personality functioning will be those with the greatest number of terms to describe and differentiate their various manifestations and nuances, and the structure of personality will be evident by the empirical relationship among these trait terms (Goldberg, 1993). Any particular personality structure that is guided by such findings will be consistent with how persons naturally think about personality structure, and will thereby be relatively comfortable and straightforward to implement and understand.

The lexical paradigm has a long and eminent history. Galton (1884) is arguably the first to propose a lexical approach to developing a model of personality structure. Allport and Odbert (1936) though are appropriately given due credit for initiating a much more thorough effort, apparently culling 4,500 trait descriptive terms from the second edition of Webster's dictionary (Goldberg, 1993). They considered current slang, such as "booster, rooter, knocker, hoodlum, climber, yes-man, four-flusher, crabber, cake-eater, chiseler, gigolo, flapper, racketeer, [and] Babbitt" (Allport & Odbert, 1936, p. 3), but most of these terms did not make the final list of "clearly 'real' traits of personality" (p. 26), albeit "knocker" did. Included within the final list, however, were auld-farrant, bibliomaniac, bloadshedder, boswellian, chesterfieldian, creepmouse, deipnosophistic, devil-dodger, soothfast, maungy, swashbuckling, supersubtle (there were 19 variations of super-), nothingarian, loppy, giggish, giant-rude, eleutheromaniac, hugger-mugger, hyppish, schoolmasterish, and jiggish (which mean, respectfully, wise beyond one's years, book-hoarder, murderer, companion and observer, elegant or urbane, shy, adept conversationalist, clergyman, truthful, whiny, heroic, very subtle, holds no beliefs, actively performing poorly, trifling, very rude, passionate for freedom, confused, rejecting conventional values, resembling a schoolmaster, and playful or frisky).

Allport and Odbert (1936) found the list frankly overwhelming, and could not do much with it. Thurstone (1934), an early pioneer of factor analysis, administered a substantially reduced list of 60 adjectives to 1,300

raters, and suggested that “the scientific description of personality may not be so hopelessly complex as it is sometimes thought to be” (p. 14). Well, maybe [Thurstone \(1934\)](#) was being overly optimistic. Anyone who reads [Allport and Odbert \(1936\)](#) will appreciate the hugger-bugger complexity of the task. Anyone reading the chapter by [de Raad and Mlačić](#) (this volume) will appreciate that perhaps little has changed with respect to this fact.

[De Raad and Mlačić](#) (this volume) suggest that only three domains of personality have true universal, cross-language lexical support: Extraversion, agreeableness, and conscientiousness ([De Raad et al., 2010](#)). This excludes not only honesty-humility of [Lee and Ashton \(2008\)](#), but also FFM openness and even neuroticism. [Ashton and Lee \(2010\)](#), however, responded in part by suggesting that [De Raad et al. \(2010\)](#) were imposing an arbitrarily high threshold for replication. It is only natural that support for replication will decrease with each new factor that is extracted. It wasn’t that there was virtually no support for replication beyond the first three factors. [Ashton and Lee \(2010\)](#) suggest that there was just relatively less support for an apparent replication of honesty–humility. “Small differences in the congruence coefficients of factors were interpreted by [De Raad et al. \(2010\)](#) as indicating large differences in factor replicability” ([Ashton & Lee, 2010](#), p. 436). To the extent that the arguments of [Ashton and Lee \(2010\)](#) are correct, this would also support the lexical validity of the FFM domains of neuroticism and openness. Perhaps the only question would then be whether it is valid or useful to extract an additional sixth factor, or leave honesty–humility within agreeableness.

Factor Analysis

Factor analysis is a highly useful analytic device ([Clark & Watson, 1995](#)). It is particularly useful for identifying the common variance among a set of measures, reducing them to a more manageable set of underlying factors, or, more theoretically, to identify a set of latent variables that provides a structural model that defines a set of manifest scales. As indicated by [Wright](#) (this volume), factor analysis has been a central tool in the development and validation of the FFM (e.g., see the chapters by [Costa and McCrae](#), by [O'Connor](#), and by [De Raad and Mlačić](#)). Nevertheless, factor analysis is not without its limitations (read [Lykken, 1971](#)). As acknowledged by [Clark and Watson \(1995\)](#), “put simply, factor analytic results provide information, not answers or solutions” (p. 314). Any single

factor analysis can be sorely misleading and far from conclusive (Schmitt, 2011). It is not at all unusual, for instance, to find a series of studies in which various laboratories have offered different factor analytic solutions for the same measure (Osborne & Fitzpatrick, 2012).

As Wright (this volume) indicates, two common problems of factor analysis complement one another: one is the insufficient representation for a potential factor and the other is providing an excessive representation for what is actually just a component of an existing factor. With respect to the first problem, if “one includes too few measures of a construct (e.g., a single openness scale), it is unlikely to emerge as a stand-alone factor, and instead these indicators may join another factor or be orphaned with low loadings on all factors” (Wright, this volume). The FFM will not emerge in a factor analysis if one of the domains lacks adequate representation relative to the other domains. Likewise, there can be an artifactual appearance of a sixth factor if a component of one of the FFM domains is represented excessively. This latter problem was first identified by Cattell and Tsujioka (1964), who coined this a “bloated specific factor.”

A bloated specific factor occurs when a trait that would normally be just a component of a larger higher-order domain is overrepresented by an excessive number of scales relative to other traits within that same domain. These scales will correlate more highly with one another than they will with the other scales from that same domain, and will then naturally bind together to form their own separate factor. As expressed by DeYoung, Grazioplene, and Peterson (2012), “if multiple measures of a single lower-level trait are present among the variables to be factor analyzed, their intercorrelations may be strong enough to cause them to form a separate factor, even when the other factors recovered are at a higher level of the trait hierarchy and one of them should subsume the lower-level trait in question” (p. 65). Wright (this volume) and DeYoung (2011) even suggest that it might be possible to separate a well-established facet, such as anxiousness, from the domain of neuroticism. There is little doubt that anxiousness is well understood as a facet of neuroticism (Costa & McCrae, 1992c, 1995; Goldberg, 1993; John et al., 2008; Mervielde, De Clercq, De Fruyt, & Van Leeuwen, 2005; O’Connor, 2002). Perhaps if multiple scales of anxiousness were included within a factor analysis of FFM neuroticism scales, the anxiousness scales would tightly bind together to form a separate

factor, as if anxiousness is a higher order construct distinct from neuroticism and comparable to extraversion and agreeableness.

Consider what would happen if one included 10 scales measuring different types of anxiety in a factor analysis with the 30 facets of the Big Five measured by the NEO PI-R. One would be likely to find a sixth factor for anxiety, in addition to the usual Neuroticism factor encompassing traits like depression, vulnerability, and self-consciousness. This would be considered a bloated specific factor because the location of anxiety as a lower-level trait within Neuroticism is well established (John et al., 2008, Markon et al., 2005).

(DeYoung, 2011, p. 718)

Berghuis, Kamphuis, and Verheul (2012) administered the 19 scales of the General Assessment of Personality Disorders (GAPD; Livesley, 2006), the 16 scales from the Severity Indices for Personality Problems (SIPP-118; Verheul et al., 2008), and the 30 facet scales of the NEO PI-R (Costa & McCrae, 1992c) to a joint factor analysis. The GAPD includes 15 scales that assess for different forms of self-pathology and four scales that assess for different forms of interpersonal dysfunction. The SIPP-118 includes four additional scales of self-pathology. Berghuis et al. (2012) submitted the correlations among these scales to a factor analysis that yielded seven factors. The NEO PI-R scales loaded substantially on and helped to define six of the seven factors. Only the first factor was not well defined in large part by multiple NEO PI-R scales. This first factor was confined to 19 scales of self-pathology (15 from the GAPD and four from the SIPP-118). Berghuis et al. (2012) concluded that the core components of personality disorder (i.e., self-pathology) and the FFM formed “clearly distinct components of personality” (Berghuis et al., 2012, p. 704).

Oltmanns and Widiger (in press), however, suggested that the factor analysis of Berghuis et al. (2012) demonstrated an instance of a bloated specific factor. The 15 GAPD scales assess alternative forms of self-pathology, such as lack of self-clarity, self-state disjunctions, fragmentary self-other representations, defective sense of self, and poorly differentiated images of others, constructs (and scales) that are highly correlated with one another. However, self-pathology can be understood as a component of neuroticism (i.e., maladaptive view of the self or self-image). Indeed, self-pathology scales correlate substantially with neuroticism (DeShong et al., 2015; Mullins-Sweatt et al., 2012). The NEO PI-R includes only six scales per domain, and these scales (e.g., Angry Hostility, Self-Consciousness, and

Vulnerability) would not correlate with one another to the same extent as the self-pathology scales. Across two independent samples and two different measures of the FFM, Oltmanns and Widiger (in press) reported that deficits in the sense of self separated from neuroticism when all 15 GAPD scales of self-pathology were included. However, self-pathology loaded with FFM neuroticism when only a subset of the GAPD self-pathology scales was included. They further demonstrated the bloated specific factor phenomenon by even separating social withdrawal scales from introversion and, as suggested by DeYoung (2011), anxiousness from neuroticism, through an excessive representation of these facets of introversion and neuroticism, respectively.

Wright (this volume) suggests that the joint factor analysis of FFM scales along with measures of schizotypy and dissociation by Watson, Clark, and Chmielewski (2008) represented another instance of a bloated specific factor. Watson et al. (2008) reported a separation of schizotypy and dissociation from FFM openness, concluding that schizotypal traits (e.g., cognitive–perceptual aberrations) lie outside of the FFM. However, as stated by Wright (this volume), “In each of their analyses it could be argued that they over-saturated their models with scales related to schizotypy/oddity, which may have served to virtually guarantee that a separate factor would emerge for schizotypy/oddity.” For example, Watson et al. (2008) administered 10 scales assessing the domains of the FFM (two for each domain), four alternative measures of dissociation, and nine scales assessing different features of schizotypal personality disorder. In another factor analysis they included five alternative measures of dissociation. In both cases the schizotypal and dissociation scales formed their own distinct factor, separate from openness (and other domains of the FFM). It is perhaps not surprising that multiple measures of a maladaptive variant of a specific facet of openness would bind together to form a factor separate from the normal variants of openness.

Childhood and Adolescence

There was a period of time when an assessment of personality in childhood and adolescence was discouraged. Personality is generally understood to be the result of the interaction of innate temperament with environment, and the presumption was that the result of this interaction would not be fully settled until perhaps young adulthood.

However, as demonstrated well by [De Pauw](#) (this volume), those days are now largely gone. Personality traits are readily evident in childhood. The classification of personality disorder by the [APA \(2013\)](#), and even psychopathology more generally, has not been so well-informed. The APA diagnostic manual has long included a section devoted to the diagnosis of childhood disorders, distinct from the disorders seen within adults. This distinction grew out of the historical context of clinical specialization, wherein some clinicians devote their practice and research to disorders of childhood and an entirely separate group of clinicians and researchers will focus on disorders of adulthood. There has typically been little communication or perhaps even much awareness across these disciplines ([Frances, First, & Pincus, 1995](#)). This specialization has contributed to an arbitrary bifurcation in the conceptualization and classification of mental disorders across developmental stages, further hampering the study of the longitudinal course of psychopathology ([Pine et al., 2002](#)). One of the odd aspects of this bifurcation is that once a child became an adult, she or he might no longer have a mental disorder simply because it was not actually recognized in adulthood, such as attention deficit hyperactivity disorder. Some disorders of childhood are indeed primarily a concern, disruption, or trouble for the adults interacting with that child. Once the person is able to determine whether she or he considers it to be a significant problem, she or he does not seek treatment. Oppositional defiant might be such an example (it used to be speculated that oppositional defiant disorder in some cases grew up to become a passive-aggressive personality disorder; [APA, 1980](#)).

In other cases, the childhood diagnosis might switch to a different diagnosis of adulthood, as if the disorder somehow, suddenly changed at the age of 18 years, such as avoidant disorder of childhood becoming avoidant personality disorder in adulthood, identity disturbance of adolescence becoming borderline personality disorder, or conduct disorder becoming antisocial personality disorder ([APA, 1980](#)). The authors of *DSM-IV* ([APA, 1994](#)) worked toward a more unified classification, in some instances breaking down the arbitrary boundary between childhood and adulthood to achieve a more developmentally informed, lifespan perspective ([Frances et al., 1995](#)). One example included the decision to subsume the *DSM-III-R* ([APA, 1987](#)) “childhood” diagnosis of overanxious disorder within the more general diagnoses of generalized anxiety disorder ([Klein, Tancer, & Werry, 1997](#)). Rather than suggest that overanxious disorder of childhood

changes to a new disorder upon reaching the age of 18 years, *DSM-IV* (APA, 1994) indicated that the same disorder can be present across the lifespan but varies in its expression due to differences in age and developmental context (Shaffer, Widiger, & Pincus, 1998). Regrettably, however, avoidant disorder of childhood did not become a childhood variant of avoidant personality disorder (as conduct disorder is a childhood variant of antisocial); it was annexed instead by the anxiety disorders work group as a childhood variant of generalized social phobia.

The stark independence of the child and adult research fields has contributed to a lack of knowledge of the childhood antecedents of some disorders, particularly the personality disorders (Cohen & Crawford, 2005; De Fruyt & De Clercq, 2013; Widiger, De Clercq, & De Fruyt, 2009). The one exception was the empirical support for conduct disorder as the childhood variant of antisocial personality disorder (Robins, 1978). In addition, advances in one domain went essentially unknown to the other. One of the more productive and influential shifts in the classification of adult psychopathology has been the recognition of the cross-cutting domains of internalization and externalization (Krueger & Markon, 2006) that had been identified by Achenbach (1966) many years ago within childhood psychopathology.

De Pauw (this volume) though provides “a plea for the study of child personality traits in its own right, rather than assuming that child personality taxonomies are identical to those established in adults.” This is perhaps somewhat analogous to the interplay and/or tension between etic and emic cross-cultural research (Cheung et al., 2011; Pike, 1954). It should not be at all surprising to find that the Big Five does not immediately or suddenly appear in infancy. A more developmental perspective for its emergence is necessary, both with respect to the number and nature of the primary domains. In particular De Pauw (this volume) cites the study by Soto and John (2014). Soto and John suggested that children’s personality might be better described in terms of six dimensions, with activity split off as an independent domain, with the Big Five structure becoming more clearly evident from ages 15 to 18–20 years. Similarly, Caspi, Roberts, and Shiner (2005) suggest that openness to experience may begin to develop early in life, but due to ongoing cognitive development, its conceptual core may shift from exploration of the physical world to an intellectual curiosity and imagination by middle childhood and early adolescence. “Hence,

openness in young children would not only be defined by cognitive characteristics (e.g., imagination, creativity), but also by aspects of motor activity and physical exploration” ([De Pauw](#), this volume).

Animal Personality

Very few individual differences might be imagined among fruit flies. Every one I have known has seemed to be pretty much the same one. In fact, it would be difficult for me to even classify the species as a whole in terms of the FFM, let alone notice any meaningful differences among them, other than finding them to be tremendously annoying flying around my line of vision when I type. [Gosling \(2008\)](#), however, readily distinguished two fruit flies in particular. Frank was an aggressive fruit fly, pushing, punching, and kicking other fruit flies, whereas Fred, in stark contrast, was clearly quite timid.

Consider, as well, sloths. When placing these adorable, seemingly docile animals within the FFM dimensions, we might think of them as being low in neuroticism (not fearful, emotionally reactive, or excitable), low in extraversion (i.e., they live alone and appear to lack much surgency, sociability, energy, vivacity), low in openness (not especially exploratory), high in agreeableness (affability, affection, social closeness), and low in conscientiousness (lack of attention and goal directedness, erratic, unpredictable, disorganized). However, these impressions are based largely on a cross-species perspective, that is, relative to us. Although there is little research on the traits of sloths, let alone FFM personality profiles for sloths, there is evidence to suggest that, as hypothesized, sloths are indeed solitary animals, traveling through trees either alone or with just an infant family member, as well as perhaps being low in openness as they are unlikely to go out exploring (although this can be blamed on the fact that their maximum speed is 6 feet per minute). However, inconsistent with expectations, there is also evidence to suggest that sloths are aggressive and willing to fight predators when danger is present and perhaps pose higher levels of conscientiousness, which can be seen in their attention to detail and goal directedness surrounding their ritualistic bathroom habits. Most importantly, when considered in their own right, from a more emic view, we will in fact observe a considerable amount of individual differences among the sloths with respect to (for instance) their neuroticism, agreeableness, and introversion.

The study of animal personality is indeed a rapidly growing line of investigation. There was at one time some resistance to any such research ([Gosling, 2008](#)). [Weiss and Gartner](#) (this volume) also refer to a period of decline that was shared with human personality research. However, it is now becoming readily apparent that there is much to be gained from studying personality within other species. As [Weiss and Gartner](#) (this volume) suggest, “studies of animal personality and outcomes related to welfare, psychopathology, and psychological needs could be used to better understand these associations in humans.” There are clearly many potential advantages of addressing questions regarding the impact and importance of personality functioning in animals, including (for instance) greater experimental control, better access to physiological parameters, increased opportunity for naturalistic observations, and accelerated lifespan allowing for productive longitudinal research ([Gosling, 2008](#)).

For the construct validity of the FFM, animal personality research provides fairly strong arguments for its universality. [Weiss and Gartner](#) (this volume) note how the etic and emic principles and issues that pervade the discussion of cross-cultural research apply as well to cross-species research. If cross-cultural research is thought to be complicated, imagine the effort to research the same traits and structure across species. It can indeed be quite difficult to translate the expression or meaning of a behavior from one species to another. Equally important, although the pole of one domain may predominate within a particular species, we will also observe considerable individual differences that are quite meaningful within that species but are not readily apparent to the human who sees only the one forest rather than the individually different trees.

Genetics

“The study of behavior and molecular genetics can help us examine where personality traits come from, how they develop, and how they change over time” ([Jarnecke and South](#), this volume). Where they came from is clear: genetics. Why they came is not so clear. Yet, if one considers the five domains of the FFM, perhaps it is understandable ([Nettle, 2006](#)). The five domains of the FFM do appear to represent the primary domains of personality functioning, covering exhaustively the most important traits for describing oneself and others ([Goldberg, 1993](#)).

The five broad domains in their order of typical extraction and size from English and other languages are extraversion, agreeableness, conscientiousness, emotional instability, and openness (or unconventionality). In other words, the first two relatively largest domains concern a person's manner of interpersonal relatedness. It is to be expected that the domains of personality functioning considered to be relatively most important to persons across cultures and languages when describing themselves and other persons would concern how persons relate to one another. All manner of interpersonal relatedness is contained within the FFM domains of agreeableness and extraversion, and how the members of a society, country, culture, or tribe relate to one another would naturally be of primary importance to most everyone.

The third domain of personality extracted from all languages is conscientiousness (otherwise known as constraint). This domain concerns the control and regulation of behavior, and contrasts being disciplined, compulsive, dutiful, conscientious, deliberate, workaholic, and achievement-oriented, with being carefree, irresponsible, lax, impulsive, spontaneous, disinhibited, negligent, and hedonistic ([Jackson and Roberts](#), this volume). It is again perhaps self-evident that all cultures would consider it to be important to describe the extent to which its members are responsible, conscientious, competent, and diligent as a mate, parent, friend, employee, soldier, or colleague (versus being negligent, lax, disinhibited, and impulsive).

The fourth domain, emotional instability, albeit not as important or as large as the first three, and perhaps not as reliably or consistently defined ([De Raad et al., 2010](#)), is certainly of considerable importance (as noted earlier) in the fields of clinical psychology and psychiatry, saturating most measures of personality disorder and psychopathology more generally ([Lahey, 2009; Widiger, 2009](#); see also the chapter by [Tackett and Lahey](#)). It would again not be surprising that most, and perhaps all, cultures consider the emotional stability (anxiousness, depressiveness, irritability, volatility, anger, and vulnerability) of its partners, children, friends, workers, laborers, and employees to be of considerable importance.

The fifth domain, openness, intellect, or unconventionality, reflects a culture or society's interest in creativity, intellect, and imagination, contrasting being open-minded, unusual, odd, weird, creative, peculiar, and unconventional with being closed-minded, practical, conventional, and

rigid. Cognitive, intellectual, and creative growth, the advancement and expansion of knowledge, and the drive for curiosity, investigation, and inquisitiveness are all dependent upon this domain (see also the chapter by [Sutin](#)). It is very difficult to imagine a society, culture, or tribe progressing without this domain, nor a model of personality structure.

Additionally, as suggested by [O'Connor](#) (this volume), the “consistent power and effectiveness of the FFM in capturing the dimensions that exist in other measures, as reviewed [within his chapter], makes it difficult to imagine that additional dimensions have been missed all of this time.” It is frankly difficult to find an important trait that lies outside of these five domains. The five domains do appear to be reasonably comprehensive in their coverage ([Funder, 2001](#); [Goldberg, 1993](#); [John et al., 2008](#); [McCrae & Costa, 2003](#); [Ozer & Reise, 1994](#)). [Ozer and Reise \(1994\)](#) and [Goldberg \(1993\)](#) even likened the domains of the FFM to the coordinates of latitude and longitude that cartographers use to map the world, suggesting that the FFM might be similarly useful in comparing and contrasting all personality measures and all of the important personality trait constructs with respect to their relative saturation of the five fundamental personality traits.

There is, of course, tremendous variability across persons within each domain, considerable variations among the traits within the same domain, and substantial interstitial presence in between the domains. The genetics of this hierarchical dimensional trait model is unlikely to be simple, as indicated well by [Jarnecke and South](#) (this volume). Nevertheless, this structure is clearly more coherent genetically than comparable or competing models. As noted earlier, [Yamagata et al. \(2006\)](#) demonstrated that “the phenotypic structure of the FFM as assessed by the NEO-PI-R is reflective of an underlying genetic structure and whether the genetic structure is universal across populations from Canada, Germany, and Japan” (p. 994), “suggesting that the FFM may represent the common heritage of the human species” (p. 996). Their final conclusion might be a bit strong (see also the chapter by [Jarnecke and South](#)), but no such comparable support would likely be obtained for the international classification of maladaptive personality structure provided by the World Health Organization’s ([WHO, 1992](#)) International Classification of Diseases (ICD-10), or the *DSM-IV* (now *DSM-5*; [APA, 2013](#)).

[Distel et al. \(2009\)](#) examined the phenotypic and genetic association between borderline personality and FFM personality traits in 4,403

monozygotic twins, 4,425 dizygotic twins, and 1,661 siblings from 6,140 Dutch, Belgian, and Australian families. Multivariate genetic analyses indicated that the genetic factors that influenced individual differences in neuroticism, agreeableness, conscientiousness, and extraversion accounted for all of the genetic liability for borderline personality (albeit unique environmental effects were not completely shared with the FFM traits). This is a fairly compelling argument that *DSM-IV* (now *DSM-5*) borderline personality disorder can be understood as maladaptive variants of the FFM domains. It would be of interest to conduct comparable twin studies concerning the antisocial, narcissistic, obsessive-compulsive, and avoidant personality disorders. I would predict much less success though for the schizotypal personality disorder, given how openness is conceptualized and assessed by the NEO PI-R ([Gore & Widiger, 2013](#)) and the genetic association of schizotypal personality disorder with schizophrenia ([Kwapil & Barrantes-Vidal, 2012](#)).

Neuroscience

The goal of personality neuroscience is to identify the neurobiological systems and substrates of respective personality traits. [Allen and DeYoung](#) (this volume) review more specifically the neuroscience research concerning FFM traits, including the available methods, such as neuroimaging techniques, electrophysiological techniques, molecular genetics, psychopharmacological manipulation, and assays of endogenous psychoactive substances. Allen and DeYoung highlight pitfalls and best practices in personality neuroscience, emphasizing the importance of theoretically informed neuroscience by framing results in light of a theory of the psychological functions underlying each of the Big Five. Emphasis was given in particular to the theoretical model of the authors, which is certainly quite appropriate given that they are arguably the leading investigators of personality neuroscience ([DeYoung, 2010, 2015](#); [DeYoung & Gray, 2009](#)).

The chapter by [Allen and DeYoung](#) is also quite timely, to say the least. The National Institute of Mental Health (NIMH) has made it clear that the institute is not very interested in funding studies concerned with the *DSM-5* diagnoses. “It is critical to realize that we cannot succeed if we use *DSM* categories” ([Insel, 2013](#)). This would, of course, include the *DSM-5* personality disorders. NIMH has developed its own diagnostic system,

called the Research Domain Criteria (RDoC; [Sanislow et al., 2010](#)). The RDoC consists of five broad domains: negative valence systems, positive valence systems, cognitive systems, systems for social processes, and arousal/modulatory systems. More importantly, perhaps, NIMH would clearly prefer that any such studies embrace a cognitive neuroscience perspective. “Mental disorders can be addressed as disorders of brain circuits” ([Insel et al., 2010](#), p. 749). “The primary focus of RDoC is on neural circuitry, with levels of analysis progressing in one of two directions: upwards from measures of circuitry function to clinically relevant variation, or downwards to the genetic and molecular/cellular factors that ultimately influence such function” ([Insel et al., 2010](#), p. 749). “The first step is to inventory the fundamental, primary behavioral functions that the brain has evolved to carry out, and to specify the neural systems that are primarily responsible for implementing these functions” ([Cuthbert & Insel, 2013](#), p. 4).

There is arguably a strong alignment of the domains of the FFM with the RDoC ([Widiger, 2012](#)). RDoC negative valence (i.e., anxiety, fear, threat) clearly aligns well with FFM neuroticism. Positive valence (reward, approach) aligns well with FFM extraversion, as positive affectivity is the driving temperament for extraversion ([Clark & Watson, 2008](#)). Social processes align with FFM agreeableness (versus antagonism) and introversion (versus extraversion), as these are the two fundamental domains of all manner of interpersonal relatedness. The RDoC domain of cognitive systems would include the psychoticism of *DSM-5*, which aligns with FFM openness (otherwise known as intellect). RDoC arousal regulatory systems align with FFM conscientiousness (*DSM-5* low disinhibition), as this domain concerns regulatory constraint ([Clark & Watson, 2008](#)).

The alignment of RDoC with the FFM is perhaps a stretch in one or two cases. The RDoC domain of cognitive systems concerns attention, perception, working memory, declarative memory, and language behavior. The cognitive and perceptual processes and mechanisms included within this domain go beyond the individual differences in intellect (cognition and perception) covered within the domain of openness and, of course, does not even necessarily concern personality traits. Likewise, the RDoC domain of arousal, involving biological rhythms and the sleep–wake cycle, may have nothing to do with constraint or conscientiousness. Being entirely and

precisely aligned with RDoC would actually be a rather surprising coincidence. The authors of the RDoC clearly had no interest or intention of aligning their classification system with a model of personality. Nevertheless, the alignment that does exist is rather striking. The FFM would certainly appear to be more commensurate with the NIMH RDoC perspective than the *DSM-IV* (now *DSM-5*) personality disorders, and the chapter by [Allen and DeYoung](#) provides a conceptualization that NIMH should find very encouraging and intriguing.

Application

There is a wide range of potential and actual applications of the FFM. The FFM is not just a scholarly academic model of personality structure. FFM personality traits have been associated with a wide array of consequential life outcomes and real world applications. Included within this section was a consideration of its assessment, its application to business and industry, health psychology, marital and family therapy, the conceptualization of personality disorders, adult psychopathology, child psychopathology, and clinical utility. Each of these chapters will be discussed briefly in turn.

Assessment

A testament to the significance of the FFM is simply the sheer number of alternative measures that have been developed for its assessment. [Widiger and Trull, back in 1997](#), devoted a review paper within a special section of the *Journal of Personality Assessment* precisely to this topic. They indicated that “the FFM has become so compelling that a variety of instruments [for its assessment] have been developed, and many existing instruments have been modified to assess the FFM” ([Widiger & Trull, 1997](#), p. 230). They noted that they could not cover all of the relevant measures as space limitations would be prohibitive and therefore they confined their “review (perhaps appropriately) [to] five alternative instruments: the [Goldberg \(1992\)](#) Big Five Markers, the Interpersonal Adjective Scales-Big Five (IASR-B5; [Trapnell & Wiggins, 1990](#)), the NEO Personality Inventory-Revised (NEO PI-R; [Costa & McCrae, 1992c](#)), the Personality Psychopathology-Five (PSY-5; [Harkness & McNulty, 1994](#)), and the Hogan Personality Inventory (HPI; [Hogan, 1986](#); [Hogan & Hogan, 1992](#))”

(Widiger & Trull, 1997, p. 230). Subsequently, De Raad and Perugini (2002) devoted an entire book to this topic, including many additional measures, such as the Hierarchical Personality Inventory for Children (Mervielde & De Fruyt, 2002), the Structured Interview for the Five Factor Model (Trull & Widiger, 2002), the Global Personality Inventory (Schmit, Kihm, & Robie, 2002), the Big Five Marker Scales (Perugini & Di Blas, 2002), and the Zuckerman–Kuhlman Personality Questionnaire (Zuckerman, 2002). There have been quite a few more instruments since then (Samuel, 2013), covered well in the chapter by Simms, Williams, and Simms (this volume).

Simms et al. (this volume) also consider the development of measures of maladaptive variants of the FFM. They identify a number of such measures, including the Five Factor Form (FFF; Rojas & Widiger, 2014). They consider in particular the Personality Inventory for *DSM-5* (PID-5; Krueger et al., 2012) and the Computerized Adaptive Test-Personality Disorder (CAT-PD; Simms et al., 2011). Worth recognizing as well, perhaps, are eight Five Factor Model Personality Disorder (FFMPD) scales (Lynam, 2012; Widiger, Lynam, Miller, & Oltmanns, 2012). Many of the FFMPD scales align closely with scales from the CAT-PD (Simms et al., 2011) and the PID-5 (Krueger et al., 2012) as well as the Dimensional Assessment of Personality Pathology-Basic Questionnaire (Livesley & Jackson, 2009) and the Schedule for Nonadaptive and Adaptive Personality-2 (Clark, Simms, Wu, & Casillas, in press). Crego and Widiger (in press) reported the results of joint factor analyses of the CAT-PD, PID-5, and selected FFMPD scales. As they indicated, “these measures were constructed with different rationales and methods, yet the end result was highly congruent.”

Indeed, the FFMPD scales were explicitly developed to be measures of maladaptive variants of the FFM (Lynam, 2012). The scales within these FFMPD inventories are aligned not only with particular domains of the FFM, but as well with the more specific facets, such as Workaholism aligning with the facet of achievement-striving from FFM conscientiousness (Samuel, Riddell, Lynam, Miller, & Widiger, 2012), Rashness aligning with low deliberation from FFM conscientiousness (Mullins-Sweatt et al., 2012), Gullibility aligning with the facet of trust from FFM agreeableness (Gore, Presnall, Lynam, Miller, & Widiger, 2012), Exploitative aligning with the facet of low altruism from FFM agreeableness (Glover, Miller, Lynam, Crego, & Widiger, 2012), Attention-

Seeking with the facet of gregariousness from FFM extraversion ([Tomiatti, Gore, Lynam, Miller, & Widiger, 2012](#)), and Social Withdrawal with the facet of low gregariousness from the domain of FFM extraversion ([Edmundson, Lynam, Miller, Gore, & Widiger, 2011](#)). Over 100 such scales have been developed and validated (see also the chapter by [Widiger, Gore, Crego, Rojas, and Oltmanns](#), for further description). All of the scales from all eight of the FFMPD instruments have been validated as measures of their respective FFM domains, as well as the underlying facets (e.g., [Edmundson et al., 2011](#); [Glover et al., 2012](#); [Gore et al., 2012](#); [Lynam et al., 2011](#); [Mullins-Sweatt et al., 2012](#); [Samuel et al., 2012](#); [Tomiatti et al., 2012](#)).

The FFMPD inventories have a number of scales for maladaptive variants of extraversion, conscientiousness, and agreeableness (as well as for high and low openness, and even for low neuroticism; [Widiger et al., 2012](#)). It is important to note that the FFMPD scales are not alone in the representation of maladaptive variants of both poles of the FFM. For instance, the CAT-PD ([Simms et al., 2011](#)) has three scales for maladaptive conscientiousness (i.e., Perfectionism, Rigidity, and Workaholism), and one scale, Exhibitionism, for maladaptive extraversion ([Wright & Simms, 2014](#)).

Business and Industry

[Seibert and De Geest](#) (this volume) document well the productive application of the FFM within business and industry. As they indicate, the initial consideration of personality traits in industrial–organizational psychology, human resource management, and organizational behavior was overly optimistic, and the pendulum eventually swung back in the other direction to excessive pessimism when the initial high expectations were not met. However, “through the decline and the resurgence [of the interest in personality traits], the Five Factor Model has predominated as an integrative personality structure for conceptualizing and researching the potential importance of personality traits for optimal and/or problematic performance” ([Seibert and De Geest](#), this volume). Seibert and De Geest focus on three particular issues: the validity of personality variables as predictors of important attitudes, behaviors, and outcomes; generalization across situations; and bandwidth—fidelity.

Another potential line of investigation is the assessment of maladaptive variants of the FFM that would be of particular relevance to business and industry. As indicated in the chapter by Simms, Williams, and Simms (this volume), considerable attention is currently being given to the development of scales to assess maladaptive variants of the FFM. As noted earlier, these instruments include (but are not limited to) the PID-5 (Krueger et al., 2012), the CAT-PD (Simms et al., 2011), and the FFMPD scales (Lynam, 2012; Widiger et al., 2012). The selection of these scales for these instruments was governed largely by their potential application within clinical psychology. It is quite possible that these selected scales would have a relevance comparable to the assessment of maladaptive personality functioning within business and industry, but also possibly not.

One of the more commonly used FFM measures in business and industry is the HPI (Hogan & Hogan, 1992, 2002). The HPI is a well validated measure that converges with other measures of the FFM, although with some important differences, due in part to Hogan's socioanalytic model of personality but also out of an interest to be slanted toward traits of particular relevance to business, including primary scales such as Ambition, Prudence, Inquisitive, and Learning Approach, and subscales such as Competitive, Leadership, No Social Anxiety, Entertaining, Easy to Live With, Likes People, No Hostility, Science Ability, and Generates Ideas. The same rationale could also be made for a selection of scales to assess maladaptive variants for optimal use in business and industry.

There is also though some reluctance to assess for maladaptive traits within business employees due in part to the stigma and pejorative stereotyping that such labeling could entail. Hogan and Hogan (1997) in fact developed the Hogan Developmental Survey (HDS) as a means to assess *DSM-IV-TR* personality disorders within employees in a manner that appeared to be more complimentary than critical (Furnham, Milner, Akhtar, & De Fruyt 2014). The instrument is explicitly intended to assess "dark side" personality traits, while at the same time suggesting that they emerge only when under stress. Each personality disorder is also retitled in a manner that conveyed a positive personality expression: borderline is renamed excitable, paranoid becomes skeptical, schizoid is just reserved, histrionic is actually colorful, the narcissistic is bold, and schizotypal becomes imaginative. Even antisocial personality disorder is conveyed in a positive manner, with its scale titled Mischievous. The items within the

respective scales assess for these adaptive, positive variants of each personality disorder. It would then, in theory, be possible to assess for the *DSM-IV-TR* personality disorders in a nonpejorative manner. It is perhaps reasonable to question whether the personality disorders can be validly assessed when they involve socially desirable, adaptive traits, but research has provided support for the validity of the HPS (e.g., De Fruyt et al., 2009; Furnham & Crump, 2005; Furnham, Trickey, & Hyde, 2012; Rolland & de Fruyt, 2003).

In addition, it is reasonable to question whether the *DSM-IV-TR* personality disorders would provide the optimal constructs for maladaptive personality functioning within business and industry. There is certainly a good deal of interest in the recognition and assessment of psychopathy in business (Babiak & Hare, 2006), but it is perhaps questionable whether there would be a comparable interest in assessing, for instance, the schizotypal personality disorder. The *DSM* personality disorder nomenclature would likely be much different if it was authored by experts identifying the most problematic personality syndromes within business and industry.

The HPI does assess for some maladaptive personality traits (such as the troublemaker, or having narrow interests). However, for a measure developed to provide an assessment at the facet level of maladaptive traits at the workplace, there should probably be a particularly heavy representation of traits from high and low conscientiousness. The *DSM-IV-TR* personality syndromes are weighted heavily in favor of traits from neuroticism (Lynam & Widiger, 2001), as neuroticism pervades clinical practice (Widiger, 2009). In contrast, as indicated by Seibert and De Geest (this volume), conscientiousness is the domain of personality that is of most relevance to success and failure at the workplace. Therefore, it would seem natural that a measure of maladaptive personality traits for the workplace (comparable to the PID-5, SNAP-2, and/or FFMPD scales) would include a particular emphasis on scales assessing maladaptively high and low conscientiousness.

Health Psychology

Kern and Friedman (this volume) provide an outstanding review of the research on the presence, importance, and mechanisms of the relationship of personality to physical health. As they demonstrated well, “the five

factor approach has shown excellent utility for understanding health, including physical and mental health, longevity, cognitive function, social competence, and productivity” ([Kern and Friedman](#), this volume). They emphasize in particular the importance of obtaining longitudinal data across persons’ lives. “Much of our existing knowledge of life course personality-health associations stem from longitudinal data—extensive data gathered prospectively across time documenting people’s lives” ([Kern and Friedman](#), this volume). This research should begin early in a person’s life, childhood and/or adolescence, and then followed well into adulthood and even older age. Of course, no researchers could ever conduct such a study, unless they began when they were children, or managed to live past much of the lives of their oldest participants.

One study that Kern and Friedman referred to in particular was the results of [Friedman et al. \(1993\)](#). This study is worth describing in some detail, as it was so creative, interesting, and informative. [Friedman and colleagues \(1993\)](#) obtained raw data from the Terman Life-Cycle Study of children, beginning in 1921–1922. Terman began with 1,500 bright male and female children (age 11 years) and continued to assess them every 5 to 10 years. The sample was fairly homogeneous (i.e., bright, mostly white and mostly middle-class). The sample was at times referred to as a longitudinal study of budding geniuses, but this did not turn out to be the case. The sample though was certainly bright. Approximately 70% became college educated, and many were business persons, physicians, lawyers, teachers, scientists, and writers. Despite the apparent homogeneity, the restriction in range was not so severe as to prohibit meaningful results. By the time [Friedman and colleagues \(1993\)](#) considered these data, the longitudinal information was quite wealthy with respect to the prediction of longevity. Indeed, the fact that meaningfully significant results were obtained despite the restriction in range is perhaps itself a testament to the strength of the results.

In 1922, a participant’s parent provided personality ratings of his or her child (age 11 years) on 25 trait dimensions. There were also a few additional questions that were scored for personality. “We endeavored to select personality variables that basic theory and research have shown are reliable and theoretically meaningful-dimensions that appear in the Big Five factors of personality” ([Friedman et al., 1993](#), p. 177). More specifically, they developed proxy scales for extraversion, conscientiousness, and

neuroticism. Sadly, there was insufficient information to score for agreeableness or openness. In any case, the findings demonstrated that even when controlling for other obvious predictors, “conscientiousness in childhood was clearly related to survival in middle to old age” (Friedman et al., 1993, p. 176), the potential mechanisms for which are discussed in the chapter by Kern and Friedman (see also the chapter by Jackson and Roberts).

The success of their study inspired researchers to seek other treasure troves of long-forgotten personality data. Imagine obtaining access to original Woodworth (1919, 1920) Personal Data Sheet results, although that would perhaps be confined largely to neuroticism. Even better would be Bernreuter (1931) personality data, or perhaps original MMPI (Hathaway & McKinley, 1943) findings, although the latter would not likely have much representation of conscientiousness (Costa, Busch, Zonderman, & McCrae, 1986; Costa et al., 1985; Han, Weed, & McNeal, 1996). Nevertheless, a clear strength of the FFM is its robustness across alternative personality measures and models, with most any instrument readily rescored with respect to the heavily researched FFM domains (O'Connor, 2002, 2005).

An additional focus of discussion within this chapter was the construct of the Type A personality. The Type A personality was first described as a potential risk factor for heart disease in the 1950s by the cardiologists Meyer Friedman and Ray Rosenman. Type A persons were described as having personality traits such as excessive competitiveness, time urgency (impatience), and angry hostility. As indicated by Kern and Friedman (this volume), “Although early health psychology research focused on Type A behavior and related domains of hostility, over the past two decades the Five Factor Model (FFM) has become the dominant organizing framework for integrating studies of personality and health (Smith & Williams, 1992).”

Although the original syndrome has not held up well, with perhaps angry hostility being the driving force behind the health risk, it is perhaps remarkable that never in the history of the APA diagnostic manual, from *DSM-III* through *DSM-III-R*, *DSM-IV*, and up to *DSM-5*, has there ever been even a proposal to consider including Type A within the personality disorders section. This is surprising and perhaps quite regrettable. Here was a personality syndrome with strong empirical support for quite important life health implications, yet it has largely been ignored within the personality disorder field. The inclusion of such a syndrome within the

personality disorders section would have provided a degree of credibility across the entire domain of medicine for the importance of considering personality disorders. This was an opportunity that was perhaps sorely missed.

However, with the shift toward a dimensional trait model, the potential for the diagnostic manual to have an impact across medicine might become truly realized. The FFM ([Costa & McCrae, 1992c](#)) and the *DSM-5* ([Krueger et al., 2012](#)) dimensional trait models both include a scale for angry hostility, as well as for other traits of the Type A personality syndrome. This has long been one of the advantages of a dimensional trait model, the FFM in particular, being able to construct new, clinically useful syndromes out of the building blocks of the reasonably comprehensive FFM lexicon ([Widiger & Costa, 2012](#); [Widiger et al., 1994](#)). There are indeed many other maladaptive traits that could be described, such as alexithymia ([Taylor & Bagby, 2013](#)), racism ([Flynn, 2005](#)), and the depressive personality ([Bagby, Watson, & Ryder, 2013](#)).

Couple's Therapy and Crossover Analysis

The chapter by [Piedmont and Rodgerson](#) (this volume) describes the application of FFM personality description for couple's therapy, more specifically, for crossover analysis. Crossover analysis concerns a comparison of each person's self-description with the description provided by the spouse. The essence of a crossover analysis is identifying those points of discrepancy across self and spouse. The areas of disagreement identify potential points of conflict, or at least identify and clarify how the couple may have an inaccurate view of themselves and their spouse within the relationship. The FFM thereby offers an interesting basis for a couple's therapeutic analysis and intervention.

I think one of the more interesting illustrations of crossover analysis was provided by [Costa and Piedmont \(2003\)](#) in their interpretation of the NEO PI-R profile of Madeline G., a case study presented in the engaging text of [Wiggins \(2003\)](#). Wiggins wrote a text on what he considered to be the five basic paradigms of personality assessment (i.e., psychodynamic, interpersonal, personological, multivariate, and empirical). Anyone familiar with personality assessment must be familiar with the seminal and highly influential contributions of Wiggins (e.g., [Wiggins, 1973](#)) and his 2003 text is also a delight to read. To illustrate each paradigm Wiggins invited experts

for each paradigm to provide an assessment of the same person, Madeline G. Madeline was a very engaging, inspirational, colorful, and intriguing woman. At the time of the assessments, she was a civil rights lawyer newly employed in a prestigious law firm. She was currently living with her common-law husband, in what she felt was a very successful and satisfying relationship for the both of them, or so she thought.

Madeline completed the NEO PI-R, as did her husband, describing her. What was immediately evident was the sharp discrepancy in their FFM profiles of Madeline. Madeline described herself in a very positive light, whereas her husband, not so much. Whereas she described herself as being high in trust and altruism, her husband described her as being very low (they both agreed that she was very low in straightforwardness, compliance, and modesty). Whereas she described herself as being high in warmth, he described her as very low (they both agreed she was high to very high in gregariousness, assertiveness, and excitement-seeking). Whereas she described herself as being high to very high in competence, dutifulness, self-discipline, and deliberation, he described her as being low to very low on each of these facets of conscientiousness (they agreed that she was high to very high in achievement-striving). These sharp discrepancies did not bode well for a successful relationship, and if her husband was correct, did not bode well for Madeline.

Wiggins' text was delayed in its publication, at least 3 years since the assessments were conducted. In that time, a lot changed in Madeline's life. At the time of the assessment she was a rising star in the law profession. However, subsequent to the assessment "Madeline and her boss apparently agreed that Madeline wasn't capable of being an employee" ([Trobst & Wiggins, 2003](#), p. 317). Approximately 1.5 years after the assessment, her husband left her, much to her surprise and substantial dismay. It is questionable whether any of the experts did or could have predicted such dramatic changes in Madeline's life, but it is certainly the case that her crossover FFM profile comparison may have been quite prescient, at least with respect to the relationship. Madeline did not appear to have a clue as to her husband's critical view of her, nor would she be aware that a good deal of his view was perhaps quite accurate.

Personality Disorders

As indicated by Widiger, Gore, Crego, Rojas, and Oltmanns (this volume), there is a substantial body of research supporting the conceptualization of the *DSM-IV-TR* (now *DSM-5*; APA, 2013) personality disorders as maladaptive variants of both poles of all five domains of the FFM. Wiggins and Pincus (1989) provided the first published study concerned explicitly with the empirical relationship of the FFM to personality disorder symptomatology, conducting joint factor analyses of measures of the FFM, the interpersonal circumplex, and *DSM* personality disorders. They concluded that “conceptions of personality disorders were strongly and clearly related to dimensions of normal personality traits” (Wiggins & Pincus, 1989, p. 305), including (but not limited to) a close relationship of schizotypal symptoms with openness; dependent with agreeableness; antisocial, paranoid, and narcissistic with antagonism; borderline with neuroticism; histrionic and narcissistic with extraversion; schizoid with introversion; and compulsive with conscientiousness. Although the interpersonal circumplex was able to provide a meaningful and informative understanding of a subset of the personality disorders, Wiggins and Pincus (1989) reached the conclusion that “the full 5-factor model was required to capture and clarify the entire range of personality disorders” (p. 305).

Trull (1992) provided the first study to include the administration of measures of the FFM and personality disorder symptomatology within a clinical sample. He administered the NEO-PI (Costa & McCrae, 1992c) and three independent measures of the *DSM-III-R* personality disorders. He concluded, “the FFM appears to be useful in conceptualizing and differentiating among the *DSM-III-R* personality disorders” (Trull, 1992, p. 557), with some findings replicating “across all three personality disorder assessment instruments” (p. 557).

Nevertheless, there is considerable opposition to understanding the *DSM-IV-TR* personality disorders as maladaptive variants of the FFM (e.g., Gunderson, 2010; Sheldler et al., 2010). This opposition is in some respects difficult to understand, as the FFM would in fact improve considerably the construct validity of the *DSM-IV* syndromes. As demonstrated across the chapters of this text, the empirical support for the FFM is extensive, to say the least. As acknowledged by the Chair of the *DSM-5* Personality and Personality Disorders Work Group, “similar construct validity has been

more elusive to attain with the current *DSM-IV* personality disorder categories" (Skodol et al., 2005, p. 1923).

The FFM conceptualization of the *DSM-IV-TR* personality disorders helps to address and resolve many of the problems with the *DSM-IV-TR* syndromes (Zapolski, Guller, & Smith, 2013). For example, one fundamental problem for the personality disorders has been their extensive co-occurrence, which in fact was a primary reason for the proposal by the *DSM-5* Personality and Personality Disorders Work Group to delete half of the diagnoses from the manual (Skodol, 2010, 2012). Lynam and Widiger (2001) and O'Connor (2005) indicated how the FFM can in fact account for the personality disorder diagnostic co-occurrence. Lynam and Widiger (2001) had personality disorder researchers describe prototype cases of each *DSM-IV-TR* personality disorder in terms of the 30 facets of the FFM. They then demonstrated empirically that the extent to which these disorders shared FFM traits explained the co-occurrence among them. The "overlap among FFM profiles reproduced well the covariation obtained for the schizoid, schizotypal, antisocial, borderline, histrionic, narcissistic, avoidant, and compulsive personality disorders aggregated across several sets of studies" (Lynam & Widiger, 2001, p. 410).

Another longstanding problem has been the differential gender prevalence rates, a source of considerable controversy (Oltmanns & Powers, 2012), which some have suggested reflects a bias in a respective disorder's conceptualization, diagnosis, and/or assessment. The differential gender prevalence rates obtained for the personality disorders are difficult to justify in the absence of any theoretical basis for knowing what differential prevalence should be obtained (Widiger & Spitzer, 1991). In contrast, the FFM has proved useful in helping to explain and understand gender differences in personality (Feingold, 1994). Lynam and Widiger (2007) demonstrated empirically that the differential gender prevalence rates obtained for the personality disorders through a meta-analytic aggregation of prior studies were consistent with the gender differences that would be predicted if the personality disorders are understood to be maladaptive variants of the FFM.

Axis I Disorders

This was probably one of the more difficult chapters to provide. I am not saying that any one of the others was easy to provide. I am just saying that

the literature on the relationship of FFM domains (and facets) with Axis I disorders is so incredibly vast and diverse. Even for just one domain, such as neuroticism, there are meta-analyses upon meta-analyses (e.g., Cassin & von-Ranson, 2005; Connor-Smith & Flachsbart, 2007; Deneve & Cooper, 1998; Hoyle, Fejfar, & Miller, 2000; Jorm, 1989; Kotov, Gamez, Schmidt, & Watson, 2010; Malouff, Thorsteinsson, Rooke, & Schutte, 2007; Malouff, Thorsteinsson, & Schutte, 2005, 2006; Munafo, Zetteler, & Clark, 2007; Ruiz, Pincus, & Schinka, 2008; Steel, Schmidt, & Schultz, 2008).

Bagby, Uliaszek, Gralnick, and Al-Dajani (this volume) address this literature with respect to the common forms of possible relationship: causal, pathoplastic, and spectrum (Andersen & Bienvenu, 2011; Widiger & Smith, 2008). The greatest interest tends to be with respect to the causal, etiological relationships, but many such studies are perhaps instead focusing on the pathoplastic and/or the spectrum. Disentangling these different forms of relationship in any one particular study can be exceedingly difficult (De Bolle, Beyers, De Clercq, & De Fruyt, 2012; De Fruyt & De Clercq, 2013, 2014; De Fruyt, Van Leeuwen, Bagby, Rolland, & Rouillon, 2006).

The influence of neuroticism and psychopathology on the presentation, appearance, or expression of one another is typically referred to as a pathoplastic relationship (Bagby et al., this volume; Widiger, 2009). This pathoplastic relationship can be bidirectional, as a psychopathology can be altered in its appearance or course due to a person's premorbid level of neuroticism, and the appearance of neuroticism can be similarly affected by the presence of a current or even recent psychopathology. With respect to the former, Duberstein and Heisel (2007), for instance, reported that neuroticism is associated with a higher level of overreporting of affective symptoms in persons with clinical depression (overreporting was suggested by higher levels of self-report relative to a clinician-based assessment of depression). A well-established finding is that persons high in neuroticism complain of more medical symptoms (ten Have, Oldehinkel, Vollebergh, & Ormel, 2005; see also the chapters by Tackett and Lahey and by Kern and Friedman). Objectively, they may be no more medically ill than the person low in neuroticism, but they are more likely to report the presence of symptoms and to seek treatment for them (Chapman, Duberstein, Sorensen, Lyness, & Emery, 2006). The same phenomenon will occur for the experience and reporting of symptoms of psychopathology.

Equally important, of course, is the pathoplastic effect of psychopathology on the self-report or perception of neuroticism (Farmer, 2000; Widiger & Samuel, 2005). Researchers will at times assess the trait of neuroticism while patients are clinically depressed, but persons who are very depressed will routinely fail to provide accurate descriptions of their personality traits (Widiger, 2009). Distortion in self-image is one of the direct effects of a mood disorder (APA, 2013), and it should not be surprising to find that persons who are depressed provide an inaccurate description of their level of FFM depressiveness, self-consciousness, or vulnerability that was present prior to or independent of their current depressed mood. Once the mood disorder is successfully treated, the level of self-described neuroticism decreases, not because of a change in personality but simply because of the remission of the mood disorder.

Jorm (1989) summarized the results of 63 therapy outcome studies that included measures of trait anxiety or neuroticism. The results indicated a significant reduction in neuroticism over the course of treatment (particularly by rational-emotive therapies). It is difficult not to be concerned that this change in self-reported levels of neuroticism was artifactual, resulting simply from changes in levels of Axis I psychopathology for which the patients were actually seeking and receiving treatment, rather than reflecting real changes in premorbid personality functioning. Piedmont (2001) similarly reported changes in FFM self-report personality assessments for 132 persons in a 6-week outpatient drug rehabilitation program. Significant changes in levels of neuroticism, agreeableness, and conscientiousness were maintained on follow-up approximately 15 months after the termination of treatment. He concluded that “personality change may be possible in the context of treatment” (p. 500). However, it is again worth noting that the change in neuroticism scores was also associated with changes in Axis I psychopathology, suggesting once more that the original assessment of neuroticism might have been an artifact of the psychopathology.

Costa, Bagby, Herbst, and McCrae (2005), however, offered a different view of these changes to mood and levels of neuroticism. To the extent that neuroticism is a disposition to experience and express negative affects, increases (and decreases) in the expression of these moods could be understood as fluctuating expressions of (and changes to) the personality trait. Costa et al. (2005) argued, “rather than regard these depression-caused

changes in assessed personality trait levels as a distortion, we interpret them as accurate reflections of the current condition of the individual” (p. 45). They suggested that the elevated neuroticism scores at the beginning of treatment should not be understood simply as an artifact of a depressed mood state but can and should be understood instead as a true fluctuation in the level of neuroticism secondary to environmental events (e.g., stress). Our levels of neuroticism will not simply remain flat and stable no matter what is happening within our lives. Fluctuations in levels of agreeableness and extraversion, and other domains of the FFM, will also occur in response to situational changes. [Costa et al. \(2005\)](#) indicated that support for the validity of the NEO PI-R neuroticism scores was their sustained correlation with variables unrelated to depression and their incremental validity in the prediction of personality-relevant criteria above and beyond the effects of severity of depression. They also indicated that there were no significant changes in the shape of the NEO PI-R profiles over the course of treatment (although there was substantially more change in the depression and vulnerability facets of neuroticism than for any other NEO PI-R facet scores). In sum, “psychometric analyses demonstrate that the baseline NEO PI-R provides a reliable and valid assessment of personality at the time it was administered” ([Costa et al., 2005](#), p. 52).

If [Costa et al. \(2005\)](#) are correct, then perhaps [Widiger and Samuel \(2005\)](#) were being too dismissive of personality change scores resulting from brief, pharmacotherapies of a mood disorder. Personality can indeed change in response to pharmacotherapy ([Widiger, 2009](#)). [Knutson et al. \(1998\)](#) “examined the effects of a serotonergic reuptake blockade on personality and social behavior in a double-blind protocol by randomly assigning 51 medically and psychiatrically healthy volunteers to treatment with a selective serotonin reuptake inhibitor (SSRI), paroxetine ... (N = 25), or placebo (N = 26)” (p. 374). None of the participants currently met, or apparently met throughout their lifetime, diagnostic criteria for any mental disorder, as assessed with a semistructured interview. None of the participants had ever received a psychotropic medication, had ever abused drugs, or had ever been in any form of psychiatric treatment. In other words, they were in many respects above normal in psychological functioning. Certainly any subsequent changes in their personality traits could not be attributed to the effect of treating a co-occurring mood disorder.

The paroxetine (and placebo) treatment continued for 4 weeks. [Knutson et al. \(1998\)](#) reported that the SSRI administration (relative to placebo) significantly reduced scores on a self-report measure of neuroticism. The magnitude of change even correlated well with plasma levels of SSRI within the SSRI treatment group. As concluded by [Knutson et al. \(1998\)](#), this was a clear “empirical demonstration that chronic administration of a selective serotonin reuptake blockade can have significant personality and behavioral effects in normal humans in the absence of baseline depression or other psychopathology” (p. 378). In sum, normal personality can be altered through pharmacotherapy.

It is generally accepted that medical conditions, such as Alzheimer’s disease, Parkinson’s disease, and traumatic brain injury, can produce actual changes in personality functioning ([Costa et al., 2005](#)). The [APA \(2013\)](#) diagnostic manual recognizes the concept of personality change due to a general medical condition. Why not then change due to a mental disorder? The [WHO \(1992\)](#) indeed recognizes within ICD-10 personality change secondary to severe mental illness, which would include, for instance, changes in levels of neuroticism secondary to a mood disorder.

However, to the extent that self-report descriptions of neuroticism secondary to a mood disorder are considered to represent fluctuations in personality functioning or actual changes in personality functioning, it becomes difficult to conduct research on the etiological contribution of neuroticism to the respective mood disorder. They are no longer distinct, independent constructs. They would then represent the same underlying disposition, with the mood disorder being a momentary, transient elevation of trait neuroticism.

There is indeed a considerable body of research to indicate that neuroticism may provide the foundation for a wide variety of Axis I psychopathologies. There is a great deal of comorbidity among Axis I disorders that may be due to the presence of a common underlying disposition. “Comorbidity may be trying to show us that many current treatments are not so much treatments for transient ‘state’ mental disorders of affect and anxiety as they are treatments for core processes, such as negative affectivity, that span normal and abnormal variation as well as undergird multiple mental disorders” ([Krueger, 2002](#), p. 44).

Krueger and his colleagues have replicated well across a variety of populations the two dimensions of internalization and externalization that

cut across a number of different Axis I disorders, and the broad domain of internalization maps well onto the personality temperament of neuroticism (Clark, 2005; Krueger & Markon, 2006; Watson, Gamez, & Simms, 2005). Kendler, Prescott, Myers, and Neale (2003) applied multivariate genetic analyses to 10 mental disorders assessed in more than 5,600 members of male–male and female–female twin pairs from a population-based registry. They concluded that “the patterns of comorbidity of these disorders (internalizing vs. externalizing, and within internalizing, anxious misery vs. fear) [are] driven largely by [common] genetic factors” (p. 936). Kahn et al. (2005) reported large effect sizes for the association of neuroticism with depression, generalized anxiety disorder, and panic disorder in a sample of 7,588 twin pairs. Neuroticism explained 20% to 45% of the comorbidity among the depression and anxiety disorders. Hettema, Neale, Myers, Prescott, and Kendler (2006) reported similarly that one-third to two-thirds of the genetic variance in mood (depressive) and anxiety disorders was shared with neuroticism.

There are some Axis I mental disorders that are even difficult to distinguish from the personality trait or temperament of neuroticism, such as social anxiety disorder and persistent depressive disorder (APA, 2000, 2013). *DSM-5* social anxiety disorder was *DSM-IV* generalized social phobia, an Axis I mental disorder that was diagnosed when the social phobia included most every social situation. Generalized social phobia was said to have an early onset and chronic course, “emerging out of a childhood history of social inhibition or shyness” (APA, 2000, p. 453). It would seem difficult to distinguish this Axis I mental disorder from elevations on the anxiousness, self-consciousness, and vulnerability facets of NEO PI-R Neuroticism, along with facets of introversion (Widiger, 2009). Likewise, persistent depressive disorder was previously early onset dysthymia whose initial literature review relied heavily on the research concerning charactological depression (i.e., Keller, 1989) and is in turn essentially equivalent to FFM depressiveness. In sum, neuroticism is not currently conceptualized as a mental disorder, but it may not be long before a temperament of neuroticism is in fact explicitly identified as a mental disorder, consistent with RDoC negative valence (Widiger, 2012).

Childhood and Adolescent Dysfunction

[Tyrer \(2015\)](#), a leading international personality disorder researcher, and Chair of the WHO ICD-11 Personality Disorders Work Group, called for an examination of “a new hypothesis explaining the relationship between personality and mental state disorders” (p. 1). He suggested that this would require overcoming the reluctance to assess for personality dysfunction in childhood and adolescence. “There is a general reluctance among all those who treat people with developmental disorders to think in terms of personality dysfunction when describing people whom others in adult psychiatry would have no difficulty in identifying as having personality problems” ([Tyrer, 2015](#), p. 5). [Tyrer \(2015\)](#) ended his paper by stating, “the time has now come for all those involved with improving understanding and awareness of personality disorders to extend their scope across the boundary between adolescence and adult life” (p. 5).

[Tyrer \(2015\)](#) would probably find the chapter by [De Fruyt, De Clercq, and De Bolle](#) (this volume) to be very encouraging, if not satisfying. All that Tyrer was calling for has in fact been realized within the work and research of De Fruyt, De Clercq, and others with respect to the study and application of maladaptive variants of FFM personality traits in childhood and adolescence ([Widiger, 2015](#)). Whereas there is considerable reluctance to identify *DSM-IV-TR* and/or ICD-10 personality disorders in childhood, contributing to the limited understanding of the childhood antecedents for their development ([Widiger, De Clercq, & De Fruyt, 2009](#)), there is a substantial body of research on personality and personality dysfunction in childhood and adolescence ([De Fruyt & De Clercq, 2014](#)). [De Clercq, De Fruyt, Van Leeuwen, and Mervielde \(2006\)](#) developed a measure of maladaptive personality functioning, the Dimensional Personality Symptom Item Pool (DIPSI), that is aligned explicitly with the FFM, as assessed by the Hierarchical Personality Inventory for Children (HiPIC; [Mervielde & De Fruyt, 1999, 2002](#)). As indicated by [De Fruyt and De Clercq \(2014\)](#), “an integrative model of personality pathology precipitants for childhood and adolescence is available now” (p. 469).

One of the reasons there is tremendous reluctance to identify personality dysfunction in children and adolescents is the stigma that can be associated with a personality disorder diagnosis. Personality disorders are among the more stigmatizing labels within the diagnostic manual. They are relatively unique in concerning “ego-syntonic” aspects of the self, or one’s characteristic manner of thinking, feeling, behaving and relating to others

throughout one's life. Whereas an Axis I disorder is something that momentarily happens to the person, a personality disorder is who that person is and perhaps always will be (Millon, 2011). A personality disorder diagnosis therefore suggests that who you are is itself a disorder. The FFM of personality disorder, in contrast, provides a more complete description of each person's self that recognizes and appreciates that the person is more than just a diagnosis and that other aspects of the self can be adaptive, even commendable, despite the presence of some maladaptive personality traits (Widiger, Samuel, Mullins-Sweat, Gore, & Crego, 2012). It would be the very rare person indeed who lacked any exemplary, admirable traits. In addition, from the perspective of the FFM, a personality disorder is no longer something that is qualitatively distinct from normal personality functioning. Instead, a personality disorder simply represents the presence of maladaptive variants of the same personality traits that are evident within all persons.

The WHO (2014) recently launched a call for a stronger focus on adolescent health, consistent with the plea by Tyrer (2015). As indicated by De Fruyt, De Clercq, and De Bolle (this volume), the top three causes of adolescent deaths across 109 countries were road traffic injuries, human immunodeficiency virus, acquired immune deficiency syndrome, and suicide. The predominant cause of illness and disability among adolescents aged 10 to 19 years was depression (WHO, 2014). Personality traits in childhood and adolescence impact these conditions. The traits of impulsiveness, self-control, and sensation-seeking contribute to unsafe sex and reckless drunk driving. Neuroticism is a strong vulnerability factor for depression and suicide (see also the chapter by Tackett and Lahey). As suggested by De Fruyt, De Clercq, and De Bolle (this volume) "given that traits can be reliably assessed in childhood and adolescence, and that half of all people developing a kind of mental disorder show an onset of symptoms in late childhood, it is clear that professionals and policy makers need to pay more attention to the developing personalities of individuals."

In sum, Tyrer (2015) appropriately bemoaned the fact that the importance of personality dysfunction to mental and physical health in childhood or adolescence has not been sufficiently well recognized or appreciated. He suggested that the possibility of such a relationship in childhood is "a testable hypothesis" (Tyrer, 2015, p. 1) that would first require though the field of personality disorder to overcome its reluctance to assess for the

presence of personality disorder in childhood and adolescence. However, no such reluctance is evident in the work of [De Fruyt and De Clercq \(2013\)](#) or their colleagues (e.g., [De Bolle, Beyers, De Clercq, & De Fruyt, 2012](#); [De Pauw & Mervielde, 2010](#); [Shiner & Tackett, 2013](#); [Tackett, Kushner, Mervielde, & De Fruyt, 2013](#)). To the extent that personality disorder and dysfunction are understood as maladaptive variants of the FFM, the relationship of personality disorder to consequential life outcomes in childhood and adolescence is not just a testable hypothesis, it is a well-established empirical finding and a vibrant line of investigation.

Clinical Utility

Quite some time ago, [Costa and McCrae \(1992a\)](#) suggested that the “five factor model is a theoretical advance that has important implications for many applied areas, including clinical practice” (p. 5). They argued that “most clinical populations are not dramatically different from normal volunteer samples with regard to the structure of personality” (p. 9). They offered a number of different ways in which the FFM can be useful to a clinician, including (but not limited to) the provision of a reasonably complete profile of the patient’s personality, which would include both strengths and weaknesses with respect to the patient’s characteristic manner of thinking, feeling, and relating to others. They indicated how this profile could help the clinician to better understand a patient’s problems in a manner that would be readily communicable to the patient, as well as anticipating the course of therapy.

The suggestions of [Costa and McCrae \(1992a\)](#) were accompanied by a critical review by [Ben-Porath and Waller \(1992b\)](#), followed by a rejoinder by [Costa and McCrae \(1992b\)](#), and then followed by a further response by [Ben-Porath and Waller \(1992a\)](#). This was a debate that was also presaged by commentaries published 5 years earlier in the *American Psychologist* (i.e., [McCrae & Costa, 1986](#); [Waller & Ben-Porath, 1987](#)). The debate was at times in reference to the FFM, but much of it actually focused on the relative strengths or weaknesses of the NEO PI-R ([Costa & McCrae, 1992c](#)) as compared to the MMPI ([Hathaway & McKinley, 1943](#)). It is difficult not to perceive this debate as reflecting some degree of a competitive rivalry between two leading measures of individual differences, with both sides taking perhaps rather strong positions. Both measures and models would

appear to have their unique strengths and could perhaps in fact nicely complement one another.

Many of the recommendations by Costa and McCrae (1992a) were subsequently mirrored years later by Widiger and Mullins-Sweatt (2009) and Krueger and Eaton (2010) in their extolling of the potential value for a clinician of a dimensional trait model. Widiger and Mullins-Sweatt (2009) discussed the benefits of a personality descriptive system that recognizes the strengths of the patient, along with the maladaptive traits that were being diagnosed as a personality disorder. “Some of these strengths may also be quite relevant to treatment, such as openness to experience indicating an interest in exploratory psychotherapy, agreeableness indicating an engagement in group therapy, and conscientiousness indicating a willingness and ability to adhere to the demands and rigor of dialectical behavior therapy (Sanderson & Clarkin, 2002)” (Widiger & Mullins-Sweatt, 2009, p. 203). Krueger and Eaton (2010), similarly, noted the virtues of having a truly integrative model of normal and abnormal personality. They described a person with borderline personality disorder whose high openness and extraversion had important treatment implications. “The high openness might also suggest that this person would be open to a therapeutic approach where depth and underling motives for behavior are explored” (Krueger & Eaton, 2010, p. 102).

As indicated by Mullins-Sweatt, Samuel, and Helle (this volume), concerns with respect to clinical utility have been a major objection with respect to a shift to a dimensional trait model of classification (e.g., Clarkin & Huprich, 2011; First, 2005; Shedler et al., 2010). This concern is somewhat ironic given that the heterogeneity of diagnostic membership, the lack of precision in description, the excessive diagnostic co-occurrence, the reliance on the “not otherwise specified” wastebasket diagnosis, and the unstable and arbitrary diagnostic boundaries of the *DSM-IV-TR* (now *DSM-5*) diagnostic categories are sources of considerable frustration for clinicians. Verheul (2005) systematically reviewed various components of clinical utility for both categorical and dimensional models and concluded, “overall, the categorical system has the least evidence for clinical utility, especially with respect to coverage, reliability, subtlety, and clinical decision-making” (p. 295). The FFM provision of more individualized and precise personality profiles, the increased homogeneity of trait constructs, and the inclusion of normal personality traits would considerably improve

the clinical utility of personality disorder assessments ([Widiger & Mullins-Sweatt, 2009](#)).

This opinion is also supported by empirical research, well documented by Mullins-Sweatt and colleagues. The primary components of clinical utility are ease of usage, the facilitation of communication, and treatment planning ([Mullins-Sweatt, Lengel, & DeShong, in press](#)), and there have been multiple studies surveying the experiences, perspectives, and opinions of clinicians that have directly compared the FFM and the *DSM-IV-TR* diagnostic categories with respect to these components. Clinicians have agreed with [Costa and McCrae \(1992a\)](#) that the FFM has a great deal of clinical utility with respect to ease of usage, communication, and treatment planning (e.g., [Glover, Crego, & Widiger, 2012](#); [Lowe & Widiger, 2009](#); [Miller, 1991](#); [Mullins-Sweatt & Lengel, 2012](#); [Mullins-Sweatt & Widiger, 2011](#); [Presnall, 2013](#); [Samuel & Widiger, 2006](#); [Stone, 2013](#)).

Conclusions

The FFM is the predominant dimensional model of general personality structure, the reasons for which should be apparent from this text. The FFM is not without criticism, dispute, and concerns. These should also be apparent from this text. Nevertheless, the FFM is a powerful and robust theoretical model of personality structure that has considerable construct validity and social, clinical utility. Persons applying the FFM to their research program or to their social, clinical practice typically discover rather quickly its power, richness, and potency. Still, there remains room for growth, development, revision, and expansion. There are different versions of the FFM, different interpretations, and different measures. As more and more investigators become involved in FFM research, it will continue to advance and evolve. Hopefully this text will serve as a useful stimulant for such future research. I hope you enjoyed it!