

TRAIT THEORIES OF PERSONALITY: ALLPORT, EYSENCK, AND CATTELL

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REVIEW

Chris has just graduated from college and started a job in a new city. He feels lonely and wants to meet some new people. After some hesitation, he decides to place a personals ad. He stares at his blank computer screen—what should he write? What kinds of personality characteristics would you choose to describe yourself? He chooses “Unconventional, sensitive, fun-loving, happy, humorous, kind, slender graduate, 22, seeks similar qualities in sane soulmate.” Somebody who can be described this way may indeed be a desirable date!

The personality characteristics that Chris has described are what are known as personality *traits*. Personality traits are psychological characteristics that are stable over time and across situations; it's a good bet that somebody who is sensitive and kind today will also be sensitive and kind a month from now. This chapter is about traits, defined as broad dispositions to behave in particular ways.

Specifically, in this chapter you will learn about three personality trait theories and their associated research programs. Two of these theories—those of Hans Eysenck and of Raymond Cattell—attempt to identify the basic *dimensions* of personality traits, that is, basic characteristics that everyone shares to a greater or lesser degree. The two associated research programs rely on a particular statistical procedure, *factor analysis*; this statistical procedure is used to identify the most basic individual differences in personality traits.

Historically, the trait approach has been popular in American and British psychology and, in the field's recent era, in personality psychology in Europe as well. Part of this popularity reflects the methodological sophistication of factor-analytic research methods and the relatively consistent research results that they yield. Part of this popularity also is rooted in the common-sense nature of trait theory; the scientific theories of personality traits have an intuitive appeal because their basic units of analysis—personality traits—are similar to simple nonscientific, “folk” understandings of personality.

**QUESTIONS TO BE
ADDRESSED IN
THIS CHAPTER**

1. What are the main ways in which individuals differ from one another in their feelings, thoughts, and behavior? How many different traits are needed to adequately describe these personality differences?
2. Does every person have a unique set of personality traits, or is it possible to identify a set of traits that is universal and that can serve as a taxonomy of individual differences?
3. If individuals can be described in terms of their characteristic traits, how are we to explain variability in behavior across time and situations?

We now introduce a third main perspective on personality, that of the trait theories. The trait theories differ strikingly from the Freudian and Rogerian perspectives you learned about in previous chapters. As you will see, the differences involve not only the substantive claims of the theories but the scientific database on which the theories rest.

Trait theorists emphasize that a central feature of the sciences is measurement. In the history of the physical sciences, scientific advances often could occur only after the development of tools for measuring physical phenomena precisely. If Galileo and Newton had not had relatively precise measures of time, mass, and other physical properties, they could not have verified that the motion of physical objects was lawful. If contemporary physicists did not have precise instruments for detecting the presence of subatomic particles, their science would be relatively speculative. Scientific progress often rests on precise measurement.

Contrast this emphasis with the approach of Freud and Rogers. Freud's work was virtually devoid of objective scientific measurement. He inferred the presence of mental structures of varying strength while providing no tools for measuring them. Freud relied merely on case study reports, which are more interpretative and thus more subjective than traditional scientific measurement. Rogers was more attentive to measurement principles. Yet some of his central theoretical constructs (e.g., the self-actualization motive) were not accompanied by measurement principles. (Rogers never provided a measure of individual differences, or intraindividual variations, in self-actualizing tendencies.) Surveying this scene, the trait theorists asked, Could these prior thinkers be said to have made truly scientific progress? Their answer: no. The work of "Jung and Freud . . . amounted scientifically almost to a disaster," concluded the trait theorist Raymond Cattell (1965, pp. 16–17). Trait theorists called for a new approach to the study of personality, one whose measures of psychological attributes were as objective and reliable as those found in the physical sciences. This chapter and the next review the progress they made.

In our previous chapters, we introduced theoretical perspectives by reviewing the life of the primary theorist (Freud in Chapter 3, Rogers in Chapter 5). Our approach to the trait theories is different. The difference reflects the nature of the theories and theorists. There simply is no single individual—no one dominant figure, no prime mover—in the trait theories of personality, in the way that there was in the psychodynamic and phenomenological traditions. In the 20th century, the foundations for trait psychology were laid by three investigators whose work is of particular significance: Gordon Allport, Raymond Cattell, and Hans Eysenck. Their contributions are reviewed in the present chapter. In the contemporary 21st-century field, much investigation centers around a theoretical perspective that endeavors to capitalize on the best aspects of the contributions of Allport, Cattell, and Eysenck. This approach, the five-factor model of personality, is reviewed in Chapter 8. Rather than providing biographical information for all these individuals right now, we include such information when introducing their respective contributions in the following sections.

A VIEW OF THE TRAIT THEORISTS

Although the various trait theorists have made distinct contributions, their work features many common themes. There is a coherent “trait perspective” on personality. As you’ll now see, it is a perspective that will seem immediately familiar. The trait theorist’s main scientific constructs are quite similar to the words and ideas you use to discuss people in your everyday life.

TRAIT THEORY’S VIEW OF THE PERSON

People love to talk about personality. We can spend hours discussing people’s characteristics: Our boss is grumpy; our roommate, sloppy; our professor, quick witted. (Well, we hope your professor is quick witted rather than sloppy and grumpy.) We even discuss the loyalty of our dog and the laziness of our cat. When talking about people we commonly use personality **trait** terms—words that describe people’s typical styles of experience and action. Apparently, people think that traits are central to personality. Likewise, personality researchers associated with the trait approach consider traits to be the major units of personality. Obviously, there is more to personality than traits, but traits have loomed large throughout the history of personality psychology.

THE TRAIT CONCEPT

What, then, is a trait? Personality traits refer to consistent patterns in the way individuals behave, feel, and think. If we describe an individual with the trait term *kind*, we mean that this individual tends to act kindly over time (weeks, months, maybe years) and across situations (with friends, family, strangers, etc.). In addition, if we use the word *kind*, we usually mean that the person is at least as kind as the average person. If one believed that the person was less kind than average, he or she would not be described as “kind.”

Trait terms, then, have two connotations: consistency and distinctiveness. By consistency, we mean that the trait describes a regularity in the person’s behavior. The person seems predisposed to act in the way described by the trait term; indeed, traits often are referred to as “dispositions” or “dispositional constructs” (e.g., McCrae & Costa, 1999, 2008) to capture the idea that the person appears predisposed to act in a certain way. The idea of disposition highlights an important fact about trait terms as used by trait theorists of personality. If a trait theorist uses a trait term—for example, *sociable*—to describe someone, she does not mean that the person *always* will act sociably, across all settings of life. As the Dutch trait psychologist De Raad (2005) recently emphasized, trait terms implicitly refer to behaviors in a type of social context. The trait theorist would expect the sociable person to be consistently sociable across settings that involve other people and in which sociable behavior is allowed by prevailing social norms. There is no expectation that the person would be sociable toward inanimate objects or act sociably when instructed by an authority figure to act otherwise.

By the other connotation, distinctiveness, we mean simply that the trait theorist is concerned primarily with psychological characteristics in which people differ—features that therefore make one person distinct compared to others. Trait theorists of personality are interested in traits for which there are significant differences among people.

The decision to build a personality theory on trait constructs implies a certain view of the person. It implies that there is substantial consistency to individuals' lives. Contemporary social life presents many changes: People change schools and jobs, meet new friends, marry, unmarry, remarry, and move to different communities if not different countries. At any one point in time, life may present multiple roles: student, employee, son or daughter, parent, community member. The trait theorist's fundamental message is that, despite all these variations, there is a consistent personality "in there." People possess psychological qualities that endure, almost regardless of time and place.

The discussion that opened this chapter is revealing of the view of personality science implicit in most trait approaches. As you learned, a paramount interest of trait theorists is measurement. The ability to measure psychological traits reliably and validly is the utterly critical first step in building a science of personality in the trait-theoretical view.

TRAIT THEORY'S VIEW OF THE SCIENCE OF PERSONALITY

This viewpoint displays a kind of conservatism that is valuable in the sciences. Both Freud and Rogers allowed themselves to create theories that went far beyond their available data; there were no direct, or indirect, measures of the strength of libidinal drives, of self-actualization motives, and so forth. Trait theorists of the mid-20th century rejected this sort of theorizing as too speculative. They felt that scientific measurement should constrain, and determine, theorizing. One should posit a personality structure if, and only if, the statistical analysis of carefully constructed measures suggests the existence of that structure.

SCIENTIFIC FUNCTIONS SERVED BY TRAIT CONSTRUCTS

A main question to ask about the trait theory's view of science is, "Why posit trait constructs?" In other words, "What is it that trait constructs *do* in a science of personality?" Trait theorists use trait constructs to serve at least two, and sometimes three, scientific functions: description, prediction, and explanation.

Description

All personality trait theorists use trait constructs descriptively. Traits summarize a person's typical behavior and thus describe what a person typically is like. Since description is a critical first step in any scientific endeavor, trait theories could be seen as providing basic descriptive facts that need to be explained by any theory of personality.

Most trait theorists do not seek just to describe individual people, one at a time; rather, they try to establish an overall descriptive scheme within which any and all persons can be described. They try, in other words, to establish a personality *taxonomy*. In any science, a taxonomy is a scientist's way of classifying the things being studied. Since trait constructs refer to consistent styles of experience and behavior, a trait taxonomy is a way of classifying people according to their characteristic, average types of experience and action.

Prediction

One question for a trait theorist is whether these classifications, within a taxonomy of personality traits, are of practical value. What can one do with knowledge of people's personality trait scores?

Throughout the history of the trait theories, a primary answer to this question has been as follows: You can predict things. People with different levels of a given personality trait may differ predictably in their everyday behavior. For example, if one knows college students' self-ratings on traits such as extraversion and conscientiousness, one can predict aspects of their personal environments, such as the decorations in, and degree of neatness of, their personal office spaces and dorm rooms (Gosling, Ko, Mannarelli, & Morris, 2002). Often one can make predictions that have important practical value. Suppose you are running a business and want to hire employees who will be reliable, honest workers. You are faced with a job of prediction: How can you predict which applicants will be good employees? One way of making this prediction is by giving people tests that measure their characteristic personality traits; trait psychologists have been deeply involved in the practical task of predicting on-the-job performance (Roberts & Hogan, 2001).

Explanation

In addition to description and prediction, a third scientific task is explanation. If personality psychology aspires to be a science, then it must tackle the most important challenge for a scientific theory, namely, explanation. Note that prediction and explanation are very different things (Toulmin, 1961). For example, in ancient times Babylonians could describe and predict astronomical events such as lunar eclipses, but they appeared to have no scientific understanding whatsoever of why these events occurred as they did. In an opposite case, Darwin explained how organisms evolved through natural selection, but he did not literally predict the past evolutionary events (Toulmin, 1961).

Some trait theorists suggest that trait constructs can be used to explain a person's behavior. One might say that a student shows up on time for class and takes good lecture notes *because* the person is high on the trait of conscientiousness. However, not all trait psychologists use trait terms to accomplish this third scientific function: explanation. Some confine themselves to description and prediction. They view a trait taxonomy as being akin to a map. A map of the continents and oceans on Earth does not explain why the continents and oceans have their particular location; for that explanation one needs additional scientific work (e.g., a theory of plate tectonics). Yet the map is still a crucial step in scientific progress.

As you will see in this chapter and again in Chapter 9, some psychologists try to move from description to explanation by identifying biological factors underlying a given trait. People who obtain high versus low scores on a personality trait test might differ systematically in a neural or biochemical system, which could be interpreted as the causal basis of the trait and trait-related behavior. This possibility, which many trait theorists pursue, raises another aspect of trait theory's view of the person. It is strongly biological. Most trait theorists

believe that inherited biological factors are a primary determinant of individual differences in traits. We discuss this possibility, and the related scientific evidence, both in the present chapter and in Chapter 9.

In sum, trait theorists differ in their claims about the explanatory status of trait constructs. This raises an important point for you to keep in mind. There is no one trait theory. The trait theories are a family of interrelated, but not identical, perspectives. In the next section, we review features that most, if not all, trait theories share.

A set of shared assumptions jointly define the trait approach. The most basic assumption is that people possess broad predispositions, called traits, to respond in particular ways. In other words, it is assumed that personality can be characterized in terms of an individual's consistent likelihood of behaving, feeling, or thinking in a particular way (e.g., the likelihood of acting in an outgoing and friendly manner, or of feeling nervous and worried, or of being reliable and conscientious). People who have a strong tendency to behave in these ways are described as being high on these traits, whereas people with a lesser tendency to behave in these ways are described as low on the traits. The person who frequently is outgoing would be called high on extraversion, whereas the unreliable, forgetful individual might be low on conscientiousness. All trait theorists agree that these generalized tendencies to act in one versus another manner are the fundamental building blocks of personality.

A related assumption is that there is a direct correspondence between the person's performance of trait-related actions and his or her possession of the corresponding trait. People who act (or report that they act) in a more extraverted or conscientious manner than others are thought, by the trait theorist, to possess more of (to be higher on) the corresponding traits of extraversion and conscientiousness. This point may seem so obvious that it isn't even worth stating. You may be thinking, "Of course people who display more of the trait-related behavior have more of the trait." But note how this thinking contrasts with an earlier theory we covered, namely, psychoanalysis. To the psychoanalyst, someone who reports being more "calm and at ease" than other people may not, in reality, possess more of the psychological characteristic of calmness. Instead, such persons may be so anxious that they are repressing their anxieties and merely saying that they are calm. Psychoanalysis, as well as other personality theories we will cover later in this text, recognize that there may be highly indirect relations between overt behavior and underlying personality characteristics. In contrast, the research procedures of trait theory assume that overt behavior and underlying traits are linked in a more direct, one-to-one manner. If someone reports a low amount of trait-related behavior on a test of personality traits, then he or she is said to possess low amounts of the given trait.

Another shared assumption is that human behavior and personality can be organized into a hierarchy. A famous hierarchical analysis was provided by Hans Eysenck (Figure 7.1), whose contributions are reviewed in more detail elsewhere in this chapter. Eysenck suggested that, at its simplest level, behavior can be considered in terms of specific responses. However, some of these responses are linked together and form more general habits. Groups of habits

**TRAIT THEORIES
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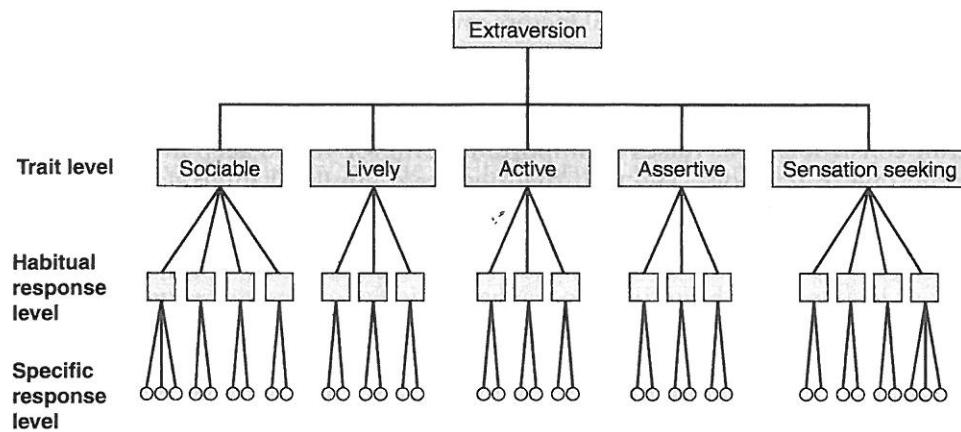


Figure 7.1 *Diagrammatic Representation of Hierarchical Organization of Personality: Extraversion-Introversion (E) (Note: Extraversion is one end of the E-I dimension. The other end, I, is not represented here).*

Adapted from Eysenck, 1970; 1990.

that tend to occur together form traits. For example, people who prefer meeting people to reading also generally enjoy themselves at a lively party; this bit of information suggests that these two habits can be grouped together under the trait of sociability. Finally, at the highest level of organization, various traits may be linked together to form what Eysenck called secondary, higher-order factors or superfactors (which also are traits, but at the highest, most abstract level of generalization). In sum, trait theories suggest that people display broad predispositions to respond in certain ways, that these dispositions are organized in a hierarchical manner, and that the trait concept can be a foundation for a scientific theory of personality.

THE TRAIT THEORY OF GORDON W. ALLPORT (1897–1967)

A figure of great historical importance to the development of trait theory, and personality psychology in general, was the Harvard University psychologist Gordon W. Allport. History remembers Allport as much for the issues he raised and the principles he emphasized than for a particular theory he created. Throughout his long and influential career, Allport highlighted the healthy and organized aspects of human behavior. This emphasis contrasted with other views of the time that emphasized the animalistic, neurotic, tension-reducing, and mechanistic aspects of behavior. Allport criticized psychoanalysis in this regard; he was particularly fond of telling the following story. While traveling through Europe at age 22, Allport decided it would be interesting to visit Freud. When he entered Freud's office, he was met with expectant silence as Freud waited to learn of Allport's mission. Finding himself unprepared for silence, Allport decided to start an informal conversation with the description of a four-year-old boy with a dirt phobia, whom he had met on the train. After he completed his description of the boy and his compulsive mother, Freud asked, "And was that little boy you?" Allport describes his response as follows:



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Gordon W. Allport

Flabbergasted and feeling a bit guilty, I contrived to change the subject. While Freud's misunderstanding of my motivation was amusing, it also started a deep train of thought. I realized that he was accustomed to neurotic defenses and that my manifest motivation (a sort of rude curiosity and youthful ambition) escaped him. For therapeutic progress he would have to cut through my defenses, but it so happened that therapeutic progress was not here an issue. This experience taught me that depth psychology, for all its merits, may plunge too deep, and that psychologists would do well to give full recognition to manifest motives before probing the unconscious.

SOURCE: ALLPORT, 1967, p. 8.

A particularly amusing aspect of this episode is that Allport personally was very meticulous, punctual, neat, and orderly—possessing many of the characteristics Freud associated with the compulsive personality. Freud's question may not have been as far off as Allport suggested!

Allport's first publication, written with his older brother Floyd, centered on traits as an important aspect of personality theory (Allport & Allport, 1921). Allport believed that traits are the basic units of personality. According to him, traits actually exist and are based in the nervous system. They represent generalized personality dispositions that account for regularities in the functioning of a person across situations and over time. Traits can be defined by three properties—frequency, intensity, and range of situations. For example, a very submissive person would frequently be very submissive over a wide range of situations.

TRAITS: PERSONALITY STRUCTURE IN ALLPORT'S THEORY

In a now classic analysis of personality descriptors, Allport and Odbert (1936) differentiated personality traits from other units of analysis in personality research. They defined traits as "generalized and personalized determining tendencies—consistent and stable modes of an individual's adjustment to his environment" (1936, p. 26). Traits are different from psychological states or behavioral activities that are temporary and induced by external circumstances. Chaplin, John, and Goldberg (1988) replicated Allport and Odbert's

Table 7.1 Prototypical Examples of Traits, States, and Activities

Traits	States	Activities
Gentle	Infatuated	Carousing
Domineering	Pleased	Ranting
Trustful	Angry	Snooping
Timid	Invigorated	Leering
Cunning	Aroused	Reveling

SOURCE: Chaplin et al., 1988.

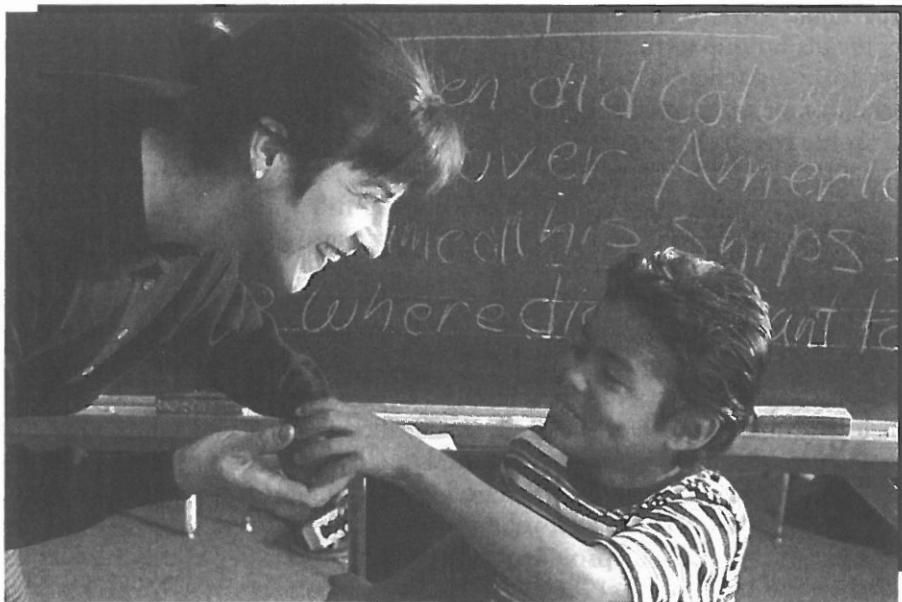
classifications of personality descriptors into three categories: traits, states, and activities. Table 7.1 lists examples of each of the three categories. For example, whereas a person may well be gentle throughout his or her lifetime, an infatuation (an internal state) typically does not last and even the most enjoyable carousing must come to an end.

Having distinguished traits from states and activities, the next question is whether there might exist different kinds of traits. Allport addressed this question by distinguishing among cardinal traits, central traits, and secondary dispositions. A **cardinal trait** expresses a disposition that is so pervasive and outstanding in a person's life that virtually every act is traceable to its influence. For example, we speak of the Machiavellian person, named after Niccolò Machiavelli's portrayal of the successful Renaissance ruler; of the sadistic person, named after the Marquis de Sade; and of the authoritarian personality who sees virtually everything in black-and-white, stereotyped ways. Generally, people have few, if any, such cardinal traits. **Central traits** (e.g., honesty, kindness, assertiveness) express dispositions that cover a more limited range of situations than is true for cardinal traits. **Secondary dispositions** are traits that are the least conspicuous, generalized, and consistent. In other words, people possess traits with varying degrees of significance and generality.

Allport did not claim that a trait is expressed in all situations, regardless of a situation's characteristics. He recognized that "traits are often aroused in one situation and not in another" (Allport, 1937, p. 331). For example, even the most aggressive people can be expected to modify their behavior if the situation calls for nonaggressive behavior, and even the most introverted person may behave in an extraverted fashion in certain situations. A trait expresses what a person generally does over many situations, not what will be done in any one situation. According to Allport, both trait and situation concepts are necessary to understand behavior. The trait concept is necessary to explain the consistency of behavior, whereas recognizing the importance of the situation is necessary to explain the variability of behavior.

FUNCTIONAL AUTONOMY

Allport analyzed not only stable traits but also motivational processes. He emphasized the **functional autonomy** of human motives. This means that although the motives of an adult may have their roots in the tension-reducing motives of the child, as Freud suggested, the adult grows out of the early motives. In adult life, motives become independent of, or autonomous from,



PhotoDisc/Getty Images, Inc.

Functional Autonomy: Sometimes a person may select an occupation for one reason, such as job security, and then remain in it for other motives, such as pleasure in the activity itself.

earlier tension-reducing drives. What originally began as an effort to reduce hunger or anxiety can become a source of pleasure and motivation in its own right. What began as an activity designed to earn a living can become pleasurable and an end in itself. Although hard work and the pursuit of excellence can be motivated originally by a desire for approval from parents and other adults, they can become valued ends in themselves—pursued independently of whether they are emphasized by others. Thus, “what was once extrinsic and instrumental becomes intrinsic and impelling. The activity once served a drive or some simple need; it now serves itself or, in a larger sense, serves the self-image (self-ideal) of the person. Childhood is no longer in the saddle; maturity is” (Allport, 1961, p. 229). This of course sets Allport’s work apart from Freud’s, since Freud explained adult behaviors in terms of early childhood drives whose basic motivational force endured throughout adulthood.

IDIOGRAPHIC RESEARCH

A final distinguishing feature of Allport’s contributions is his emphasis on the uniqueness of the individual. Unlike the other trait theorists we will discuss, Allport primarily endorsed an idiographic approach to research. An idiographic strategy, as we explained in Chapter 2, focuses on the potentially unique individual. In-depth studies of individual persons are viewed as a path for learning about people generally. This approach contrasts with that of other trait theorists, who generally adopt nomothetic procedures in which large numbers of individuals are described in terms of a common, universal set of personality traits.

One illustration of Allport's idiographic procedures was analysis of his use of materials unique to the individual case. For example, Allport published 172 letters from a particular woman. The letters were the basis of a clinical characterization of her personality, as well as for quantitative analysis. This sort of idiographic research highlights the pattern and organization of multiple traits *within* a person rather than a person's standing, relative to others, on isolated trait variables.

COMMENT ON ALLPORT

In personality psychology, Allport generally is revered. A biography (Nicholson, 2002) highlights his contributions not only to trait psychology but to personality psychology's emergence as a unique scientific discipline. Nonetheless, Allport's empirical contributions were limited. He clarified the trait concept but did little research to establish its utility. He believed that many traits were hereditary but conducted no research on their genetic basis. He documented that people display distinctive patterns of trait-related behavior and that traits interact with situational influences, but provided no detailed processing that could explain these observations (Zuroff, 1986).

Furthermore, Allport's idiographic emphasis partly backfired. Some felt it was antiscientific, thinking that the study of individual idiosyncrasies conflicted with science's search for general laws. In retrospect, this was a poor reading of Allport's idiographic efforts. To build an adequate science of human beings, it may be necessary to study individual persons in detail. Idiographic strategies may advance, rather than impair, a general understanding of persons. Allport, like Freud, recognized that detailed case studies may yield insight into general principles that are found across individual cases. Scientists in other human sciences recognize this in a similar fashion; for example, a famed anthropologist who studies, in detail, the meaning systems of particular cultures concludes that, as a general principle of scientific understanding, "the road to the general, to the revelatory simplicities of science, lies through a concern with the particular, the circumstantial, the concrete" (Geertz, 1973, p. 53).

This idiographic approach, however, is *not* the one pursued by most trait theorists other than Allport. Subsequent trait theorists put little stock in idiographic studies. Instead, contrary to Allport's suggestions, they studied populations of individuals and tried to identify the most important individual differences in the population at large.

Before presenting these theories, we will explain (1) the primary scientific problem faced by the trait theorists discussed in the remainder of this chapter, as well as Chapter 8, and (2) the statistical tool they used to solve it, namely, the statistical technique of factor analysis. We then turn to the trait theories of Raymond B. Cattell and Hans J. Eysenck.

IDENTIFYING PRIMARY TRAIT DIMENSIONS: FACTOR ANALYSIS

With the exception of Allport, trait psychologists generally have tried to identify a universal set of traits, that is, a set of traits that everyone possesses to a greater or lesser degree. Physically, everyone is more or less tall, heavy or thin, young or old, and so forth; height, weight, and age are universal

dimensions that can be used to describe any and all persons. Psychologically, might there be a set of universal trait dimensions that can be used to describe the personality characteristics of any and all persons? If so, how can we identify those traits? Identifying a set of basic, universal traits is a scientific challenge that is fundamental to the history of trait theories of personality.

This challenge is made difficult by the fact that there seem to be so many traits. Some people are absentminded. Some people are agreeable. Some are aggressive. Some altruistic. Some antagonistic. Some argumentative. There are so many traits—and we're still in the A's! How can one possibly identify a simple yet comprehensive set of basic traits?

The key insight required to solve this problem is noticing that some traits go together, that is, that they tend to co-occur. When talking about physical characteristics, no one is bewildered by the large number of physical features: long left arms, long right arms, long left legs, long right legs, long fingers, and so on. We recognize that these qualities co-occur and summarize their co-occurrence with a simple dimension: height (or size). Height, then, is a more basic physical trait than “length of left leg”; the lengths of individual body parts are just manifestations of the person’s overall height.

Psychological traits also co-occur. Consider our list of traits two paragraphs back. More often than not, if one finds someone who is extremely argumentative and extremely aggressive, it is unlikely that he or she will be extremely altruistic and extremely agreeable. Intuition tells us that certain traits co-occur, which suggests that some traits may be manifestations of other more basic traits. The question, then, is, How can one identify the basic traits? Clearly one can’t just rely on intuition. What is needed is a precise tool for identifying a basic structure of personality traits.

The tool that trait theorists have relied on is a statistical technique. The technique is called **factor analysis**. Factor analysis is a statistical tool for summarizing the ways in which a large number of variables go together, or co-occur. As you learned in Chapter 2, a correlation is a number that summarizes the degree to which *two* variables go together. If there were only two variables in which trait theorists were interested, then the technique of correlation would be sufficient for their purposes. However, the trait theorist is interested in a *lot* of variables. There seem to be hundreds of possible traits to measure. Once one measures them, there are hundreds and hundreds of correlations between one variable and another. Factor analysis is a statistical method for identifying patterns in this mass of correlations. Ideally, a factor analysis (i.e., a particular application of the general technique of factor analysis) will identify a small number of factors that summarize the intercorrelations among the large number of variables.

In a typical factor-analytic study, a large number of test items are administered to many subjects. Inevitably, some of these items are positively correlated with one another. People who answer a question (e.g., “Do you often go to loud and noisy parties?”) in one way answer other questions (e.g., “Do you enjoy spending time with large groups of people?”) in a similar manner. Some items are negatively correlated (e.g., responses to “Do you prefer to stay home at night rather than going out?” might be negatively correlated with answers to the two previous questions in this paragraph). In principle, large clusters of items might be correlated in this manner. These clusters might reflect the

influence of an underlying factor, that is, something that is responsible for the correlations among the items (in the way that height is responsible for the correlations among long leg, long arm, and so on, in our previous example). Factor analysis identifies these patterns, or clusters, or correlations. The technique of factor analysis, then, simplifies the information contained in a large table of correlations by identifying a small set of factors, where each factor represents one cluster of correlations.

The factors technically are merely mathematical. Factor analysis is a technique of mathematical statistics, not psychology. However, using their knowledge of personality, psychologists generally attach psychological labels to the factors. The labels are meant to identify the primary psychological content in the test items that correlate with one another. In our example (the one with noisy parties, large groups of people, etc.), factor analysis would identify a mathematical factor that represents the correlations among the items, and the psychologist would give that factor a name such as "sociability."

Factor analysis is of the greatest importance to trait theories. It is the tool they use to identify the structures of personality. To most trait theorists, the factors that are identified in factor-analytic studies are the structures of personality. If a factor analysis identifies six mathematical factors that summarize correlations among personality test items, then the trait psychologist will usually refer to the resulting six-dimensional mathematical structure as the "structure of personality."

The use of factor analysis to identify personality structures has some significant advantages as compared to the procedures used by previous theorists. Previously (e.g., in the work of Freud, Jung, or Rogers), theorists relied heavily on their intuition. They observed clinical cases and intuited that certain personality structures were responsible for their clients' behavior. But human intuition can be faulty (Nisbett & Ross, 1980). Rather than relying on intuition to identify personality structures, the trait theorist relies on an objective statistical procedure: factor analysis.

Note that the statistical procedure identifies patterns of covariation in test responses. It does not answer the question of why the responses covary. It is the researcher, using his or her knowledge of psychology and relying on his or her theoretical beliefs, who infers the existence of some common entity (the factor) and interprets it. Different psychologists may make different interpretations. For example, in the contemporary field, some researchers conclude that the core of extraversion is reward sensitivity, that is, that extraverts are highly motivated to attain positive, goal-related rewards (Lucas, Diener, Grob, Suh, & Shao, 2000). Others, using similar correlational and factor-analytic methods, disagree, concluding instead that the core of extraversion is social attention; extraverts appear to enjoy being the object of attention (Ashton, Lee, & Paunonen, 2002).

Also, the exact nature of, and number of, factors one obtains hinges partly on subjective decisions about how exactly to conduct the analysis. Factor analysis is a complex set of techniques, not a simple arithmetic algorithm, and the researcher must choose exactly how to proceed. This is why, as you will now see, different investigators who each rely on factor-analytic methods end up with somewhat different factors, and different numbers of factors, in their theories of personality.

Raymond B. Cattell was born in 1905 in Devonshire, England. He obtained a B.Sc. degree in chemistry from the University of London in 1924. Cattell then turned to psychology, obtaining a Ph.D. degree at the same university in 1929. Cattell did personality research and acquired clinical experience in Britain, then moved to the United States in 1937. He spent much of his career as professor and director of the Laboratory of Personality Assessment at the University of Illinois. During his professional career, he was enormously prolific, publishing more than 200 articles and 15 books. Cattell stands as one of the most influential psychological scientists of the 20th century (Haggstrom et al., 2002).

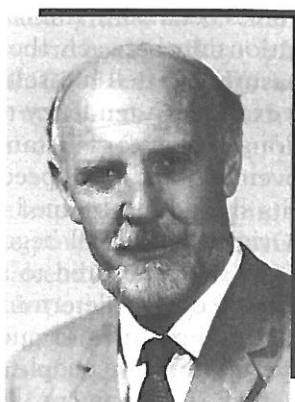
Early in his career, Cattell gained knowledge of the newly developed (in his time) technique of factor analysis. He quickly exploited its potential. Specifically, with his background in chemistry Cattell recognized the importance to scientific advance of having a taxonomy of “basic elements,” such as the periodic table of elements that is foundational to work in the physical sciences. Cattell judged that factor analysis could yield a set of basic psychological elements that would be foundational to personality psychology.

THE FACTOR-ANALYTIC TRAIT THEORY OF RAYMOND B. CATTELL (1905–1998)

SURFACE AND SOURCE TRAITS: PERSONALITY STRUCTURE IN CATTELL'S THEORY

Cattell provided two conceptual distinctions that are both valuable for distinguishing among the multiplicity of personality traits. One distinction differentiates **surface traits** from **source traits**. Surface and source traits represent different levels of analysis; in this regard, Cattell relied on the idea that there are hierarchical relations among trait concepts. Surface traits represent behavioral tendencies that are literally superficial: They exist “on the surface” and can be observed. By examining patterns of intercorrelations among a large number of personality trait terms, Cattell was able to identify roughly 40 groups of trait terms that were highly intercorrelated. Each grouping, to Cattell, represented a surface trait.

The psychologist, of course, does not want merely to describe behavior “on the surface.” The psychologist wants to identify psychological structures that underlie observable behavior tendencies. To this end, Cattell sought to identify source traits, that is, internal psychological structures that were the source, or underlying cause, of observed intercorrelations among surface traits.



Raymond B. Cattell

Courtesy University of Illinois.

To understand this co-occurrence of traits, Cattell relied on the technique of factor analysis. He developed systematic measures of each of the surface traits, administered these measures of surface traits to large numbers of people, and used factor analysis to identify patterns in the intercorrelations among the surface traits. The factors (i.e., the mathematical dimensions identified via factor analysis) that summarized the correlations among surface traits are, in Cattell's system, the source traits. These source traits that are revealed through factor analysis are the core personality structures in Cattell's theory of personality.

And what exactly are these source traits? Cattell identified 16 source traits. He grouped the 16 source traits into three categories: ability traits, temperament traits, and dynamic traits. **Ability traits** refer to skills and abilities that allow the individual to function effectively. Intelligence is an example of an ability trait. **Temperament traits** involve the emotional life and the stylistic quality of behavior. The tendency to work quickly versus slowly, to be calm versus emotional, or to act impulsively or only after deliberation are all qualities of temperament. Finally, **dynamic traits** concern the striving, motivational life of the individual. Individuals who are more or less motivated differ in dynamic traits. Ability, temperament, and dynamic traits are seen as capturing the major stable elements of personality.

SOURCES OF EVIDENCE: L-DATA, Q-DATA, AND OT-DATA

How did Cattell identify these traits? What exactly was his scientific database? A great virtue of Cattell's work is that there was no *one* database. Cattell relied on three different types—or three different sources—of data about personality. His distinctions among three different types of data are enduringly valuable to personality science.

Cattell's distinctions, presented here, should seem familiar; they are a basis of the LOTS classification of data sources we presented in Chapter 2. Cattell distinguished among (1) life record data (**L-data**), (2) self-report questionnaire data (**Q-data**), and (3) objective-test data (**OT-data**).

The first, L-data, relates to behavior in actual, everyday situations such as school performance or interactions with peers. These may be actual counts of behaviors or ratings made on the basis of such observations. The second, Q-data, involves self-report data or responses to questionnaires, such as the Eysenck personality inventory discussed later in this chapter. The third, OT-data, involves behavioral miniature situations in which the subject is unaware of the relationship between the response and the personality characteristic being measured. Cattell himself developed a large number of these mini-situations; for example, a tendency to be assertive could be expressed in behaviors such as long exploratory distance on a finger maze test, fast tempo in arm–shoulder movement, and fast speed of letter comparisons. Ideally, the same factors or traits should be obtained from the three kinds of data.

Originally, Cattell began with the factor analyses of L-data and found 15 factors that appeared to account for most of an individual's personality. He then set out to determine whether comparable factors could be found in Q-data. Thousands of questionnaire items were written and administered to large numbers of people. Factor analyses were run to see which items went together. The main result of this research is a questionnaire known as the

Table 7.2 Cattell's 16 Personality Factors Derived from Questionnaire Data

Reserved	Outgoing
Less intelligent	More intelligent
Stable, ego strength	Emotionality/neuroticism
Humble	Assertive
Sober	Happy-go-lucky
Expedient	Conscientious
Shy	Venturesome
Tough minded	Tender minded
Trusting	Suspicious
Practical	Imaginative
Forthright	Shrewd
Placid	Apprehensive
Conservative	Experimenting
Group dependent	Self-sufficient
Undisciplined	Controlled
Relaxed	Tense

Sixteen Personality Factor (16 P.F.) Questionnaire. Initially, Cattell made up neologisms, such as "surgeency," to name his personality trait factors, hoping to avoid misinterpretations of them. Nonetheless, the terms given in Table 7.2 roughly capture the meanings of these trait factors. As can be seen, they cover a wide variety of aspects of personality, particularly in terms of temperament (e.g., emotionality) and attitudes (e.g., conservative). In general, the factors found with Q-data appeared to be similar to those found with L-data, but some were unique to each kind of data. Illustrative L-data ratings and Q-data items for one trait are presented in Figure 7.2.

Cattell was committed to the use of questionnaires, in particular, those derived from a factor-analytical perspective, such as the 16 P.F. Questionnaire. At the same time, he expressed concern about the problems of motivated distortion and self-deception in relation to questionnaire responses. He also felt that the questionnaire is of particularly questionable utility with mental patients. Because of problems with L-data and Q-data, and because the original research strategy itself called for investigations with OT-data, Cattell's later efforts were concerned more with personality structure as derived from OT-data. It is the source traits as expressed in objective tests that are the "real coin" for personality research.

The results from L-data and Q-data research were important in guiding the development of miniature test situations; that is, the purpose was to develop objective tests that would measure the source traits already discovered. Thus, more than 500 tests were constructed to cover the hypothesized personality dimensions. These tests were administered to large groups of subjects, and repeated factoring of data from different research situations eventually led to the designation of 21 OT-data source traits.

SOURCE TRAIT EGO STRENGTH VERSUS EMOTIONALITY/NEUROTICISM (L-DATA AND Q-DATA)

<i>Behavior Ratings by Observer</i>		<i>Ego Strength Emotionality/Neuroticism</i>
Mature	versus	Unable to tolerate frustration
Steady, persistent	versus	Changeable
Emotionally calm	versus	Impulsively emotional
Realistic about problems	versus	Evasive, avoids necessary decisions
Absence of neurotic fatigue	versus	Neurotically fatigued (with no real effort)

*Questionnaire Responses**

Do you find it difficult to take no for an answer even when what you want to do is obviously impossible?

(a) yes

(b) no

If you had your life to live over again, would you:

(a) want it to be essentially the same? (b) plan it very differently?

Do you often have really disturbing dreams?

(a) yes

(b) no

Do your moods sometimes make you seem unreasonable even to yourself?

(a) yes

(b) no

Do you feel tired when you've done nothing to justify it?

(a) rarely

(b) often

Can you change old habits, without relapse, when you decide to?

(a) yes

(b) no

*Answer in italic type indicates high ego strength.

ANSWER

Strength

Cattell, 1965

Figure 1.2 Correspondence Between Data from Two Different Test Domains: L-data Ratings and Q-data Responses
Cattell, 1965

Cullen, 1988

As mentioned, the source traits or factors found in L-data and Q-data could, for the most part, be matched to one another. How, then, do the OT-data factors match those derived from L-data and Q-data? Despite the years of research effort, the results were disappointing: Although some relations were found across all three data sources, no direct one-to-one mapping of factors was possible.

In summary, we have described four steps in Cattell's research. (1) He set out to define the structure of personality in three areas of observation, called L-data, Q-data, and OT-data. (2) He started his research with L-data and through the factor analysis of ratings came up with 15 source traits. (3) Based on research findings, he developed the 16 P.F. Questionnaire, which contains 12 traits that match traits found in the L-data research and four traits that appear to be unique to questionnaire methods. (4) Using these results to guide his research in the development of objective tests, Cattell found 21 source traits in OT-data that appear to have a complex and low-level relation to the traits found in the other data.

The source traits found in the three types of observations do not complete Cattell's formulation of the structure of personality. However, the traits presented in this section do describe the general nature of the structure of personality as formulated by Cattell. In other words, here we have the foundation for psychology's table of the elements—its classification scheme. But what is the evidence for the existence of these traits? Cattell (1979) cited the following: (1) the results of factor analyses of different kinds of data, (2) similar results across cultures, (3) similar results across age groups, (4) utility in the prediction of behavior in the natural environment, and (5) evidence of significant genetic contributions to many traits.

STABILITY AND VARIABILITY IN BEHAVIOR

Cattell did not view persons as static entities who behaved the same way in all situations. Social action depends not only on traits but other factors as well. Cattell highlighted two other determinants: states and roles. **State** refers to emotion and mood at a particular, delimited point in time. One's psychological state is partly determined by one's immediate situation. Illustrative states are anxiety, depression, fatigue, arousal, and curiosity. To Cattell, the exact description of an individual at a given moment requires measurement of both traits and states: "Every practicing psychologist—indeed every intelligent observer of human nature and human history—realizes that the state of a person at a given moment determines his or her behavior as much as do his or her traits" (1979, p. 169).

Regarding the concept of **role**, Cattell noted that certain behaviors are more closely linked to social roles one must play than to personality traits one possesses. Social roles, not personality traits, explain why people shout at football games and not in churches (Cattell, 1979). Two people may act differently toward one another in different settings in which they play different roles. For example, a teacher may respond differently to a child's behavior in the classroom than when outside the classroom and no longer in the role of teacher.

In sum, although Cattell believed that traits foster stability in behavior across situations, he also recognized that a person's mood (state) and style of self-presentation in a given situation (role) contribute to behavior: "How vigorously Smith attacks his meal depends not only on how hungry he happens to be, but also on his temperament and whether he is having dinner with his employer or is eating alone at home" (Nesselroade & Delhees, 1966, p. 583).

COMMENT ON CATTELL

One cannot help but be impressed with the scope of Cattell's efforts. His theorizing addressed all major aspects of personality theory, and his systematic research efforts laid a foundation for generations of trait-based researchers. One observer concluded that "Cattell's theory turns out to be a much more impressive achievement than has been generally recognized. . . . Cattell's original blueprint for personality study has resulted in an extraordinarily rich theoretical structure" (Wiggins, 1984, pp. 177, 190). His primary personality assessment device, the 16 P.F. Questionnaire, continues to be used widely in applied settings that require the assessment of individual differences.

**CURRENT
APPLICATIONS****THE RIGHT STUFF: CHARACTERISTICS OF SUCCESSFUL
BUSINESS EXECUTIVES**

Some time ago, Tom Wolfe wrote a book about the first U.S. team of astronauts. An all-male group, these were men who felt they had the *right stuff*—the manly courage it took to make it as a test pilot and astronaut. Other people might have had the necessary skills, but if they didn't have the *right stuff* they just didn't make it. Most demanding occupations have their own kind of *right stuff*—the personality characteristics or traits that, in addition to skill, make for success. For example, what makes for a top business executive? According to some research, the difference between senior executives who make it as a chief executive officer and those who do not is often subtle and has something to do with the way these individuals' personality characteristics shape and influence their work experiences with others, and, possibly, ensure work leadership. To be sure, members of both groups show considerable talent and have remarkable strengths, as well as a few significant weaknesses, and yet, although no one trait discriminates between the two groups, those who fall short of their ultimate goals frequently are found to have the following characteristics: they are insensitive to others, untrustworthy, cold/aloof/arrogant, moody, volatile under pressure, and defensive. In contrast, those who make it to the top show integrity as well as understanding and tolerance towards others.

So, if one had to determine the personal qualities and the abilities of leaders, the search might be difficult, time-consuming, and, perhaps even destined to fail. After all, it seems plausible that each trait or

personality characteristic might be the *right stuff* in certain situations, and yet, the *wrong stuff* in other situations—that is, no personality characteristic is “the right stuff” *per se*. This is indeed the gist of what has characterized research seeking to understand the personality characteristics of leaders for several decades. This is in the past, however, and recent leadership research evokes a brighter future for trait researchers, especially those in industrial psychology. In particular, this research suggests that personality qualities are indeed needed for understanding and promoting leadership effectiveness, and this seems specifically true for managers who are versatile enough to take into account the expectations and requests of others, and balance these situational demands with their own preferences, goals, and behaviors in the work environment.

A recent longitudinal research by Cavazotte, Moreno, and Hickmann (2012) supports this general view. The authors evaluated the personality traits and emotional intelligence of midlevel managers from a large Brazilian company operating in the energy sector. They also measured the so-called “transformational” behaviors of managers as perceived by employees (e.g., behaviors seeking to avoid or reduce conflicts at work, or supportive behaviors towards subordinates) as well as the short- and long-term performance of these managers. The findings of this research suggest that leadership effectiveness (as measured by the achievement of organizational goals) arises from the managers’ positive transformational behaviors, and these, in

turn, are partly the expression of individual differences in leadership personality traits, in particular, conscientiousness and emotional intelligence.

This type of research continues to characterize industrial psychology research, which seeks to identify and measure personality characteristics that are essential

for success in various fields. It also continues to have applied implications in the personnel selection procedures and practices of private firms seeking the best candidates for middle- and top-level management positions.

SOURCE: Cavazotte, Moreno, & Hickmann (2012).

Despite this, if Cattell were here today he would be disappointed with the relative lack of impact his work exerts in contemporary personality science. This lack of impact may result, in part, from issues that are practical as much as they are scientific. Cattell provided a theoretical system with a lot of personality factors: 16. In practice, it is difficult for the basic or the applied psychologist to keep in mind this large number of factors when assessing the personality of individuals. Cattell would argue that this range of factors is necessary. Yet, in comparison to other theories, the approach is not parsimonious. As you will see in the remainder of this chapter and the next, other theorists tried to establish a simpler structure of personality traits.

Deeper problems may lie behind this practical concern. Cattell was fundamentally interested in the problem of measurement. In most respects, that is a very good thing; inadequate measurement impairs a scientific program. However, in Cattell's work the measurement process was not used solely for the purpose of measurement. It was used for a second purpose: theorizing. In other words, the basic structure of Cattell's theory (the number of, and content of, the source traits) was determined entirely by the results of the measurement process (factor analyses of measures of the surface traits). Basing theory on measurement is a risky strategy. The risk is that there may exist important qualities that one *should* be studying in a comprehensive theory but that are not detected by one's measurement system. If this happens, the theory lacks coverage of the important topic. As one example, consider the fact that most people have a "life story" (McAdams, 2006). If you ask someone to tell you about themselves, they are likely to provide a narrative or autobiographical story about themselves. It is not at all clear that the numerical measurement of the sort employed by Cattell can capture the content of such stories. If, in a literature class, you are asked to analyze the meaning of a story, we would *not* suggest that you do so by employing the statistical technique of factor analysis! To the extent that individuals possess psychological attributes, such as a life story, that are not reducible to a set of numbers, these attributes are overlooked by Cattell's measurement system and, thus, his theory. If Carl Rogers were here today, he surely would think that this was an enormous limitation for a personality theory.

**THE THREE-FACTOR
THEORY OF
HANS J. EYSENCK
(1916–1997)**

In our concluding comments on Cattell, we noted that his 16-factor theory had a practical drawback: It is cumbersome in practical applications to track such a large number of factors: 16. There may be a parallel scientific drawback. Sixteen factors may be too many on sheer scientific grounds. It might be that, hidden behind the 16 factors, there is a simpler and even more basic structure of personality traits. If one could identify this simpler trait structure, it might serve as the basis of a scientific model that is parsimonious and also of applications that are simple and practical. This possibility was pursued with unique creativity and energy by one of the giants of 20th-century psychology, Hans Eysenck.

Hans J. Eysenck was born in Germany in 1916 and later fled to England to escape Nazi persecution. Like Cattell, his work was influenced by advances in statistical techniques, especially factor analysis. He also was influenced intellectually by the work of European psychologists who studied personality types (especially Jung and Kretschmer), by research on the heredity of psychological characteristics, and by the experimental work on classical conditioning conducted by the Russian physiologist Pavlov (see Chapter 10).

Eysenck led a life characterized by enormous energy and productivity. His work included a broad sampling of both normal and pathological populations. He was an exceptionally prolific writer. In the scientific literature, he is one of the most influential and cited research psychologists of the 20th century (Haggstrom et al., 2002). In the 1980s, he founded and edited the journal *Personality and Individual Differences*, an international journal devoted primarily to research on personality traits, temperament, and the biological foundations of personality—all issues Eysenck cared about deeply. Eysenck died in 1997, after seeing through the republication of three of his early books and shortly after finishing his last book, *Intelligence: A New Look* (Eysenck, 1998).

Eysenck's role in the field was both constructive and critical. In addition to constructing a trait theory, he criticized other theories that he found flawed, particularly psychoanalysis. Eysenck, like Cattell, believed that the psychoanalysts' failure to provide precise, reliable measures of their psychological constructs was a serious shortcoming. In constructing a trait theory, Eysenck sought to avoid this problem through the use of reliable measures of individual differences. He felt that such measures also were necessary to identify the presumed biological foundations of each trait.



The Granger Collection.

Hans J. Eysenck

Eysenck's emphasis on biological foundations of personality traits is particularly noteworthy. He recognized that, without understanding the biology of traits, trait explanations could be circular—where circular explanations are those that go around in a conceptual circle, with a trait concept being used to explain the very behavior that served as the basis for inferring the existence of the trait in the first place. For example, think of a friend of yours who frequently talks in a friendly and outgoing manner to other people. How would you describe her behavior? You might say that she is “sociable.” Now consider another question: How would you *explain* her behavior? You might say that she is acting sociable because she has the trait of sociability. But if you said this, you wouldn’t be providing a very good explanation; indeed, your explanation would violate basic principles of scientific explanation (e.g., Nozick, 1981). The problem is that the only reason you know that your friend has the trait of sociability is because you saw her act in a sociable manner. Your explanation thus goes around in logical circles: It uses a word (*sociable*) to describe a pattern of behavior and then uses that same word to explain the existence of the pattern of behavior that was described. Eysenck recognized that trait theory can break out of such conceptual circles by going beyond the mere use of words and identifying biological systems that correspond to trait. We consider his degree of success in identifying such systems in the following pages.

“SUPERFACTORS”: PERSONALITY STRUCTURE IN EYSENCK’S THEORY

To construct a personality theory, Eysenck conducted factor analyses of participants’ responses, as did Cattell. But Eysenck also took another step, specifically a secondary application of the factor-analytic method. He conducted secondary factor analyses. A secondary factor analysis is a statistical analysis of an initial set of factors that are correlated with one another. In other words, when analyzing a broad spectrum of personality traits, an initial factor analysis might indicate the existence of a moderately large number of factors. In Cattell’s case, in analyses of self-report data this number was 16. However, these factors are not statistically independent. When one obtains this number of factors, different factors are commonly correlated; people who obtain low (high) scores on one factor tend to obtain low (high) scores on another. (A glance back at Table 7.2 would suggest, on intuitive grounds, that this is true for some of Cattell’s factors, such as “reserved” and “shy.”) Since the factors are correlated, and factor analysis is a tool for identifying patterns in a set of correlations, the intercorrelations among the factors could be factor analyzed. This is what is called a secondary factor analysis.

This, then, is what Eysenck did. He used secondary factor analysis to identify a simple set of factors that were independent, that is, not correlated with each other. These secondary factors of course also are traits: They are consistent styles of emotion or behavior that distinguish people from one another, and the superfactors are continuous dimensions, with a high and a low end and with most people falling in the middle. But they are factor-analytic trait dimensions at the highest level of a hierarchy of traits, and thus Eysenck called them **superfactors** (“super” in the sense of “high”).

Eysenck at first identified two such superfactors, which he labeled (1) **introversion-extraversion** and (2) **neuroticism** (alternatively called

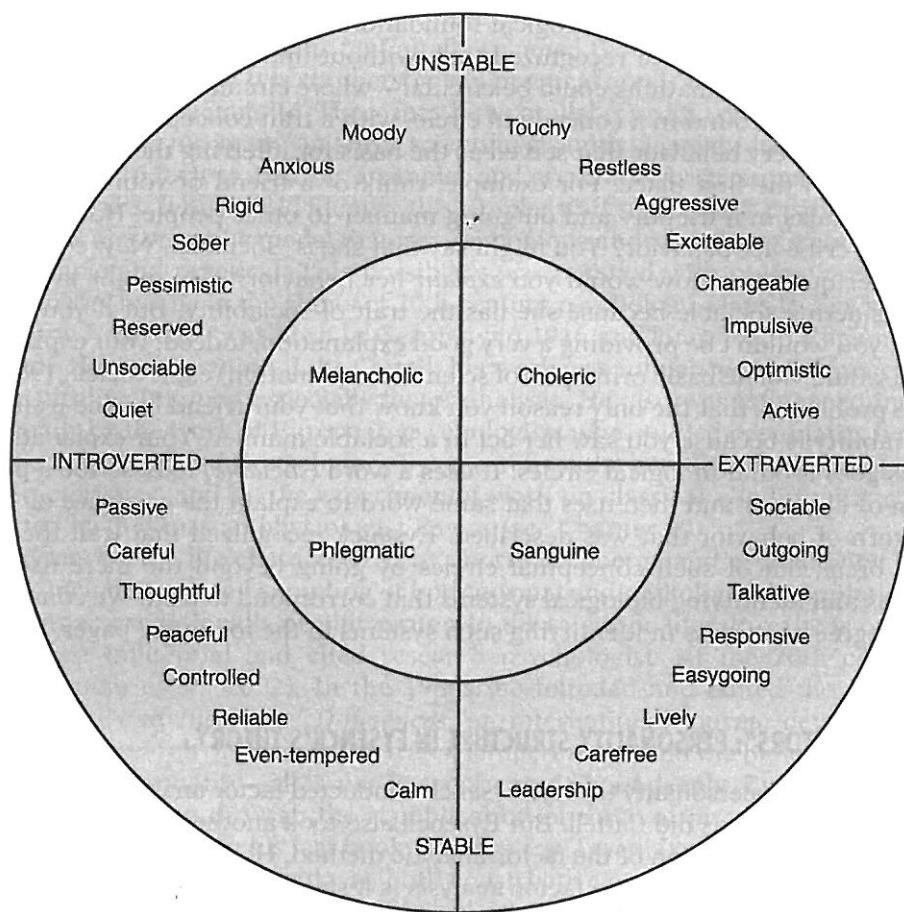
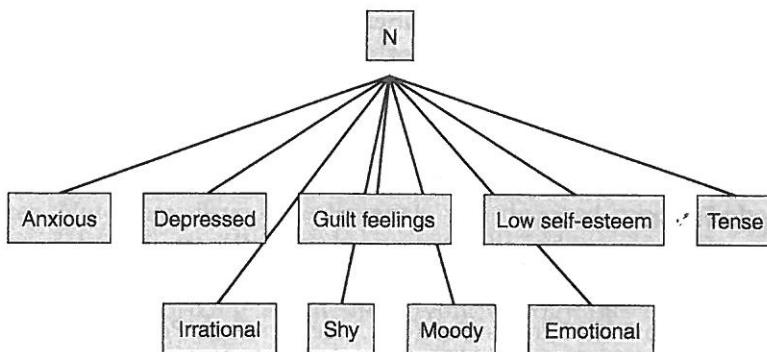


Figure 7.3 *The Relationship of Two Dimensions of Personality Derived from Factor Analysis to Four Greek Temperamental Types*
(Eysenck, 1970). Reprinted by permission, Routledge & Kegan Paul Ltd.

emotional stability versus instability). Figure 7.3 shows how the superfactor serves as a high-level organizational scheme for lower-level traits. The superordinate concept of extraversion organizes lower-level traits such as sociability, activity, liveliness, and excitability. Neuroticism organizes traits such as anxious, depressed, shy, and moody (Figure 7.4). Figure 7.3 shows Eysenck's representation of the traits as two perpendicular lines that together define a psychological space of personality traits; it is the statistical fact that the traits are uncorrelated that allows Eysenck to represent them as two separate, independent, orthogonal (at a right angle) dimensions. In principle, any individual can be located within this two-dimensional space; in the Eysenck theoretical system, everyone has a greater or lesser amount of extraversion and neuroticism. Using a language we introduced earlier, this is a *nomothetic* system of personality traits.

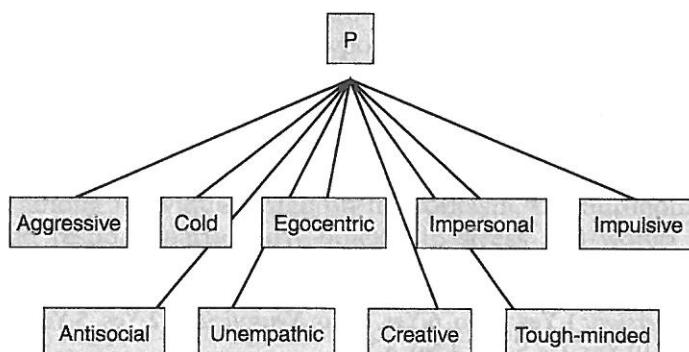
An interesting feature of Eysenck's system (also represented in Figure 7.3) is that it captures individual differences identified in ancient times. The Greek physicians Hippocrates (around 400 B.C.) and Galen (around 200 A.D.) proposed

**Figure 7.4** *The Hierarchical Structure of Neuroticism (N)*

(Eysenck, 1990). Reprinted by permission, Guilford Press.

the existence of four basic personality types: melancholic, phlegmatic, choleric, and sanguine. Ancient Greek theorizing about the causes of personality types have since been repudiated. However, as Eysenck recognized, ancient scholars did validly identify important variations among people. People whom the Greeks saw as being of a particular personality type (e.g., choleric) actually had a high amount of two associated personality traits (in the case of the choleric type, extraversion and emotional instability; see Figure 7.3). The fact that these variations in personality were evident in both the ancient world and contemporary society suggests that they might be fundamental features of human nature, with a biological basis that transcends time and place.

Eysenck's initial work, then, identified two dimensions of normal variation in personality, that is, variations readily apparent in the personality qualities of people we know in our everyday life. We all recognize that our friends and family vary in the degree to which they are calm versus anxious, shy versus sociable, and Eysenck's model organizes these intuitions scientifically. After establishing these two dimensions, however, Eysenck added a third dimension. It organizes personality traits that, in the extreme, we might label as "abnormal": aggressiveness, a lack of empathy, interpersonal coldness, antisocial behavioral tendencies. This superfactor is called **psychoticism**. The hierarchical organization of characteristics associated with it appear in Figure 7.5.

**Figure 7.5** *The Hierarchical Structure of Psychoticism (P)*

(Eysenck, 1990). Reprinted by permission, Guilford Press.

These resulting three factors—psychoticism, extraversion, and neuroticism—comprise Eysenck's complete model of personality structure. The factors are so well known in personality psychology that they commonly are referenced merely by their first letters: P, E, and N.

Measuring the Factors

With this model in hand, one then needs an assessment device to measure individual differences in P, E, and N. Eysenck provided this device, too. He developed questionnaire measures (e.g., the Eysenck Personality Questionnaire) that contained simple self-report items designed to tap each of the factors (Figure 7.6). The typical extravert will answer "yes" to questions such as these: Do other people think of you as very lively? Would you be unhappy if you could not see lots of people most of the time? Do you often long for excitement? The typical introvert will answer "yes" to questions such as these: Generally, do you prefer reading to meeting people? Are you mostly quiet when you are with people? Do you stop and think things over before doing anything? Note that Eysenck also included "lie scale" items to detect individuals who are faking responses in order to look good (Figure 7.6).

An important feature of Eysenck's work is that, like Cattell, he developed objective measures of traits, that is, measures that did not rely on subjective ratings in questionnaires. One such test, designed to differentiate extraverts from introverts, is Eysenck's "lemon drop test." A standard amount of lemon juice is placed on the subject's tongue. Introverts and extraverts (as identified by questionnaires) differ in the amount of saliva produced when this is done.

	Yes	No
1. Do you usually take the initiative in making new friends?	<hr/>	<hr/>
2. Do ideas run through your head so that you cannot sleep?	<hr/>	<hr/>
3. Are you inclined to keep in the background on social occasions?	<hr/>	<hr/>
4. Do you sometimes laugh at a dirty joke?	<hr/>	<hr/>
5. Are you inclined to be moody?	<hr/>	<hr/>
6. Do you very much like good food?	<hr/>	<hr/>
7. When you get annoyed, do you need someone friendly to talk about it?	<hr/>	<hr/>
8. As a child did you always do as you were told immediately and without grumbling?	<hr/>	<hr/>
9. Do you usually keep "yourself to yourself" except with very close friends?	<hr/>	<hr/>
10. Do you often make up your mind too late?	<hr/>	<hr/>
<i>Note:</i> The above items would be scored in the following way: <i>Extraversion:</i> 1 Yes, 3 No, 6 Yes, 9 No; <i>Neuroticism:</i> 2 Yes, 5 Yes, 7 Yes, 10 Yes; <i>Lie Scale:</i> 4 No, 8 Yes.		

Figure 7.6 Illustrative Items for Extraversion, Neuroticism, and Lie Scale from the Maudsley Personality Inventory and Eysenck Personality Inventory.

Why might this be (we hope you are asking yourself)? The idea is that there may be a biological basis to the individual differences.

BIOLOGICAL BASES OF PERSONALITY TRAITS

Eysenck provided specific scientific models of the biological bases of individual differences. Note that, if you are Eysenck, you do need models (plural), not just one model. The traits (P, E, N) are statistically independent. One therefore needs a separate biological model for each of the three traits. The trait for which Eysenck's theorizing about underlying biology has proven most successful is extraversion.

Eysenck suggested that individual variations in introversion–extraversion reflect individual differences in the neurophysiological functioning of the brain's cortex. The idea is that introverts are more arousable; they experience more cortical arousal from events in the world. As a result, highly intense social stimuli (e.g., a loud party) make them *overaroused*—an aversive state that they avoid. The social behavior of introverts, then, is more inhibited because of the relatively greater arousal they experience. Conversely, extraverts experience less cortical arousal than introverts from a given stimulus and therefore seek out more intense social experiences. Research that directly measures the brain activity of introverts and extraverts provides some support for Eysenck's theorizing (Geen, 1997; also see *Personality and the Brain* feature, this chapter, and Chapter 9). Eysenck himself generated much relevant evidence on the biology of this dimension, including evidence that introverts are more influenced by punishments in learning, whereas extraverts are more influenced by rewards.

Since the trait has a biological basis, individual differences in introversion–extraversion should be at least partly hereditary. (Note that the biological basis does not imply that a trait would be entirely hereditary, since one's experiences during child development influence one's biological makeup.) Studies of identical and fraternal twins commonly suggest that heredity does, in fact, play a major part in accounting for differences between individuals in E scores (Krueger & Johnson, 2008; Loehlin, 1992; Plomin & Caspi, 1999). The following are other facts consistent with Eysenck's biological theorizing: the fact that the dimension of introversion–extraversion is found cross-culturally, that individual differences are stable over time, and that various indices of biological functioning (e.g., brain activity, heart rate, hormone level, sweat gland activity) correlate with E scores (Eysenck, 1990).

Regarding neuroticism, Eysenck hypothesized that the key neural systems are (a) the limbic system—a lower-level brain region involved in emotional arousal, and (b) the autonomic nervous system—the part of the nervous system that influences bodily arousal (e.g., heart rate, sweat gland activity) and that, in turn, is regulated by the limbic system. In particular, Eysenck predicted that, among individuals high on neuroticism, the autonomic nervous system would respond particularly quickly to stress and would be slow to decrease its activity once danger disappears. The neurotic person thus seems “jumpy” and “stressed out.” Unfortunately for Eysenckian theory, research has not consistently supported this physiological theory of neuroticism, as Eysenck himself fully recognized (Eysenck, 1990). Recent work using brain-imaging methods unavailable to Eysenck, however, has been more promising (see this chapter's *Personality and the Brain* feature).



Personality and the Brain

Extraversion and Neuroticism

More than a half century ago, Hans Eysenck predicted that people with different scores on extraversion (E) and neuroticism (N) questionnaires would differ neutrally. He anticipated, specifically, that they would differ in brain response when presented with emotionally arousing stimuli. With all the time that's elapsed, you might guess that this prediction would have been tested extensively, with the relevant brain systems being well understood. But guess again. Here in the contemporary era, authors (Kehoe, Toomey, Balsters, & Bokde, *in press*) still can state that "the relationship between extraversion and the neural substrates of emotional arousal processing are unknown" (ms. p. 2) and that, until recently, Eysenckian predictions about neuroticism and the brain "have never been investigated using functional magnetic resonance imaging (fMRI)" (ms. p. 1), the contemporary neuroscientist's favored tool.

This state of affairs is beginning to change. Kehoe et al. (*in press*) used fMRI to explore brain activity in a group of 23 women who differed in extraversion and neuroticism. After completing an Eysenck questionnaire that yielded E and N scores, the women participated in a laboratory experiment in which they viewed a series of photos showing faces that depicted varying emotional content. By analyzing brain scans taken while the photographs were viewed, the researchers could determine whether E and N were linked to brain activity, as Eysenck predicted.

So how did Eysenck's theory fare? Let's look at the two traits one at a time. Eysenck predicted that higher levels of extraversion would be associated with lower levels of

cortical arousal—that is, arousal in the cortex of the brain—when people encounter environmental stimuli. This prediction was only partly supported by the fMRI evidence (Kehoe et al., *in press*). When the researchers examined arousal in the cerebellum (a brain region that influences motor movement but also is involved in emotional response), extraverts displayed lower levels of arousal, in accord with the Eysenckian prediction. But when they examined a different brain region, the insula (which contributes to the subjective conscious experience of emotion), extraverts displayed higher levels of brain arousal, contradicting Eysenck's theory.

fMRI evidence was more consistent with Eysenck's theory about the other trait, neuroticism. When emotionally arousing stimuli were presented, people higher in neuroticism displayed higher levels of brain activity in a region in the front of the brain, the prefrontal cortex (Kehoe et al., *in press*). This is not the exact region of the brain that Eysenck had linked to N; he anticipated that neuroticism would be associated with variations in lower-level regions of the brain, in the limbic system. Nonetheless, since the prefrontal cortex and limbic system are highly interconnected, the results are consistent with Eysenck's general expectations that the brains of people high in neuroticism would respond more strongly.

These findings represent a start in using fMRI to understand E and N. One would hope to see them replicated with larger and more diverse samples of participants and with a wider array of experimental stimuli. When it comes to the neural bases of extraversion and neuroticism, there's still a lot to learn. •

Less is known about the biological basis for the psychoticism (P) dimension. However, here a genetic association is suggested, in particular an association linked with maleness; aggressiveness, a component of (P), is higher in men and may be affected by levels of testosterone (Eysenck, 1990). A more recent suggestion involved a neurotransmitter in the brain, namely, dopamine. Research suggests that people with higher levels of psychoticism have higher levels of dopamine-based neural activity (Colzato, Slagter, van den Wildenberg, & Hommel, 2009). This result is intriguing in that dopamine also has been linked to the severe mental disorder schizophrenia.

EXTRAVERSION AND SOCIAL BEHAVIOR

Do people who differ in extraversion-introversion scores also differ in their everyday social behavior? A mountain of evidence speaks to this question; extraversion is probably the most extensively studied of all traits, in part because relevant behaviors are relatively easy to observe (Gosling, John, Craik, & Robins, 1998). A review of the dimension presents an impressive array of findings (Watson & Clark, 1997). For example, introverts are more sensitive to pain than extraverts; they become fatigued more easily than extraverts; excitement interferes with their performance whereas it enhances performance for extraverts; and they tend to be more careful but slower than extraverts. The following additional differences have been found:

1. Introverts do better in school than extraverts, particularly in more advanced subjects. Also, students withdrawing from college for academic reasons tend to be extraverts, whereas those who withdraw for psychiatric reasons tend to be introverts.
2. Extraverts prefer vocations involving interactions with other people, whereas introverts tend to prefer more solitary vocations. Extraverts seek diversion from job routine, whereas introverts have less need for novelty.
3. Extraverts enjoy explicit sexual and aggressive humor, whereas introverts prefer more intellectual forms of humor such as puns and subtle jokes.
4. Extraverts are more active sexually, in terms of frequency and different partners, than introverts.
5. Extraverts are more suggestible than introverts.

This last finding is illustrated in a study of a hyperventilating epidemic in England (Moss & McEvedy, 1966). An initial report by some girls of fainting and dizziness was followed by an outbreak of similar complaints, with 85 girls needing to be taken to the hospital by ambulance—"they were going down like ninepins." A comparison of the girls who were affected with those who were not, demonstrated that, as expected, the affected girls were higher in both neuroticism and extraversion. In other words, those individuals whose personalities were most predisposed to suggestion proved most susceptible to influence by suggestions of a real epidemic.

Finally, the results of an investigation of study habits among introverts and extraverts may be of particular interest to college students. The research examined whether such personality differences are associated with differing preferences for where to study and how to study, as would be predicted by Eysenck's theory. In accord with Eysenck's theory of individual differences, the following was found: (1) extraverts more often chose to study in library locations that provided external stimulation than did introverts, (2) extraverts took more study breaks than did introverts, and (3) extraverts reported a preference for a higher level of noise and for more socializing opportunities while studying than did introverts (Campbell & Hawley, 1982). Extraverts and introverts differ in their physiological responses to the same noise level (introverts show a greater level of response), and each functions best at his or her preferred noise level (Geen, 1984). An important implication of such research is that different environmental designs for libraries and residence units might best fit the needs of introverts and extraverts.

PSYCHOPATHOLOGY AND BEHAVIOR CHANGE

Eysenck also developed a theory of abnormal psychology and behavior change. A core idea Eysenck espoused is that the type of symptoms or psychological difficulties a person experiences relate to basic personality traits and the nervous system functioning associated with the traits. A person develops neurotic symptoms because of the joint action of a biological system and environmental experiences that contribute to the learning of strong emotional reactions to fear-producing stimuli. Consistent with this suggestion of Eysenck's, the vast majority of neurotic patients tend to have high neuroticism and low extraversion scores (Eysenck, 1982, p. 25). In contrast, criminals and antisocial persons tend to have high neuroticism, high extraversion, and high psychoticism scores. Such individuals show weak learning of societal norms.

Despite the genetic component of personality traits and disorders, Eysenck was optimistic about treatment: "The fact that genetic factors play a large part in the initiation and maintenance of neurotic disorders and also of criminal activities is very unwelcome to many people who believe that such a state of affairs must lead to therapeutic nihilism. If heredity is so important, they say, then clearly behavior modification of any kind must be impossible. This is a completely erroneous interpretation of the facts. What is genetically determined are predispositions for a person to act and behave in a certain manner, when put in certain situations" (Eysenck, 1982, p. 29). It is possible for a person to avoid certain potentially traumatic situations, to unlearn fear responses, to learn appropriate social conduct, and thus to achieve a personality style that varies from his or her original predispositions. Eysenck thus was a major proponent of behavior therapy, which is the systematic application of principles of learning and behavior change to therapy (see Chapter 10).

COMMENT ON EYSENCK

In many ways, Eysenck's contributions to personality science are exemplary. He upheld the highest standards of science while theorizing in a creative manner. He brought diverse forms of evidence to bear on questions of individual differences. His prolific writings delivered his messages about personality not only to fellow scientists but also to a wider intellectual public. If personality psychology had experienced ten Eysencks instead of one, it would today be a much stronger field.

Historically, Eysenck was always prepared to swim against the tide. "I have usually been against the establishment and in favor of the rebels. Readers who wish to interpret this in terms of some inherited oppositional tendency, some acquired Freudian hatred of father substitutes, or in any other way are of course welcome" (Eysenck, 1982, p. 298). Of course, this is Eysenck's own view of his own work. Many contemporary scholars would contend that the Eysenckian strategy of describing individual persons in terms of scores on a small number of universal personality dimensions is itself an establishment procedure against which the humanist might rebel.

One might ask why Eysenck has not been even more influential (see Loehlin, 1982). Many psychologists have moved away from Eysenck's views. At least four factors have contributed to his diminished impact. (1) Alternative two- and

three-dimensional models have been proposed that better fit the available data; for example, individual differences on the dimensions of impulsivity and anxiety, rather than E and N, often appear superior for describing biologically based individual differences (Gray, 1990). (2) As Eysenck (1990) recognized, his theories of the biological bases of personality traits—particularly of neuroticism and psychotism—lack consistent support. At the same time, Eysenck often is credited with being a pioneer in the effort to relate personality traits to biological variables. (3) On a point that involves the practice of science as a social activity, Eysenck's decision to found a new journal (see above) may partly have backfired. When a scientist starts a scientific journal, devotees of the scientist's position read it carefully, but others may not. Publications thus become isolated from the field's mainstream. The existence of a journal devoted strongly to research in the Eysenckian tradition may have contributed to isolating this tradition from the rest of psychology, thus lowering its impact outside of the United Kingdom, Eysenck's scientific home base. (4) Maybe more than two or three factors are needed to describe personality. It is not hard to think of personality characteristics (e.g., honesty, reliability, creativity) that cannot easily be fit into the Eysenckian system. Maybe trait theorists don't need as many as 16 basic traits. Yet they might need more than 2 or 3. This simple point is the foundation for the scientific investigations that we review in our next chapter.

MAJOR CONCEPTS

Ability, temperament, and dynamic traits In Cattell's trait theory, these categories of traits capture the major aspects of personality.

Cardinal trait Allport's concept for a disposition that is so pervasive and outstanding in a person's life that virtually every act is traceable to its influence.

Central trait Allport's concept for a disposition to behave in a particular way in a range of situations.

Extraversion In Eysenck's theory, one end of the introversion-extraversion dimension of personality characterized by a disposition to be sociable, friendly, impulsive, and risk taking.

Factor analysis A statistical method for analyzing correlations among a set of personality tests or test items in order to determine those variables or test responses that increase or decrease together. Used in the development of personality tests and of some trait theories (e.g., Cattell, Eysenck).

Functional autonomy Allport's concept that a motive may become independent of its origins; in particular, motives in adults may become independent of their earlier base in tension reduction.

Introversion In Eysenck's theory, one end of the introversion-extraversion dimension of personality characterized by a disposition to be quiet, reserved, reflective, and risk avoiding.

L-data In Cattell's theory, life-record data relating to behavior in everyday life situations or to ratings of such behavior.

Neuroticism In Eysenck's theory, a dimension of personality defined by stability and low anxiety at one end and by instability and high anxiety at the other end.

OT-data In Cattell's theory, objective test data or information about personality obtained from observing behavior in miniature situations.

Psychotism In Eysenck's theory, a dimension of personality defined by a tendency to be solitary and insensitive at one end and to accept social custom and care about others at the other end.

Q-data In Cattell's theory, personality data obtained from questionnaires.

Role Behavior considered to be appropriate for a person's place or status in society. Emphasized by Cattell as one of a number of variables that limit the influence of personality variables on behavior relative to situational variables.

Secondary disposition Allport's concept for a disposition to behave in a particular way that is relevant to few situations.

Source trait In Cattell's theory, behaviors that vary together to form an independent dimension of

personality, which is discovered through the use of factor analysis.

State Emotional and mood changes (e.g., anxiety, depression, fatigue) that Cattell suggested may influence the behavior of a person at a given time. The assessment of both traits and states is suggested to predict behavior.

Superfactor A higher-order or secondary factor representing a higher level of organization of

traits than the initial factors derived from factor analysis.

Surface trait In Cattell's theory, behaviors that appear to be linked to one another but do not in fact increase and decrease together.

Trait A disposition to behave in a particular way, as expressed in a person's behavior over a range of situations.

REVIEW

1. The trait concept represents people's broad dispositions to display a certain type of behavior or to have certain types of emotional experiences. Allport, one of the first trait theorists, differentiated among cardinal traits, central traits, and specific dispositions. He also suggested that some traits could only be identified through idiographic research strategies, that is, research strategies that are sensitive to potentially idiosyncratic qualities of particular individuals.
2. Many trait theorists use the statistical technique of factor analysis to develop a classification of traits. Through this technique a group of items or responses (factors) are formed, the items in one group (factor) being closely related to one another and distinct from those in another group (factor).
3. Cattell distinguished among ability, temperament, and dynamic traits, as well as between surface and source traits.
4. According to Eysenck, the basic dimensions of personality are introversion-extraversion, neuroticism, and psychotism. Questionnaires have been developed to assess people along these trait dimensions. Research has focused particularly on the introversion-extraversion trait dimension, where differences in activity level and activity preferences have been found. Eysenck suggests that individual differences in traits have a biological and genetic (inherited) basis.