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Guest Editorial

On the Functional Properties of Perceived Self-Efficacy Revisited

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This commentary addresses the functional properties of perceived self-efficacy in the context of a set of studies contending that belief in one's capabilities has debilitating or null effects. It encompasses four theoretical orientations. These include social cognitive theory rooted in an agentic perspective, control theory grounded in a cybernetic model, and trait self-efficacy theory and Big Five theory based on a decontextualized trait model. Critical analyses of the studies in question document their failure to fulfill key theoretical, methodological, analytical, and construct assessment requirements. The article extends beyond critical analyses of the published studies. It specifies the theoretical, methodological, and analytical requirements essential to the advancement of knowledge on the role that perceived self-efficacy plays in human self-development, adaption, and change at both the individual and collective levels.

Keywords: *agency theory; goal setting; personality*

The present article addresses a variety of issues concerning the functional properties of perceived self-efficacy within the agentic perspective of social cognitive theory. It does so in the context of studies based on perceptual control theory, trait self-efficacy theory, and

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Big Five trait theory contending that self-efficacy has negative or null effects. A set of articles published by adherents of Powers's (1973) perceptual control theory maintain that derivations from this theory predict that belief in one's capabilities is self-debilitating. These publications include studies by Vancouver and his collaborators (Vancouver & Kendall, 2006; Vancouver, More, & Yoder, 2008; Vancouver, Thompson, Tischner, & Putka, 2002; Vancouver, Thompson, & Williams, 2001). In a test of trait self-efficacy theory, Yeo and Neal (2006) argue that domain-linked self-efficacy is debilitating, whereas general trait self-efficacy is behaviorally enhancing. In addition, this commentary provides a comparative conceptual and empirical analysis of the claim that the Big Five traits predict performance but that self-efficacy fails to do so (Judge, Jackson, Shaw, Scott, & Rich, 2007).

Empirical tests of a theory include the core theory, a set of auxiliary assumptions, psychological interventions presumed to alter the key determinants, and the measures purported to assess them (Meehl, 1978). Hence, it is not a core theory alone that is being put to empirical test. The studies cited above provide a context for addressing key theoretical, methodological, analytical, and construct assessment issues in the verification of the effects of self-efficacy beliefs on human self-development, adaptation, and change.

Sources of Discordance Between Self-Efficacy Belief and Action

Because of the multidetermination and contingent nature of everyday life, human behavior is conditionally manifested. Hence, no factor in the social sciences has invariant effects. To explain these complexities of human functioning, a theory must specify conditional factors. Social cognitive theory does not allege an invariant self-efficacy effect. Indeed, it explicitly specifies a variety of conditions under which self-efficacy may be unrelated, or even negatively related, to quality of psychosocial functioning (Bandura, 1997). Many of the sources of discordance between efficacy beliefs and action center on the assessment of self-efficacy. These include faulty measures of self-efficacy; misconstrual of self-efficacy as an omnibus trait that is unconditionally manifested; mismatch between assessed self-efficacy and the activity domain, temporal disparities between assessed self-efficacy beliefs and performance under conditions in which self-efficacy has changed in the interim, and failure to distinguish between self-efficacy during acquisitional phases and performance of acquired skills under taxing conditions.

Other sources of discordance are at the performance locus. These include faulty assessment of performance and ambiguity about the performance undertakings. There is little basis for judging one's self-efficacy for activities shrouded in ambiguity. The consequences of misjudgment and situational constraints also can be distorting. Individuals are unlikely to take seriously their self-appraisals in performance situations in which misjudgment of capability is inconsequential. Under forcible disincentives or imposed social and physical constraints, individuals are disinclined to act on their self-efficacy beliefs. Analytic procedures also can alter the nature of relations in a causal structure. These include theoretical misspecification of the location of self-efficacy in the causal ordering of multiple determinants and statistical overcontrol for covarying factors that include self-efficacy among their determinants.

Self-efficacy belief may also diverge from action because of genuine faulty self-appraisal. As noted above, however, in most of the sources of discordance the problem is not the self-knowledge but rather the extraneous factors that distort the relation between self-belief of capability and action. The processes through which these various factors can distort the functional relation between self-belief and action and the empirical support for them are analyzed extensively elsewhere (Bandura, 1997). Throughout this article, *perceived self-efficacy* is shortened to *self-efficacy* for linguistic thrift.

The findings of two meta-analyses of studies in which self-efficacy is experimentally varied to differential levels puts the negative self-efficacy effect in proper perspective. Boyer and his colleagues (2000) found negative self-efficacy effects in only 5.5% of the studies. Moderate to high positive effect sizes were obtained regardless of whether self-efficacy was altered by enactive experience (0.75), modeling (1.02), or verbal persuasion (0.40). The modeling and persuasive modes of influence are especially informative because they raise and lower self-efficacy independently of performance. Hence, the altered self-efficacy beliefs cannot be dismissed as reflectors of prior performance. Positive effect sizes were also consistently found regardless of whether the populations were children (1.51), adolescents, (0.30), student adults (0.70), or nonstudent adults (0.66).

In their meta-analysis of collective efficacy, Stajkovic and Lee (2001) also found negative self-efficacy effects in only 6.8% of the studies. The low incidence rate cannot be discounted as a publication bias favoring articles reporting positive effects. The authors identified the relevant studies by computerized searches of the databases not only of published journal articles but also of unpublished sources such as dissertation abstracts, references in books, presentations at annual meetings, and solicited unpublished manuscripts from researchers in the field. This comprehensive search minimized possible bias in the database

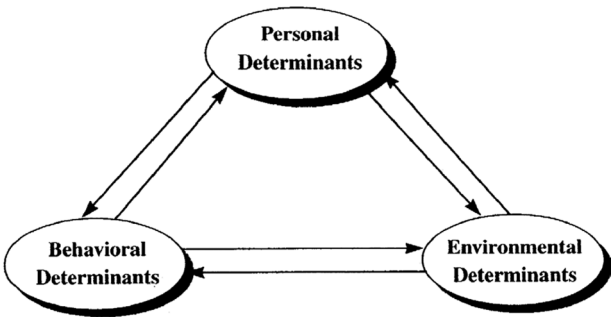
Self-efficacy is embedded in a broader social cognitive theory. Hence, to understand the nature and functional properties of self-efficacy requires a brief summary at the outset of some of the main tenets of social cognitive theory. The subsequent sections of this commentary address a variety of issues raised by the studies in question conducted within the conceptual framework of control theory, trait self-efficacy theory, and Big Five trait theory.

Social Cognitive Theory

Social cognitive theory is founded on an agentic perspective (Bandura, 2006d, 2008a). To be an agent is to exert intentional influence over one's functioning and the course of events by one's actions. Social cognitive theory subscribes to a casual structure grounded in triadic reciprocal causation (Bandura, 1986). In this triadic codetermination, human functioning is a product of the interplay of intrapersonal influences, the behavior individuals engage in, and the environmental forces that impinge upon them (Figure 1). Because intrapersonal influences, in which self-efficacy is a constituent, are part of the determining conditions in this dynamic interplay, people have a hand in shaping events and the course their lives take.

The nature of the environment in the triadic codetermination warrants brief comment. The environment is not a monolithic force. The agentic perspective distinguishes among three types of environments—imposed, selected, and constructed. The imposed environment acts on individuals whether they like it or not. However, they have some leeway in how they

Figure 1
Schematization of Triadic Reciprocal Determination in the Causal Model of Social Cognitive Theory



construe it and react to it. For the most part, the environment is only a potentiality that does not come into being unless selected and activated. The activities and environments individuals choose affect the course their lives take. And finally, people create environments that enable them to exercise better control of their lives. Gradations of environmental changeability require increasing levels of efficacy-based agentic activity.

The environment is not confined to physically proximate influences. Integration of social cognitive theory with social network theory (Bandura, 2006c) has fostered research on the role of self-efficacy in the diffusion of innovation across broad social networks. Revolutionary advances in electronic technologies have transformed the nature, reach, speed, and loci of human influence. People now spend much of their lives in the cyberworld. Social cognitive theory addresses the growing primacy of the symbolic environment and the expanded opportunities it affords people to exercise greater influence in how they communicate, educate themselves, carry out their work, relate to each other, and conduct their business and daily affairs (Bandura, 2002).

People exercise their influence through different forms of agency rooted in corresponding types of efficacy beliefs (Bandura, 1997, 2000). In personal agency exercised individually, people bring their influence to bear on what they can control directly. However, in many spheres of functioning, people do not have direct control over conditions that affect their lives. They exercise proxy agency. This requires influencing others who have the resources, knowledge, and means to act on their behalf to secure the outcomes they desire. People do not live their lives in social isolation. Many of the things they seek are achievable only by working together. In the exercise of collective agency, they pool their knowledge, skills, and resources and act in concert to shape their future. To do so they have to achieve unity of effort for common purpose within diverse self-interests and distribute and coordinate subfunctions across individuals of differing competencies. The more heavily group performance depends on interdependent effort, the greater the contribution of collective efficacy to group productivity (Stajkovic, Lee, & Nyberg, 2009).

Self-Efficacy as a Component of Social Cognitive Theory

The self-efficacy portion of social cognitive theory addresses the origin of self-efficacy beliefs, their structure and functional properties, their diverse effects, the processes through which they work, and how to develop and enlist such beliefs for personal and social change (Bandura, 1997). Diverse lines of research provide a wealth of information on each of these different aspects of self-efficacy theory (Bandura, 1995, 1997; Maddux, 1995; Pajares & Urdan, 2006; Schwarzer, 1992).

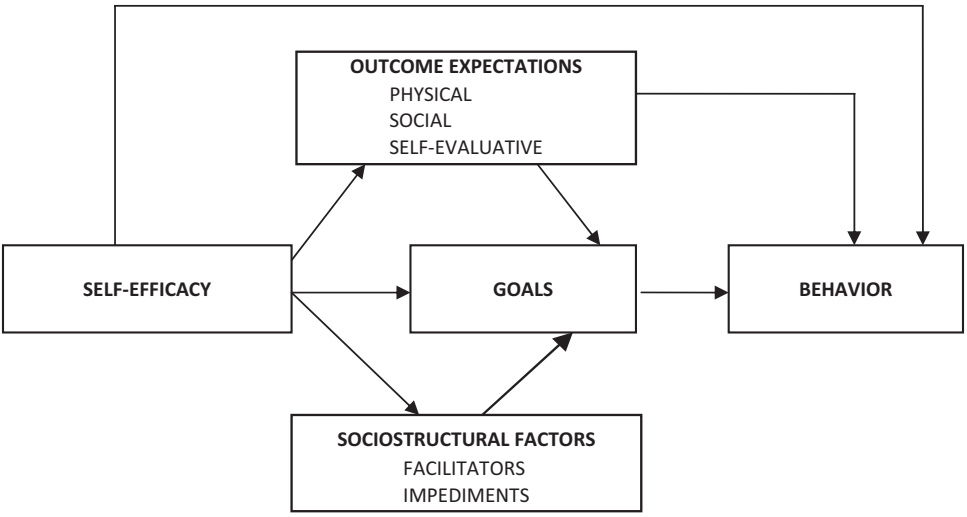
Examination of the structure of the self-belief system verifies that people's beliefs in their capabilities vary across activity domains and situational conditions rather than manifest uniformly across tasks and contexts in the likeness of a general trait. Regarding the sources of self-efficacy, people's beliefs in their capabilities are developed in four ways. The first is through mastery experiences. If people experience only easy successes they come to expect quick results and are easily discouraged by setbacks and failures. Resilient self-efficacy requires experience in overcoming obstacles through perseverant effort. Resilience is also built by learning how to manage failure so that it is informative rather than demoralizing. The second way of developing self-efficacy is by social modeling. Seeing people similar to oneself succeed by perseverant effort raises observers' aspirations and beliefs in their own capabilities. Social persuasion is the third mode of influence. If people are persuaded to believe in themselves they are more perseverant in the face of difficulties. Resolve increases the chance of success. Individuals are encouraged to measure success by self-improvement rather than by triumphs over others. People also rely partly on their physical and emotional states in judging their self-efficacy. Efficacy beliefs are strengthened by reducing anxiety and depression, building physical strength and stamina, and correcting the misreading of physical and emotional states.

Self-efficacy beliefs affect the quality of human functioning through cognitive, motivational, affective, and decisional processes. Specifically, people's beliefs in their efficacy influence whether they think pessimistically or optimistically, in self-enabling or self-debilitating ways. Self-efficacy beliefs influence how well people motivate themselves and persevere in the face of difficulties through the goals they set for themselves, their outcome expectations, and causal attributions for their successes and failures. People's beliefs in their coping capabilities play a pivotal role in their self-regulation of emotional states. This affects the quality of their emotional life and their vulnerability to stress and depression. The final way in which self-beliefs of efficacy contribute to self-development and change concerns choice processes. Such beliefs affect the slate of options people consider and the choices they make at important decisional points. By their choices of activities and environments, people set the course of their life paths and what they become.

Theoretical Scope

Social cognitive theory provides not only knowledge for predicting behavior but also a theory of learning and change. It specifies the modes and mechanisms of learning as they operate through attentional, representational, translational, and motivational processes. The learning portion of the theory, which is a key feature of the change model, specifies how

Figure 2
Structural Paths of Influence Wherein Perceived Self-Efficacy Affects Motivation and Performance Accomplishments Directly and Through Its Impact on Goals, Outcome Expectations, and Perception of Sociostructural Facilitators and Impediments



individuals acquire knowledge structures; cognitive, social, and emotional proclivities; and behavioral competencies (Bandura, 1986, 1997). This body of knowledge for effecting personal and social change is one of the hallmarks of social cognitive theory.

To add further to the scope of the theory, it encompasses a large set of factors that operate as regulators and motivators of action rooted in a well-established body of knowledge (Bandura, 1986, 1991b). Figure 2 shows the paths of influence in the posited sociocognitive structural model of self-motivation and self-regulation of action. Self-efficacy is a focal determinant because it affects behavior both directly and by its influence on the other determinants. One set includes the outcome expectations for prospective courses of action. These incentive motivators may be material costs and benefits, social detriments and benefits, and positive and negative self-evaluative reactions to one's own behavior. Different lines of research clarify how these incentive systems are developed and work in concert when they are complementary or in conflict (Bandura, 1986). Cognized goals and personal standards rooted in value systems function as further incentives and guides for action through self-reactive mechanisms. How people perceive the structural characteristics of their environment—the impediments it erects and the opportunity structures it provides—also influences the course of human action. Those of low self-efficacy are easily convinced of the futility of effort when they come up against institutional impediments, whereas those of high self-efficacy figure out ways to surmount them.

Diverse lines of research have verified the various paths in the structural model (Bandura, 1997). Longitudinal research, evaluating the full set of determinants with structural equation modeling, confirms that the model provides a good fit to the empirical data (Plotnikoff, Lippke, Courneya, Birkett, & Sigal, 2008). Among these different determinants, self-efficacy emerges as the strongest predictor.

The scope of a personality theory has important social implications on how it is used. A theory confined mainly to prediction is heavily oriented toward selection based on the attributes people possess. A theory of broader scope that addresses both prediction and change provides actionable knowledge on how to enable people to develop desired attributes and improve their living conditions. It also broadens the scope of agentic influence. The exercise of human agency is embedded in social systems. However, social cognitive theory rejects a duality of personal agency and social structure (Bandura, 2008b). They function interdependently rather than as disembodied entities. People create social systems, and the authorized rules and practices of social systems, in turn, influence human development and functioning.

Measurement of Self-Efficacy

As noted in the introduction, tests of a theory require valid assessment of its key constructs. There are serious problems in the measurement of self-efficacy in the studies under discussion. Before commenting on the validity of the measures in question, I will review briefly the standard procedure for constructing psychometrically sound scales of perceived self-efficacy. Self-efficacy is concerned with people's beliefs in their capabilities to produce given attainments (Bandura, 2006b). All too often, this belief system is treated as though it is a generalized trait. In fact, people differ in their efficacy, not only across different domains of functioning but even across various facets within an activity domain. Consequently, there is no single all-purpose measure of self-efficacy with a single validity coefficient.

The construction of valid self-efficacy scales requires sound conceptual specification of the determinants governing performance in a given domain of functioning and the impediments to realizing desired attainments (Bandura, 2006b). Consider, by way of example, the role of self-regulatory efficacy in the management of one's weight. There are at least three separable aspects to this endeavor that are personally controllable. To begin with, it includes self-efficacy to regulate the type of food products that are purchased and brought home. This creates the food environment that can be conducive to shedding pounds or that undermines such efforts. The second factor concerns one's eating habits that determine daily caloric intake. The third controllable factor is the level of physical activity that burns calories and affects the body's metabolic rate. Focusing solely on self-efficacy to regulate eating habits, as is typically the case, presents a truncated view of the contribution of self-efficacy to weight self-management. In the case of eating disorders, self-efficacy for stress management, affect regulation, and management of interpersonal relationships come into play as well.

The events over which personal influence is exercised can vary widely. They may entail regulating one's own motivation, thought processes, performance level, emotional states, or altering environmental conditions. Many areas of functioning are primarily concerned with self-regulatory efficacy to motivate oneself to get things done that one knows how to do. In

such instances, perceived self-regulation is the capability of interest. The issue is not whether one can do certain activities occasionally but whether one has the efficacy to get oneself to do them *regularly* in the face of different types of impediments.

Maurer and Andrews (2000) introduced confusion into the assessment of self-efficacy. They advocate substituting a Likert-type bipolar scale in the rating but scoring it as a unipolar scale ranging from 1 (*strongly disagree*) through a neutral midpoint of 3 (*neither agree nor disagree*) to 5 (*strongly agree*). A Likert-type scale is appropriate for phenomena that have positive and negative valences, such as attitudes, opinions, and likes and dislikes, but not for self-efficacy because a judgment of complete incapability (0) has no lower negative gradations. One cannot be any less than completely inefficacious.

Efficacy scales are unipolar, ranging from zero to a maximum strength of belief. Bipolar scales of self-efficacy with negative gradations below the zero point make no sense. In scoring the discontinuous bipolar scale, authors convert partially ordered positive and negative segments disjoined with neutral in between (*neither agree nor disagree*) as though it were a completely ordered unipolar gradation. It is meaningless to say that one has a neutral level of self-efficacy. When ratings on a bipolar scale are converted to a unipolar ordinal one, the meaning of the neutral midpoint is reconstrued as a moderate level of self-efficacy. Unfortunately, bipolar Likert-type scales are beginning to appear as measures of self-efficacy, with distorted meaning.

Chen, Gully, and Eden (2001) created an eight-item measure of trait self-efficacy. Individuals rate on a discontinuous bipolar scale statements that they can "perform effectively on different tasks," "succeed at most any endeavors," "achieve most of their goals and important outcomes," and "overcome many challenges." These indefinite items do not specify the activities to be performed, at what level of attainment, the nature and level of the goals they are striving for, and what those "valued outcomes" and "challenges" are. This trait measure also includes a confound. I *can* is a statement of efficacy. I *will* is a statement of intention. In one of the eight items, individuals are instructed to rate their agreement with a statement of certainty that "I will accomplish" difficult tasks. A statement of intention should not be included in a self-efficacy scale.

Scales that use only a few response options are less sensitive and less reliable because they omit differentiating information (Streiner & Norman, 1989). Thus, an efficacy scale with multiple gradations of strength of self-efficacy is a stronger predicator of performance than one with only a few choices (Pajares, Hartley, & Valiante, 2001). In their task-related measure of self-efficacy, Yeo and Neal (2006) asked participants to rate their confidence for only three performance levels—very easy, moderate, or very difficult. Individuals who judge themselves inefficacious for very difficult performance are likely to differ in their efficacy for intermediate levels of performance, which the scale prevents them from rating. Scores that are restricted distort the relation between variables.

In four of the laboratory studies conducted by Vancouver and his collaborators (Vancouver et al., 2002; Vancouver et al., 2001), participants were instructed to guess the correct color pattern that was randomly changed across games. This is analogous to asking high jumpers to judge their efficacy before each try when they do not know the height of the bar that is randomly changed. It is meaningless to ask individuals to judge their efficacy in guessing randomly changing color patterns. As would be expected for a guessing game, they judged they had on average about 50% chance of guessing the correct pattern. In a study of

the role of self-efficacy in academic achievement, Vancouver and Kendall (2006) measured self-efficacy with a single item. Undergraduates were asked to foretell their letter grades for the next quiz. This is not a measure of self-efficacy. There is a difference between foretelling a letter grade, which can be influenced by a variety of factors, and judging the strength of one's belief that one can achieve academic performances assessed across the full range of grade levels. In the entire set of studies conducted by Vancouver et al., not a single one included adequate assessment of self-efficacy.

Misconstrual of Domain-Linked Assessment as Task Specificity

There is a common misconception that self-efficacy theory is confined to "narrow" task measures in which individuals judge their efficacy for a specific performance on a specific task. The dictionary entry defines *task* as a "piece of work." Judgments of self-efficacy for pursuits like academic achievement, organizational productivity, entrepreneurship, and effecting social change encompass activities of broad scope, not just an isolated piece of work. Moreover, strength of self-efficacy is measured across a wide range of performances within an activity domain, not just performance on a specific item. To cite an example, general intelligence is assessed by a set of highly specific items of varying levels of challenge. However, it is not mischaracterized as a task-specific narrow measure. Similarly, in the standard self-efficacy assessment, an activity domain is measured by a set of specific items representing gradations of challenge, but the self-efficacy score is for the totality of items encompassing the domain of activities, not for a specific item within it. It is not the accuracy of the self-efficacy measures in published studies using the standard assessment procedure that is in question. Rather, it is the mischaracterization of them as highly specific and narrow in scope.

Activity domains, of course, vary widely in breadth and complexity, so the scope of the self-efficacy assessment and the types of self-efficacy that are relevant will depend on the sphere of activity. The assessment may be of limited scope, as in perceived creative capability to generate varied functional uses for a given object, or of broad scope, as in perceived collective efficacy to achieve organizational venture growth. Moreover, complex activity domains usually require multidimensional assessment of different types of self-efficacy operating in concert. Conceptually grounded multidimensional assessments of self-efficacy are usually broad in scope and domain complexity. It is time to retire the misleading claim that self-efficacy theory is inherently wedded to "narrow measures."

The mischaracterization of self-efficacy as narrow in scope is often used as justification for creating decontextualized one-size-fits-all trait measures of self-efficacy. These types of global measures of self-efficacy usually bear weak relation both to domain-related self-efficacy beliefs and to behavior. There is substantial evidence on this matter (Earley & Lituchy, 1991; Eden & Zuk, 1995; McAuley & Gill, 1983; Pond & Hay, 1989; Stajkovic, Brown, & Reilly, 2008). When general measures are related to performance, they typically lose their predictiveness when the influence of domain-linked efficacy beliefs is removed (Caprara, Barbaranelli, Pastorelli, & Cervone, 2004; Martin & Gill, 1991; Pajares & Johnson, 1994).

Measures of general self-efficacy not only have problems of predictiveness. Most of them are seriously confounded as well. For the most part, they assess the cognitive, motivational,

affective, decisional, and behavioral *effects* of self-efficacy rather than peoples' *beliefs* in their capabilities (Ryckman, Robbins, Thornton, & Cantrell, 1982; Sherer et al., 1982; Tipton & Worthington, 1984).

Perceptual Control Theory

There are many control theories that differ in the types of factors appended to the negative feedback loop. However, virtually all are founded on Powers's (1973) perceptual control theory. The core feature of Powers's theory, which is an outgrowth of the mechanical cybernetic model, is the negative feedback loop. In this model, discrepancies between a programmed reference standard and the perceived input from the output automatically trigger action to match the standard. Error correction is the driving force. In Powers's (1991:152) succinct description of the governing error correction mechanism, "action is driven by the difference, or error." In this view, the human organism is "nothing more than a connection between one set of physical quantities in the environment (input quantities) and another set of physical quantities in the environment (output quantities)" (Powers, 1978: 421). This conceptual scheme embodies a hierarchy of nested feedback reference signals that serve as goal settings for subordinate negative feedback loops.

Powers (1978) dismissed interest in intrapersonal self-regulatory processes on the grounds that "we are not modeling the interior of the subject." The origin for the claim that belief in one's capability is self-debilitating is a commentary published by Powers (1991). It was in response to a growing body of evidence that belief in one's efficacy generally functions as an enabling personal resource. Powers designated self-efficacy belief as the interior shaper of perceived discrepancies within the negative feedback loop. Specifically, belief in one's efficacy "reduces the apparent shortfall that is driving behavior, and so decreases behavior" (Powers, 1991: 152). The self-impairing effect was stated as occurring unqualifiedly rather than conditionally. Responses to Powers's commentary (Bandura, 1991a; Rottschaefer, 1991) and a more detailed evaluation of perceived control theory are available elsewhere (Bandura & Locke, 2003; Locke, 1994).

In Powers's view, perceived self-efficacy serves only one function. It shrinks or expands perceived discrepancies between the goal reference and perceived performance. This is a very narrow view of how efficacy beliefs affect human functioning. As previously noted, they affect performance and well-being through cognitive, motivational, affective, and decisional processes. Of special relevance to control theory is evidence that individuals adjust their goal comparator based on their beliefs in their capabilities (Bandura, 1991b; Locke & Latham, 1990; Seo & Ilies, 2009). Hence, tests of the role of self-efficacy in control theory must examine how changes in self-efficacy alter the comparator in the form of self-set goals, not only perceived discrepancy. For example, among individuals who fall just short of their performance goals, they alter their level of effort depending on their perceived self-efficacy (Bandura & Cervone, 1986). Those of high self-efficacy set even higher goals for themselves and mount a vigorous effort to realize these goals; those of somewhat lower efficacy believe they can achieve the original goal, stick to it, and work a bit harder; and those who distrust their efficacy to even repeat what they had accomplished lower their goals and slacken their efforts.

Self-regulation of motivation and action by error correction through negative feedback is only half the story. People are proactive and aspiring. Their capacity for forethought enables them to exercise adaptive control anticipatorily rather than simply being reactive to the effects of their actions. Self-motivation relies on dual-control mechanisms that include both discrepancy production and discrepancy reduction. It requires proactive control as well as reactive control. People initially motivate themselves through proactive control by setting themselves challenging goals that create a state of disequilibrium. They then mobilize their efforts to attain the desired level. After they attain the standard they have been pursuing, those of high self-efficacy set a higher standard for themselves. The adoption of further challenges creates new motivating discrepancies to be mastered.

Role of Self-Efficacy in Self-Regulation of Motivation and Action

Research on the role of self-efficacy in the self-regulation of motivation and action has direct bearing on the reported self-debilitating effect. If self-efficacy shrinks and expands discrepancies, as claimed, evidence shows that it works in the opposite direction predicted by perceptual control theory. Research by Bouffard-Bouchard (1990) demonstrates the multiple self-regulatory benefits of belief in one's capabilities. Students' perceived problem-solving efficacy was raised or lowered independently of their actual performance by bogus feedback that they surpassed or fell short of their peer norm. Those whose self-efficacy was arbitrarily raised set higher standards for themselves, used more efficient strategies, and achieved higher intellectual performances than their counterparts whose self-efficacy was arbitrarily lowered. Among students equated for ability but differing in self-efficacy, those with a higher sense of efficacy manage their time better, are more persistent, are less likely to reject good solutions prematurely, and are more successful in their problem solving (Bouffard-Bouchard, Parent, & Larivee, 1991). As these and other studies reveal, it is not just what you have but how well you orchestrate what you have that determines the quality of performance. A skill is only as good as its execution. This is where self-regulatory influences come into play.

The notion that a negative mismatch between internal standards and perceived performance regulates effort automatically in a machinelike fashion (Powers, 1991) is disputed by evidence that the identical negative discrepancy has diverse effects depending on how it is framed. Jourden (1991) had business students manage a computer simulation of an organization and receive accurate feedback of their performances. Jourden used a framing influence by characterizing their actual performances in terms of degree of shortfall from the assigned productivity goal (20% short of the goal) or degree of advancement toward the goal (80% headway toward the goal). The performance level is identical in both conditions, but the mindset is different, that is, accenting performance deficiencies or performance gains. Under the mastery frame, the participants were resilient in their managerial efficacy, set progressively higher goals, improved the quality of their decision making, were more satisfied with their performances, and achieved higher organizational productivity. Under the deficiency frame, which should be especially motivating according to control theory because it portrays the discrepancy in error terms, the participants became progressively worse on all the indices of functioning noted above.

Nor does control theory fare well in experiments in which the level and direction of discrepancy between reference standard and performance attainments are arbitrarily varied by bogus feedback adjusted for prior performance (Bandura & Cervone, 1986). Within-person changes in motivation were measured in terms of effort expenditure, with adjustment for individual differences in baseline performances. The study assessed not only self-efficacy but also self-set goals and level of self-dissatisfaction with substandard performances. Contrary to control theory, in hierarchical regression analysis self-efficacy enhanced motivation at every level of discrepancy. The stronger the self-efficacy to realize a challenging standard, the more the participants intensified their efforts. Self-efficacy operated as a motivator, regardless of whether attainments supposedly fell substantially, moderately, or minimally short of the assigned goal or even exceeded it.

Methodological Deficiencies in Tests of Control Theory

Table 1 summarizes the methodological deficiencies of the set of studies designed to test the adverse effects of belief in one's capabilities. Deficiencies in the assessment of self-efficacy were documented earlier. Another methodological problem concerns the appropriateness of the performance tasks. In four of their studies, Vancouver et al. (2002, 2001) used a game with two odd characteristics for studying the functional role of self-efficacy. They included guesswork and random sequential disconnectedness. Participants had to guess the color and position of four pegs in a row. The correct pattern was preset randomly by the computer for each game in the series. In this guessing game, there is little that is incrementally learnable.

To further detract from the meaningfulness of the task, it contains a confound that cannot be disentangled. It is impossible to separate sheer guesses from discovery of the solution for a given game. Indeed, some participants had to be discarded because they guessed the correct pattern on the very first try by sheer luck. The research yielded a minute negative relation of self-efficacy to subsequent performance (Vancouver et al., 2001). But unsettling to control theory, goals were also negatively related to performance. These are spurious negative relations that reflect the discordant structure of the task rather than the functional properties of goals and belief in one's capabilities.

In a subsequent study, Vancouver et al. (2008) selected another task with the same random discontinuity. They present the study as a test of four relations between self-efficacy and performance. These include growth, decline, inverted U, and discontinuous. Participants were instructed to hit a square flying around on a screen. The size of the target was randomly preset from round to round. Structuring a task with random disconnectedness will beget discontinuity by structural design. In these studies, self-efficacy beliefs cannot function proactively to promote incremental growth.

Then there is the troublesome goal comparator. As noted earlier, the goal comparator is an indispensible feature of Powers's control theory as well as other control theories. Without it, the feedback control system is immobilized. Vancouver et al. (2001) set out to verify predictions from control theory that self-efficacy impairs performance but that goals enhance it. Finding this opposite direction of causation was destined to failure from the outset. This is because the stronger the belief people have in their capabilities, the higher the

Table 1
Methodological Deficiencies in Tests of Perceptual Control Theory for Negative Self-Efficacy Effects

Vancouver, Thompson, & Williams (2001)
- Deficient assessment of self-efficacy
- Guessing game with random sequential disconnectedness
- Participants discarded because they guessed the correct solution on first trial
- Posited key mediator, "perceived discrepancy," never measured

Vancouver, Thompson, Tischner, & Putka (2002)
- Deficient assessment of self-efficacy
- Guessing game with random sequential disconnectedness
- Deletion of goal comparator rendered control theory untestable

Vancouver, More, & Yoder (2008)
- Deficient assessment of self-efficacy
- Performance tasks with random sequential disconnectedness
- Pseudo "do your best" goal substituted for an explicit goal comparator in test of control theory
- Discrepancy not judgeable against an indefinite "do your best" goal comparator

Vancouver & Kendall (2006)
- Deficient assessment of self-efficacy
- Participants discarded for "illogical responses" judging themselves inefficacious for low grades
- Assessment of strength of self-efficacy abandoned
- Posited "perceived preparedness" mediator not measured
- Effort tested by retrospective self-report
- Loss of discriminative information by converting continuous exam scores to categorical grades
- Lack of variance in goals for testing performance effects
- Past performance deleted from reported hierarchical linear modeling (HLM) analysis
- Use of a dated HLM program

Yeo & Neal (2006)
- Severely constricted range in self-efficacy assessment
- Deletion of goal comparator rendered control theory untestable
- Confounded experimental design
- Partialing out from current self-efficacy future versions of itself

goals they set for themselves, the firmer their commitment to them, and the greater their investment of effort to fulfill them (Bandura, 1997; Locke & Latham, 1990). Given the positive relation between self-efficacy and goal setting, getting them to work in opposing directions proved to be a daunting challenge.

The magnitude of the goal problem in Vancouver's efficacy-related studies is most telling when examined in the aggregate. Goals in these studies are nothing but methodological and empirical trouble. They did not work the way they were supposed to according to perceptual control theory. Of the six studies, contrary to control theory, in the initial two studies self-set goals had a *negative* effect on performance, as did self-efficacy (Vancouver et al., 2001). In the next study, the authors varied the level of assigned goals, but they, too, were negatively related to performance. In an odd dismissal of the discordant goal findings, the authors concluded that the negative goal effect is spurious "because we cannot think of a mechanism," but the negative self-efficacy is genuinely causal "because of control theory and the mechanism described by Powers (1991)" (p. 618). This is proof by ex cathedra presumption.

The complete faith in perceptual control theory is especially striking given that the presumptive causal chain (self-efficacy → shrinks perceived discrepancy → slackens effort → impairs performance) has never been tested empirically. The findings of experimental studies cited earlier on the role of self-efficacy in the self-regulation of motivation does not support it. Other studies generally show that people enhance their efforts as they near the goal rather than slacken their efforts. I shall revisit in greater detail the meditational issue in perceptual control theory.

Evidence that studies producing negative self-efficacy effects also produce negative goal effects indicate that goals are the canary in the mine for detecting spurious negative self-efficacy effects on oddly structured tasks. In two subsequent studies, Vancouver and his collaborators stayed clear of the troublesome negative goal effects by deleting goals from the experimental design (Vancouver et al., 2002). This exclusionary remedy for evidence contradictory to control theory not only left the anomalous negative goal effects unexplained but immobilized the feedback loop as well. The cybernetic control system requires a goal comparator; otherwise, there can be no discrepancies, and without discrepancies, there can be no driving force. Stripping the cybernet of its comparator, which precludes empirical test of the theory, was not a good thing to do.

In the fifth study, Vancouver et al. (2008) adopted an alternative solution to the troublesome negative goal effect problem. They substituted a pseudo-goal for genuine goals. They instructed participants to hit as many flying squares on a screen as possible in a three-minute period. Encouraging people to do their best is not a specification of a goal level. On the contrary, indefinite exhortation to do one's best, which Vancouver et al. misconstrue as an assigned goal, is widely used as an experimental control for social demand to enhance one's performance. For example, Locke and Latham (1990) use it regularly against which to measure the effects of genuine assigned or self-set goals. Because the pseudo-goal of "hit as many as possible" does not specify any particular performance level, it leaves the comparator in immobile ambiguity and control theory untestable. Their claim that the "goal" remained constant has no foundation in fact. Except for the indefinite exhortation to do one's best, goals were never measured. Given that people's belief in their efficacy affects the goals they set for themselves, Vancouver et al. do not explain how goals are rendered immune to people's beliefs in their efficacy. In the sixth study, once again, goals proved troublesome. They had no effect on performance. Vancouver and Kendall (2006) dismiss the null result as due to lack of variance in goals.

This brings me to the changing but untested mediators allegedly governing the debilitating effects of self-efficacy on performance. The size of perceived discrepancy that self-efficacy influences is the key mediator in the chain of events. Surprisingly, perceived discrepancy, which is the presumed driving force, is never measured and tested in the studies alleging negative self-efficacy effects. Vancouver et al. (2002) invest the depersonalized feedback loops with metacognitive capabilities. The feedback loops reflect on the adequacy of their thinking about the information that is fed back. Given that feedback loops have no personal identity, they couldn't care less about the adequacy of their thinking. Self-evaluative reactivity requires some form of self-representation. For Powers (1978), the discrepancy assessment works with machinelike automaticity. How a cybernet can judge its capabilities without some notion of itself that is personally evaluatable was never explained. In a recent study (Vancouver & Kendall, 2006),

"perceived preparedness" is invoked as the key mediator. As in the case of perceived discrepancy, the perceived preparedness mediator is never measured, let alone tested.

Life experiences are processed through the self-referential system rather than directly in a dispassionate way as though one were devoid of any personal investment in what one is doing (Bandura, 2008b). Moreover, self-regulation is not as dependable as the cybernetic metaphor would lead one to believe. In this automated process, the organism senses a mismatch and faithfully mobilizes the necessary effort to correct the error. In actuality, people often perfect skills for subverting their efforts to do what is difficult, unpleasant, and in competition with more attractive activities.

The varied forms that subversion of self-management takes have been vividly described. People temporize by deferring what needs to be done under the fantasy that they will have more time at a later period. The backlog of unfinished work piles up. In detouring, they do other things first that disrupt what needs to be done. Computers and wireless electronic devices provide a handy, limitless source of such detours. The author of a recent best seller was asked about his writing schedule. "I check the emails first," he replied. "Then I get down to writing. But before long I am back in the emails." In addition, people distract themselves with trifling matters that fritter away the time. If all else fails, they find excuses in the urgency of more immediate demands, unfavorable circumstances, and situational impediments.

Thermostat-like cybernets do not suspend temperature regulation on the grounds that they will do it in earnest tomorrow, they have other things to do first, they can distract themselves from their temperature-control mission by countless events around them, they do not feel up to it, or it is an inopportune time to manage the temperature. Social cognitive theory addresses the determinants of adherence to personal standards and the mechanisms through which personal standards are selectively disengaged, and it provides strategies for counteracting the subversion of self-regulation through temporizing, dawdling, detouring, and excusing (Bandura, 1986, 1997).

A comprehensive theory of self-regulation must also specify where the goals and personal standards that serve as the "comparators" come from and how they are constructed. Controlled experiments, conducted within the conceptual framework of social cognitive theory, have given us a better understanding of how personal standards are constructed under the diversity of social evaluative, modeling, and tutorial sources of influences in everyday life (Bandura, 1986).

Misrepresentation of Research on the Functional Properties of Self-Efficacy

Vancouver and his collaborators characterize the research on self-efficacy as merely correlational "passive research." They attribute positive self-efficacy relations to performance to uncontrolled differences in past performance (Vancouver & Kendall, 2006; Vancouver et al., 2008; Vancouver et al., 2002; Vancouver et al., 2001). Yeo and Neal (2006) make a similar claim. In these articles, the claim substitutes for review of the relevant empirical evidence. In point of fact, the thousands of self-efficacy articles include controlled laboratory investigations, randomized field studies, longitudinal studies, fine-grain analyses of within-person changes over time, and correlational studies of changes with multiple controls

not only for past performance but for a host of other possible determinants. The present section documents the misleading nature of the claim.

Controlled experimentation is the gold standard for verifying the unique contribution of self-efficacy to the quality of human functioning. Disputes about self-efficacy effects typically single out studies in which perceived self-efficacy is altered by enactive modes of influence. This provides a behavior to latch on to as an explanatory covariate. In experimental studies of causation, self-efficacy is systematically raised or lowered by nonperformance means (Bandura, 1997; Bandura & Locke, 2003). Such modes of influence provide no performance basis for judging one's efficacy. Some of these intervention studies using nonperformance modes of influence include fine-grain analyses of the microrelation between efficacy belief and subsequent action at each point in a change process. This body of research is highly consistent in its findings. Increasing people's beliefs in their capabilities fosters efficient self-regulation and enhances motivation, persistence in the face of difficulties, and performance attainments.

In naturalistic studies, performance is often used as a proxy for ability as a covarying factor. The recent years have witnessed major changes in the conception of human ability and competence (Sternberg & Kolligian, 1990). Ability is not a fixed entity in one's behavioral repertoire. Rather, it is a generative capability in which cognitive, social, emotional, and behavioral skills must be organized and effectively orchestrated to serve diverse purposes (Bandura, 1990). There is a marked difference between possessing knowledge and skills and being able to use them well under diverse circumstances, many of which contain ambiguous, unpredictable, and stressful elements. Self-efficacy plays an influential role at the operative level. The malleability of ability is strikingly illustrated in research demonstrating that individuals of higher self-efficacy outperform their counterparts of lower perceived efficacy at each level of ability (Bouffard-Bouchard, 1990; Bouffard-Bouchard et al., 1991; Collins, 1982).

Refined Index of Past Performance

Performance is not an isomorphic reflection of ability. Performance is heavily infused with many motivational and self-regulatory determinants. Past performance is thus a mixed conglomerate index in which perceived self-efficacy is part of its constellation of determinants. The use of raw performance scores overcontrols for ability. Efficacy beliefs, which are autocorrelated, affect both prior and future performance. Hence, using unadjusted past performance scores also removes some of the effects of efficacy beliefs on future performance.

A variety of statistical procedures have been devised to identify the unique contribution of self-efficacy to performance with control for past performance. Feltz, Chow, and Hepler (2008) tested different analytic models of the relation between self-efficacy and performance across recursive multiple trials. These alternative procedures included raw past performance, past performance after removing the self-efficacy contribution to it, self-efficacy after removing the performance contribution to it, and a dual-residualized model combining the latter two corrective adjustments. In all of these models, self-efficacy remains a unique contributor to subsequence performance. Moreover, in both residualized models, self-efficacy not only is a stronger predictor but increases in predictiveness over time. Heggestad and Kanfer (2005) report that removing the effect of self-efficacy from past performance makes

no difference, with the implication that researchers need not bother to correct for the variance in past performance due to self-efficacy. Feltz et al. criticize the null results as an artifact of an inappropriate statistical procedure applied to a small sample. In fact, the corrective adjustment makes a notable difference in the significance of relations. In studies in which performance and self-efficacy covary, researchers should use the dual-residualized procedure to minimize the problem of statistical overcontrol. It provides the full corrective adjustment for covarying influences. It would be of interest to reanalyze published studies of within-person changes using the dual corrective for past performance.

In a recently published study on the role of self-efficacy in academic achievement, Vancouver and Kendall (2006) repeat the claim that the positive self-efficacy relation to performance in between-person analysis is due to uncontrolled variations in ability or prior performance. Not a single study on the role of self-efficacy in academic development and achievement using multiple controls is cited. Compare the misleading claim against the empirical evidence.

Studies in the academic domain control for specific and composite ability, aptitude, amount of experience in the academic subjects, scholastic interest, amount and quality of homework done, course grades, grade point average, standardized measures of achievement, socioeconomic status, and parents' academic aspirations for their children (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001; Caprara et al., 2008; Joo, Bong, & Choi, 2000; Lent, Brown, & Larkin, 1986, 1987; Pajares & Johnson, 1994, 1996; Pajares & Kranzler, 1995; Pajares & Miller, 1994; Pajares & Valiante, 1997; Stajkovic, Bandura, Locke, & Lee, 2010; Wood & Locke, 1987; Zimmerman, Bandura, & Martinez-Pous, 1992; Zimmerman & Kitsantas, 2005). For example, Schunk and Hanson (1985) studied the unique contribution of self-efficacy to children's acquisition of mathematical competencies through self-directed learning. This ability includes a number of separable subskills, the mastery of which provides a microbehavioral record of the level of skill acquisition. In regression analysis, self-efficacy predicts level of mathematical achievement over and beyond that of acquired skill.

This substantial body of evidence is highly consistent in showing that a strong sense of efficacy is accompanied by high academic motivation and performance after taking into account not only prior performance but a host of other factors that may contribute to variance in performance. The unique contribution of self-efficacy to academic achievement is often evaluated by hierarchical regression analysis and structural modeling in multifactor causal structures.

The assessment of academic self-efficacy is not confined to the belief that one can realize given levels of academic attainment. It is also measured in terms of belief in one's *learning efficacy* and *self-regulatory efficacy* to manage learning activities that eventuate in academic accomplishments. Schunk and Hanson (1989) examined the contribution to mathematical achievement of children's beliefs in their *learning efficacy* to acquire the arithmetic skill. This form of self-efficacy was varied experimentally by social modeling. Children gained a stronger belief in their learning self-efficacy by observing a peer model than by observing a teacher model, even though the same arithmetic operations were modeled in both conditions. The stronger children believed in their learning efficacy as altered at the outset, the faster they acquired the skills, and the higher the proficiency they achieved in the subject matter.

Because of the centrality of self-directed learning in academic development and self-renewal, much of the self-efficacy research in the academic domain centers on students'

beliefs in their self-regulatory efficacy. Good intentions will contribute little if students cannot get themselves to do their academic work, especially in the face of stressors, difficulties, and a host of competing attractions. Self-regulatory efficacy measures students' beliefs that they can manage not only the cognitive demands but the social, motivational, and affective aspects of learning.

In multivariate studies analyzed with structural equation modeling, self-regulatory efficacy contributes to a strong sense of academic self-efficacy, which, in turn, is positively related to subsequent academic achievement both directly and through its impact on self-set goals. These relations remain after controlling for aptitude, level of instruction, and prior academic achievement (Zimmerman & Bandura, 1994; Zimmerman et al., 1992). Self-regulatory efficacy serves the same positive function after multiple controls are applied in the construction of knowledge through the Internet (Joo et al., 2000).

In the process of career decision making, self-efficacy affects the slate of options given serious consideration. People do not regard options in domains of perceived inefficacy as worth considering, whatever the benefits might be. They exclude entire classes of options rapidly on self-efficacy grounds after controlling for relevant skills (Hackett, 1995). Academic career preparation is predicted by self-efficacy not only to complete the academic prerequisites but to fulfill academic milestones in the career path as well. Self-efficacy retains its predictiveness after controlling for academic grades, scholastic aptitude, high school rank, occupational interests, congruence with the prevalent interests of others in the field, and expected costs and benefits of different occupations (Lent, Brown, & Larkin, 1986, 1987).

Self-Efficacy in Within-Person Changes

Well-designed studies of the role of self-efficacy in within-person change verify its positive function. Compare the conceptual, methodological, analytic, and interpretive machinations involving trifling tasks in the Vancouver et al. studies with ecologically valid research conducted by Seo and Ilies (2009). It is thoughtfully conceived, well designed methodologically, and accurately analyzed and interpreted. Stock investors, recruited from investment clubs, engaged in trading activities each day for 20 consecutive business days. For the stock trading, the participants were given hypothetical cash of $10,000 and had to decide each day the number of shares to invest in each of 12 national stocks. To enhance the meaningfulness of the trading activity, the traders received actual monetary rewards that varied from $100 to $1,000 depending on their investment performance. Each day they rated the strength of their efficacy to beat the market by varying percentage points, set goals for themselves relative to the market return, and rated positive and negative reactions to their trading performances. The amount of time they devoted to the investment decision making was automatically recorded.

Within-person relations were analyzed using hierarchical linear modeling (HLM). In accord with the large body of evidence from experimental and field studies, the stronger the traders' self-efficacy, the higher the goals they set for themselves, the more effort they devoted to their investment decision making, and the better their investment performance. Changes in self-efficacy along the way were accompanied by readjustment of goals. The positive self-efficacy

effects remained significant after controlling for past performance, goal level, amount of experience, and daily stock market fluctuations. Goals partially mediated the impact of self-efficacy on investment performance. Affective states also contributed to performance both directly and through self-efficacy. This well-crafted, informative study is a breath of fresh air amid machinations that produce a negative self-efficacy effect, however small, with tasks of little or no consequence and of questionable interest to participants performed in a brief session by students fulfilling course requirements, with minute change to explain.

Gilson, Chow, and Feltz (in press) provide a further within-person test of the functional properties of self-efficacy beliefs using a genuine activity allowing progressive growth. They tested self-efficacy and weight-lifting performance by collegiate football players in different universities at key points during off-season strength training. In hierarchical modeling analyses, self-efficacy was a positive predictor of subsequent strength performance at the within-person level after controlling for raw past performance.

The influence of self-efficacy to regulate one's learning activities over a long period is verified in longitudinal research spanning the transition from middle school to high school (Caprara et al., 2008). Children who had a high sense of efficacy to regulate their academic work achieved high grades in middle school and exhibited high self-efficacy to regulate their course work in high school. A strong sense of self-regulatory efficacy at the high school level predicted high academic performance on national achievement tests and less likelihood of dropping out of school, after controlling for middle school grades and socioeconomic status. This unique incremental predictiveness was obtained by a within-person analysis using latent growth curve modeling that is statistically similar to hierarchical modeling.

The positive contribution of efficacy belief to performance is further replicated at the collective level in within-team HLM of ongoing team performance (Chen, Kanfer, DeShon, Mathieu, & Kozlowski, 2009). In both within-person and within-team analyses, perceived efficacy predicts mutual assistance to fulfill team goals and level of team performance, after controlling for prior individual and team performance.

As mentioned in the introduction, social cognitive theory specifies a number of conditions under which self-efficacy may relate to performance weakly or even negatively. Ambiguity about the nature of the activity is one such conditional factor (Bandura, 1997). When beliefs of personal efficacy exceed performance, it does not necessarily mean that individuals have inflated views of their capabilities, as is usually assumed. Such disparities often stem from ambiguities about the nature of the activity. When performance requirements are ill defined, underestimating task demands produces seeming overconfidence, whereas overestimating task demands gives rise to seeming underconfidence. Both types of discrepancies can stem from task ambiguity. Schmidt and DeShon (2010) varied level of task ambiguity and analyzed the functional role of self-efficacy in within-person changes over time. Self-efficacy related negatively to performance under ambiguous conditions where lower level performances may be considered sufficing. However, when individuals are informed about the nature of the activity, the stronger their self-efficacy the more effort they enlist and the higher their performance attainments. Using a within-person analysis, Neal and Yeo (2003) similarly found that task ambiguity is a conditional factor in the relation of self-efficacy to performance. Self-efficacy is negatively related to performance under ambiguous feedback, but under unambiguous feedback the stronger the self-efficacy the higher the performance attainments.

In sum, the field has moved beyond the simplistic view that efficacy beliefs are reflectors of performance or "ability." Experimental investigations that alter self-efficacy to differential levels by nonperformance means dispute it. Diverse lines of research, using multiple controls in between-person analyses, provide converging evidence for the unique contribution of self-efficacy in multifaceted causal structures. The controls usually extend beyond past performance to a host of possible covarying influences evaluated by structural modeling of direct and mediated paths of influence. Alternative conceptual models are also tested for how well they fit the empirical data. Assessment of belief in oneself as a learner and as a self-regulator focuses on perceived capability to master the constituent competencies that beget academic attainments. The latter forms of self-efficacy are for navigating the journey, not just reaching the destination.

Multiple Methodological Deficiencies in a Field Study of Control Theory

In a study plagued by a host of methodological problems, Vancouver and Kendall (2006) report that students' forecasts of their grades on quizzes were negatively related to their performances on those quizzes. The methodological deficiencies touch virtually every aspect of the research. In a questionable single-item measure of self-efficacy, undergraduates reported their expected letter grades for the next quiz. Assessment of strength of self-efficacy in one of the two classes was unusable. Because of inadequate instruction, the students gave "illogical responses," judging themselves inefficacious for low grades. So the scores had to be discarded (Vancouver, 2008). The authors reverted to the simpler measure of expected letter grade without regard to the strength of their belief. Retrospective reports of study time were used rather than actual study time recorded antecedently. Because of lack of variance, the measure of self-set goals was unrelated to performance. Continuous test scores were converted to a category-based scale with likely loss of differentiating information. In a footnote, the authors explain that one of the classes yielded negative self-efficacy effects, but no significant effect was found in the second class.

In various articles, Vancouver repeats the claim that uncontrolled variation in past performance accounts for the positive relation of self-efficacy to performance. In a surprising finding that receives no mention in the article, past performance is significantly *negatively* related to subsequent performance. In the height of irony, Vancouver and Kendall (2006) excluded past performance from their reported HLM analysis. They limited the analysis to exam order, study time, goals, and self-efficacy.

Stajkovic and Bandura (2009) conducted HLM reanalyses of all 25 models reported by Vancouver and Kendall (2006) with their set of variables. In none of the prediction models retested was self-efficacy significantly negatively related to subsequent performance. Adding past performance and goals did not change the null results. In short, this exhaustive analysis provides no statistical basis for the claim that self-efficacy impairs performance.

Examination of the possible source of the conflicting finding revealed discrepancies in the number of observations and iterations. Vancouver and Kendall (2006) used the old version of the HLM 5 program. It can yield questionable results because it allows pairwise deletions. As the HLM publisher (Scientific Software International, www.ssicentral.com) explains,

> In previous versions of HLM, the option to use pairwise deletion was also available. While pairwise deletion would retain more of the data than listwise deletion, use of the method of deletion is likely to cause problems during the estimation procedure. In addition, the calculation of degrees of freedom and –2 in *L* are debatable, and thus it becomes risky to base any conclusions on these. Due to these concerns, HLM 6 no longer offers the option to implement pairwise deletion.

For this reason, our reanalysis of the data used the more reliable HLM 6 program. The negative self-efficacy effect reported by Vancouver and Kendall appears to be an artifact of a dated analytic program.

Untested Policy Prescriptions

Academic disputes over tasks of questionable ecological validity may be of little social interest. It is a different matter when findings of questionable research are used prescriptively in ways that can be socially consequential. Viewed from the theory that Vancouver and his colleagues espouse, teachers should lower children's beliefs in their capabilities to get them to learn. Organizations should deflate their employees' beliefs in their capabilities to boost their productivity. Social reformers should instill self-doubts in their followers to mobilize them to fight vested interests for political and social changes.

Vancouver and Kendall (2006) discredit programs designed to raise people's beliefs in their capabilities on the grounds that they will impair performance by curtailing "resource allocation." They create erroneous associations in this effort by equating self-efficacy with self-esteem and its questionable predictive value. Self-esteem and self-efficacy are entirely different constructs. Self-efficacy is a judgment of capability. Self-esteem is a judgment of self-worth. The empirical status of self-esteem has no bearing on the functional properties and predictiveness of self-efficacy (Bandura, 1997).

In their call for restructuring training programs, trainers should "attempt to decrease self-efficacy to improve learning and motivation" (Vancouver & Kendall, 2006: 1151) However, the prescription is empty because they never explain how to do the self-efficacy deflation. The occupational survival of hapless trainers would, in all likelihood, be in serious jeopardy were they to be practitioners of motivation by efficacy deflation. Social prescription carries responsibility for the empirical soundness of what one is promoting. Vancouver and Kendall prescribe their self-efficacy deflation approach without ever bothering to test its effects socially. The wide-ranging applications of self-efficacy theory that have bettered people's lives are founded on an enabling model rather than a deflation model of training (Bandura, 1995, 1997, 2006a; Maddux, 1995; Pajares & Urdan, 2006).

Faced with the dispiriting social implications of perceptual control theory—to motivate people one should undermine belief in their capabilities—Vancouver and Kendall (2006) construe their recommendations favorably as a "practical and adaptive" strategy. Quite the contrary. The substantial body of experimental evidence shows it is an ill-advised motivational strategy (Bandura, 1997; Bandura & Locke, 2003). In another form of the positive portrayal, Vancouver and Kendall rely on selective focus on only half of their predictive scheme. They cite the performance-enhancing effect of goals but ignore the second half of

their motivational scheme, that is, the alleged performance-impairing function of high self-efficacy. According to their control theory, whatever motivational gains that raised goals produce, self-efficacy will negate. However, this omission is not worth fretting about. Reversing the functional properties of factors that vary positively, to produce positive goal effects but negative self-efficacy effects, would require an anomalous feat. Vancouver and his collaborators have yet to find a way to do it, but not for lack of trying.

In an athletic example, we explained that coaches address vulnerable facets of team efficacy in preparing players to counteract the strengths of a forthcoming opponent (Bandura & Locke, 2003). Vancouver and Kendall (2006) misconstrued this statement, elevated it to a contradiction in self-efficacy theory, and generalized it inappropriately by arbitrarily designating all learning as "preparatory." Learning concerns acquisition of knowledge and skills. Preparation is getting ready for some encounter. Most of what we learn is not preparation for a contest. There is also a difference between identifying facets of efficacy vulnerability in otherwise highly skilled performers as a step toward refining their performance strategies for an athletic contest and undermining people's sense of efficacy to motivate them to learn. Moreover, preparation is not necessarily grounded in self-efficacy deflation. We saw earlier that highlighting progress toward a desired goal enhances self-efficacy, aspiration, and skill acquisition, whereas highlighting deficiencies is demotivating and even demoralizing. In short, acquisition of knowledge and skills is not defined as preparation for a contest, nor is effective "preparation" driven by weakening people's beliefs in their capabilities.

Trait Self-Efficacy Theory

Human life involves diverse spheres of activities. One cannot be all things. Hence, people differ in the areas on which they cultivate their self-efficacy and the levels to which they develop it even within their chosen pursuits. If, for example, a corporate executive has high self-efficacy for managing a company, low self-efficacy for managing family life, and middling self-efficacy for social activities, how do divergent types of self-efficacy create a general sense of self-efficacy? Proponents of a trait view of self-efficacy, labeled *general self-efficacy,* provide no information integration theory on how diverse specific self-efficacies are weighted and integrated to beget a general self-efficacy. Social cognitive theory addresses the issue of whether efficacy information based on different sources and activity domains is integrated additively, multiplicatively, configurally, or heuristically. The theory also specifies a number of conditions under which there may be some generality of self-efficacy across activity domains (Bandura, 1997). However, generality is better assessed by multidimensional self-efficacy scales linked to relevant activity domains than by an all-purpose scale with a small set of items proclaiming that one is uniformly self-efficacious, without being told the nature of the activity, except in general terms, or the settings and conditions of performance.

The generality of self-efficacy is linguistically imposed by decontextualized items rather than a product of reflective self-appraisal. Devising a collection of redundant items stripped of conditional factors linguistically begets a dispositional trait. We know empirically that human behavior is socially situated, richly contextualized, and conditionally manifested. Indeed, when individuals rate their self-efficacy on multidimensional scales they rarely judge themselves as uniformly efficacious in all activities under all circumstances (Bandura, 1997). Trait measures

mask existing variability in people's beliefs in their capabilities for different types of activities under different levels of challenge. Therefore, in personality assessment, one size cannot fit all without sacrificing explanatory and predictive power. The problems with trait measures of self-efficacy that mask the conditional nature of human behavior are compounded when the discontinuous bipolar rating format is converted to a continuous scale.

Yeo and Neal (2006) tested the hypothesis that general self-efficacy and specific self-efficacy operate in opposite directions. General self-efficacy enhances performance; specific self-efficacy impairs it. They use the eight-item scale of general self-efficacy developed by Chen et al. (2001) for this purpose. It is essentially a trait measure cast in terms of a few decontextualized generalities. The conceptual and psychometric problems with this measure and the relative predictiveness of general measures of self-efficacy were reviewed earlier.

Piecemeal Theorizing

Yeo and Neal (2006) present a variety of predictions concerning self-efficacy effects as integrative theorizing. However, there is no conceptually integrated theory from which these predictions are derived. A postulated positive effect for general self-efficacy is attributed to a buffering notion that belief that one is uniformly efficacious across tasks and situations and over time cushions against adverse experiences (Eden, 1988). The postulated negative effect of specific self-efficacy is attributed to Powers's theory that self-efficacy reduces performance by shrinking the discrepancy from the reference value. In this integrative theory, general and specific self-efficacy require different theories to explain how they work. For unexplained reasons, neither form of self-efficacy works through the processes empirically verified in self-efficacy theory. A postulated weakening effect of self-efficacy over time is attributed to resource allocation theory (Kanfer & Ackerman, 1989). In short, each self-efficacy effect in this piecemeal theorizing—cushioning, debilitating, and weakening—has its own mini-theory.

Yeo and Neal (2006) faced dual daunting challenges. The first was how to get self-efficacy and goals operating in opposing directions as predicted by perceptual control theory, given their positive relation. The second was how to get specific and general trait self-efficacy working in opposing directions given that specific efficacy is said to build general efficacy and mediates the effects of general efficacy (Chen, Gully, & Eden, 2001; Sherer et al., 1982). Why should specific efficacy that does such wondrous things for general efficacy, building it, and positively mediating its effects, do such detrimental things to motivation and performance? We saw earlier that specific self-efficacy is a better buffer and enabler because it is highly relevant to the activity at hand when one needs the staying power. It enhances motivation, fosters effective self-regulation, and strengthens resilience to adverse experiences in the here and now (Bandura, 1997).

Yeo and Neal (2006) cite Powers's control theory and Vancouver's research, with qualifications, as the basis for the opposite directional effects. However, this portion of the theoretical rationale was untestable with the experimental design they used. One cannot test perceptual control theory without a goal comparator. The authors do not explain why they deleted goals. Without it, there is no discrepancy for self-efficacy to affect, thereby stripping the feedback loop of its essential error correction function. Had goals been included, the

theorizing would have had to spell out how general self-efficacy affects perceived discrepancy. Why shouldn't individuals of high general self-efficacy also perceive a smaller discrepancy and, according to perceptual control theory, slacken their efforts compared to those beset with doubts about their general capabilities? Because they allegedly work at cross-purposes, how does general and specific self-efficacy resolve their opposite influence in computing discrepancies? Are both rendered ineffective if they cancel each other?

Deficient and Confounded Experimental Design

As explained above, the omission of the comparator in the form of goals rendered control theory untestable. Confounding of experimental conditions is another major flaw in the study. The authors linked general trait self-efficacy to aggregated performance but specific self-efficacy to discrete performance. This confounds type of self-efficacy (specific or general) with degree of performance aggregation (discrete or lumped together). Yeo and Neal (2006) report that aggregated specific self-efficacy and trait self-efficacy both relate positively to aggregated performance, whereas specific self-efficacy relates negatively to discrete performances. They concluded that these findings confirm that trait self-efficacy is enabling and specific self-efficacy is debilitating. However, the required comparison (i.e., relation of general trait self-efficacy to discrete performance) for this conclusion is missing. Because of the confounded design, one cannot disentangle the effects of self-efficacy specificity from the covarying difference in performance aggregation.

In the confounded design, general trait self-efficacy seems to be in an idling mode during the sequential performance, while specific self-efficacy is sapping motivation and curtailing resource allocation. The posited hypothesis requires assessment of what general trait self-efficacy is doing, if anything, in the ongoing activity. According to its ascribed function, general trait self-efficacy should be buffering performers from the negative effects of their failings as they cope with the task at hand. If it has any functional value, it has to be causally operative as performers manage task demands at each trial. Moreover, if the authors are serious about testing prediction from Powers's theory, they need to incorporate and assess changes in the goal comparator during the sequential performances.

Partialing Out the Future From a Current Cause

The predictors that Yeo and Neal (2006) used in their within-person analysis include self-efficacy, past performance, affect, linear growth trajectories, and quadratic growth trajectories for affect and self-efficacy and cross-level interactions. A puzzling aspect of the statistical analysis is the surprising appearance of affect in the set of predictors. It is never mentioned in the specification of the conceptual model, in the hypotheses, or even in the method section of how it was measured and its psychometric properties.

In reanalysis of the data, Stajkovic and Bandura (2010) tested 26 HLM models comprising various constellations of the set of variables. In all of the performance prediction models, including those using past performance as a control, self-efficacy was *positively* related to

subsequent performance. The miniscule negative self-efficacy effect was obtained by measuring the effect of pretrial self-efficacy on subsequent performance after controlling for future self-efficacies. This self-efficacy control variable is created by lumping the specific self-efficacy ratings across trials into an average value. This type of analysis is statistically doable. But it is theoretically illogical to study the effect of a current influence by controlling for the future version of itself. This is backward control for the future. The amount of the future that is partialed out from any given current cause varies depending on its location in the ongoing activity. In the first trial, all of the specific self-efficacies encompassed by the mean represent the future. In the middle trials, the mean value represents a mixture of past and future self-efficacies. And in the late trials, the mean value represents mainly the past self-efficacies. Regardless of whether the amount of future self-efficacies in the conglomerate are predominant, medial, or on the low side, partialing out the future form of a present cause does not belong in a valid prediction model. The distinguished statistician, Tukey, put it well when he once said that if you torture data long enough it will admit to just about anything.

Big Five Trait Theory

The Big Five theory reduces personality to five behavioral traits. In this one-size-fits-all approach, personality is assessed in terms of general descriptors of activities. This conception of personality is the product of an atheoretical strategy relying heavily on the computer to find traits in the mixture of behavioral descriptors with some bootstrapping to fill out the scales with additional items of the same type. This approach to theory building is, in large part, a psychometric method in search of a theory. McCrae and Costa (1996), the developers of this fivefold approach, extol the atheoretical method by slighting conceptually guided approaches to personality as "armchair theories." Serious theorists are not simply lounging in metaphoric armchairs. They subject their constructs and theoretical propositions to empirical verification and continue to extend and refine their theories. It is odd to see a science of human behavior extolling the virtue of not being handicapped by a theoretical conception of how things work.

The Big Five traits are mainly five clusters of behaviors. They include conscientiousness, agreeableness, extraversion, openness to experience, and emotional stability. Here is a sample of conscientious behaviors that make up the conscientious trait: "I try to perform all the tasks assigned to me conscientiously," "I am a productive person who always gets the job done," and "I work hard to accomplish my goals." The items in the other traits also are predominantly descriptors of behaviors. These five behavioral clusters are largely disconnected from the vast body of psychological knowledge on the development, organization, regulation, and modification of behavior. A fivefold behavioral taxonomy is hardly a theory of personality, which is largely concerned with intrapersonal determinants and the processes through which they regulate human behavior. The traits comprising this conception should be named *behavioral traits* rather than *personality traits*. One needs a theory of personality to explain how intrapersonal factors contribute to the development of conscientious, agreeable, receptive, and socially outgoing behavior. Evidence from some efforts in this direction will be reviewed later.

Because the traits are mainly behavioral clusters, the fivefold trait approach is bereft of theoretical propositions and mechanisms by which one gets from trait to action. An approach that relies heavily on habitual behaviors as predictors of behavior is primarily a prediction model, not a theory of psychological causation. Proponents of this view do not tell us where the traits come from except for the suggestion that natural endowment may equip us with them. To ask how the traits work invites explanatory circulatory in which descriptors of habitual behavior often get reified as personal causes of behavior. Behavior is not a cause of behavior. Correlations between past and present behavior reflect the degree of commonality of their determinants. Therefore, the predictiveness of past behavior can be attenuated or its direction even reversed by changing its functional value in different contexts and time periods (Bandura, 1986).

One can identify predictive factors without knowing how they are linked to the predicted occurrences. As long as the correlate holds up, the predictive factors have some social utility. If, however, one understands by what means a predictor foretells outcomes, the explanatory knowledge informs ways of improving predictiveness and effecting change in functioning. Consider an example. Daily aspirin predicts lowered vulnerability to heart attacks and strokes. However, advancement of predictive and actionable knowledge requires disentangling the relevant ingredients in aspirin and verifying how they work in protecting the heart. The Big Five trait approach provides few explanatory premises.

Given the high conditional and contextualized nature of human functioning, it is unrealistic to expect personality measures cast in nonconditional generalities to shed much light on the contribution of personal factors to psychosocial functioning in different spheres of activity, under diverse circumstances, across varying situations, and at different times. For example, assertiveness toward an indifferent store clerk may bring more attentive service, whereas assertiveness toward a police officer will get one roughed up and arrested. Conditional factors help to explain the variation and functional value of the same behavior. Indiscriminativeness and behavioral fixedness are not smart ways to behave.

A theory of personality should recognize the conditional character of everyday life. Even the same behavior can mean different things in different contexts. Consider the decontexualized item from the Big Five questionnaire, “prefer to do things alone.” This is a rejective behavior in a marital relationship but self-sufficiency in a physical fitness program.

That decontextualization sacrifices predictiveness is demonstrated in field research by Hunthausen, Truxillo, Bauer, and Hammer (2003). The standard decontextualized Big Five traits were unpredictive of job performance, whereas some of the traits gained some predictiveness when the items were rated with the work-specific context in mind. The predictive benefits of knowing the context of performance are replicable (Bing, Whanger, Davison, & VanHook, 2004; Schmit, Ryan, Stierwalt, & Powell, 1995). The decontextualized Big Five approach clearly shortchanges the contribution of personal factors in human motivation and performance. However, even with the added context, the Big Five are often weak predictors because of the many other conditional factors that govern behavior within the social setting. Adding a relevant context highlights the irrelevancy of certain items to the activity domain of interest. This is an inherent obstacle to efforts to increase the predictiveness of an all-purpose measure. The Big Five trait approach is now the main source of unconditional dispositions. We know that behavior is richly contextualized and conditionally manifested, but

trait theorists try to predict it as though it were not so. This is an odd disconnect for a theory of personality. All too often, weak trait predictiveness gets misconstrued as inherent limitations of intrapersonal contributors to causal processes. Some researchers circumvent the relevancy problem by rewriting the items to make them more appropriate to the activity domain of interest (Pace & Brannick, 2010). In self-efficacy assessment, the conditional contexts are embedded in the items. There is also the question of predictive uniqueness. In evidence to be cited later, the Big Five lose predictiveness after controlling for self-efficacy.

It is ironic that, at a time when other specialties of psychology are becoming contextualized and discarding global personal determinants (Feldman, 1980; Flavell, 1978; Freeman & Bordia, 2001), a part of the field of personality continues to seek the causes of human behavior in general traits disconnected from the conditional social realities of everyday life. The convenience of all-purpose tests of personal attributes is gained at the cost of explanatory and predictive power (Bandura, 1999). All too often, personality psychology is marginalized as simply a supplier of handy off-the-shelf trait measures. They are being appended, often with little conceptual rationale, to whatever one is studying, under the illusion that inserting an all-purpose trait measure in the mix represents the contribution of "personality" to human functioning.

It should be noted that social cognitive theory does not cede the notion of disposition to trait theory. Individuals who have a resilient sense of self-efficacy in a given domain of functioning are obviously disposed to behave differently in that realm than those who are beset by self-doubt. The theoretical issue is whether disposition operates unconditionally or as a patterned proclivity that is conditionally manifested. The patterned individuality of self-efficacy represents the unique dispositional makeup of self-efficaciousness for a given person.

Other major benefits of self-efficacy assessments tailored to spheres of functioning and the realities people have to manage are the informative guides these assessments provide for programs of change. Such measures identify areas of secure and vulnerable self-efficacy that need to be rectified if changes are to be achieved and maintained. The social cognitive theory of personality does more than profile the self-efficacy belief system, however. It also provides a reliable set of guidelines on how to develop and strengthen a sense of efficacy (Bandura, 1995, 1997). The social cognitive theory of personality and detailed critique of trait theories of personality are presented elsewhere and will not be reviewed here (Bandura, 1999).

Comparative Predictiveness of Self-Efficacy and Big Five Traits

Judge and his collaborators tested a causal model in which general ability, experience, and the Big Five traits are construed as distal causes. They affect performance both directly and indirectly through their impact on self-efficacy (Judge et al., 2007). However, the authors provide little conceptual rationale on how each of the Big Five traits should affect self-efficacy and performance. Conscientious behavior is said to boost performance, and behaving agreeably with others also should help. This sketchy account for two of the traits is more descriptive than explanatory. But there is no mention of what neuroticism, extroversion, and openness to experience are doing in the causal mix. The notion that individual differences should make a difference is not an explanatory theory.

Nor do the authors explain how far back one goes in a causal chain before a cause becomes distal or how bygone causes, which are things of the past, can be direct causes of current behavior. One must distinguish between historical and proximate contemporary causes. There is nothing distal about knowledge structures, intrapersonal dispositions, abilities, and experience. They are constructed residuals of past experiences that evolved into contemporary determinants of motivation and action. For example, self-efficacy developed at an earlier time is a historical cause that contributed to the development of subsequent self-efficacy beliefs that operate as the proximate contemporary cause (Caprara et al., 2008). In short, historical causes are linked to future events through their evolving contemporary versions. They set in motion cyclic processes that alter the course of events.

Meta-Analytic Path Analysis

Judge and his collaborators tested the structure of their causal model using meta-analytic path analysis. However, the meta-analytic synthesis of the data for the correlation matrix presented formidable problems. Their meta-analytic path coefficients were not based on studies that measured *together* all of the variables in their conceptual model. Therefore, the authors had to patch together a correlation matrix for the path analysis by selecting bits and pieces of it from different sources. No study included the full set of variables, and only three of the studies measured both self-efficacy and the Big Five traits (Judge, 2009). Moreover, many of the studies include only one link of the structural model.

With numerous missing paths of influence in the set of studies, the path analysis was based on estimated path coefficients rather than on actual ones. Proponents of meta-analytic path analysis regard missing data as a serious problem in this otherwise informative analytic procedure (Viswesvaran & Ones, 1995). Becker and Schram (1994) note that missing data at the synthesis phase of the path analysis identify the links requiring further research for a reliable test of a posited structural model.

In addition to missing and fragmented data from different sources, there is the problem of relevancy of some of the studies to job performance, which is the behavior being predicted. The data set includes a conglomeration of diverse interventions and varied types of self-efficacy and performance outcomes. Some of the studies are tangential to job performance, and others, such as self-defense against sexual assault and physical exertion on an ergometer, are irrelevant to it. Unlike the Big Five approach, which is the same measure whatever the activity, self-efficacy differs across activity domains depending on the particular blend of cognitive, affective, social, and motor aspects that require regulation for successful attainments. In studies in which different types of self-efficacy beliefs are measured in the same sample, confirmatory factor analyses verify different types and their conceptual distinctiveness from other factors. For example, perceived social efficacy, academic efficacy, and self-regulatory efficacy differ from each other and their predictiveness for different spheres of activity. One type does not fit all. Distinctive types of self-efficacy can lose their predictiveness if treated as a conglomerate variable (Stajkovic et al., 2008).

Distinguishing Between Theory-Based Aggregation and Heterogeneous Aggregation

There is a difference between using theory-based selective aggregation to verify a specified theoretical proposition and heterogeneous aggregation to test a general notion. Theoretical propositions include conceptually distinct determinants, mediators, and outcomes. The point at issue is not aggregation but what is aggregated and for what purpose. One can test the general notion that eating a lot of fruits, vegetables, high-fiber foods, and good protein from legumes and fish promotes good health, by aggregating across diverse food groups, different types of health outcomes, and whatever the biological mechanisms through which these nutrients affect health. Such knowledge can inform nutritional policies. However, the heterogeneity does not reveal what the various ingredients are doing and by what means in the heterogeneous mix; to advance understanding of the basis for the health benefits requires theoretically selective aggregation. For example, to test the proposition that foods high in vitamin C prevent scurvy and to verify the mechanisms by which they do so requires control for confounding irrelevancy of other types of food groups and health effects. Tailoring the type of aggregation to the purpose of the research should not be misconstrued as rejecting meta-analytic path analysis.

The meta-analytic path analysis conducted by Judge et al. (2007) yielded mainly null results. General mental ability, experience, and conscientiousness were positively related to self-efficacy and performance. However, none of the other Big Five traits had the predicted direct relation to performance. Nor was self-efficacy related to performance. Conscientiousness, extraversion, and emotional stability were positively related to self-efficacy, but with self-efficacy unrelated to performance, none of the traits had a mediated relation to performance either.

Stajkovic and his collaborators (2010) conducted multiple tests of Judge et al.'s (2007) structural model using meta-analytic path analysis based on five studies concerning academic achievement. The authors of the original study did not provide the conceptual rationale for most of the structural links involving the Big Five traits. Stajkovic et al. accepted whatever rationale they may have had in mind. The participants were students in business schools preparing for careers in business. Each study included all of the same links among the set of variables used by Judge et al. and the same type of self-efficacy relevant to the academic performance domain. Judge et al. operationalized experience as time spent on activity. Time spent is a weak proxy because the meaningful aspect of experience is what one gained from it. In Stajkovic et al.'s study, grade point average was the index of the knowledge gained from academic experience. An added benefit is that it provided a quantitative measure of past academic performance for control purposes. Performance on the final exam, measured as a continuous variable in terms of degree of accuracy, served as the index of academic achievement.

In accord with theory-based aggregation, the same type of self-efficacy and performance outcome was assessed in each study. The comparability and completeness of assessment for the meta-analytic correlation matrix removed the problem of irrelevant heterogeneity and estimating path coefficients for missing data for links in the conceptual model. To add to the generalizability of the findings, the studies were conducted by different experimenters, in

both public and private universities, including Korea, which represents a collectivistically oriented cultural system.

Alternative models to the one proposed by Judge et al. (2007) were also tested. In the posited *partial-mediation model,* all the factors are related to performance both directly and partly through self-efficacy. In the *direct-effects model,* all the factors affect performance only directly, without any mediation through self-efficacy. In the *total indirect model,* the relations of the factors to performance are entirely mediated through self-efficacy.

Although average sample size and the harmonic mean have been used in statistical analyses, proponents of meta-analytic path analysis generally recommend the harmonic mean because it is more powerful for detecting significant relations (Viswesvaran & Ones, 1995). Judge et al. (2007) state that the average sample size should be used to generalize to the average study, whereas the harmonic mean is used to generalize to the population of studies. The main function of inferential statistics is generalization from a sample to a population rather than to an average study. Judge et al. present their findings based only on the statistically less powerful analytic procedure using the average sample size. They briefly mention in a footnote that their analysis using the harmonic mean yielded more significant relations, but they do not report those results. Stajkovic et al. (2010) report the findings of the analyses based on both types of means.

Contrary to the null self-efficacy effect reported by Judge et al. (2007), in the Stajkovic et al. (2010) meta-analytic path analysis, self-efficacy plays an influential role in the causal structure regardless of the type of structural model and whether the average sample size or the harmonic mean is used. In the analysis using the harmonic mean, general mental ability and academic experience are related to performance both directly and partly through the positive effect of self-efficacy on performance. The Big Five traits collectively added little incremental predictiveness. Among the set of traits, conscientiousness usually carries the main predictive burden in most studies. This is true both in Stajkovic et al.'s research and in the study conducted by Judge et al. In Judge et al.'s study, conscientiousness is the only trait linked to performance. In Stajkovic et al.'s study, conscientiousness is linked to performance directly and mediationally through self-efficacy. Emotional stability is the only other trait that is related to performance. However, its positive relation to the mediating influence of self-efficacy is negated by its negative relation to performance, resulting in no overall significant effect. The other traits are unrelated either to self-efficacy or to performance. In the comparison of alternative models, the conceptual model in which the various factors are partly mediated through self-efficacy provides a better fit to the empirical data than one in which the various factors affect performance only directly or entirely through self-efficacy.

In the analysis using the average sample size, both experience and self-efficacy predict performance. Conscientiousness and emotional stability are related to self-efficacy, but none of the other Big Five traits have any direct or mediated relation to performance. The comparative test of alternative models supports the model in which any relations to performance are entirely mediated through self-efficacy.

A longitudinal study conducted by Caprara and his collaborators further documents the influential role played by self-efficacy in a comparative test with the Big Five traits (Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011). They analyzed academic achievement in high school as a function of socioeconomic status, self-efficacy, the Big Five traits of

conscientiousness and openness to new experience, and academic achievement in junior high school. In path analysis, the relation of socioeconomic status and the Big Five traits to academic achievement in high school is entirely mediated through self-efficacy. Self-efficacy also partly mediates the relation of past academic achievement to subsequent achievement.

Ability and experience are not the products of immaculate conception. Motivational and self-regulatory influences help to shape ability and the experiences people undergo. A highly plausible alternative structural model is that self-efficacy is also an important contributor to the development and regulation of the behaviors characterized as personality traits. Compared with individuals who are burdened by self-doubts about their capabilities, those of high self-efficacy are likely to be more conscientious in their undertakings; open to new experiences; less emotionally perturbed by stressors; and, depending on their values and social self-efficacy, more outgoing and prosocial in their interpersonal relationships. Caprara and his collaborators tested alternative directional models of causation. They compared the predictiveness of a child version of the Big Five traits with self-efficacy theory assessed in terms of three types of efficacy beliefs—perceived academic, social, and self-regulatory efficacy (Caprara et al., 2004). Academic achievement, peer popularity, and internalized and externalized psychosocial problem behaviors were the predicted behaviors. The correlates of the Big Five with behavior across these diverse spheres of functioning shrink or disappear after controlling for self-efficacy. By contrast, self-efficacy retains its predictiveness after taking into account variation in the Big Five trait behaviors.

Judge et al. (2007) interpret their findings as supporting Heggestad and Kanfer's (2005) view that distal traits are not entirely dependent on proximal states but can operate causally on their own. However, neither Haggestad and Kanfer nor Judge and his collaborators explain how bygone causes do things autonomously in the here and now. To invest the bygone past with autonomous current control of behavior is a rather mysterious form of causation.

Vancouver et al. (2001), Yeo and Neal (2006), and Judge et al. (2007) all cite the study by Feltz (1982) as showing that the contribution of self-efficacy to performance declines over time. What they fail to acknowledge is that at each time point in the ongoing activity, contrary to perceptual control theory, self-efficacy is *positively* related to subsequent performance after controlling for past performance. As reported earlier, in Feltz's reanalysis of this data set using the more refined measure of past performance, the contribution of self-efficacy to subsequent performance not only *increases* rather than weakens over time but is a stronger predictor than past performance at the each of the time points.

There is no invariant influence of self-efficacy on performance over time. The strength of the relation depends on temporal changes in challenges and environmental conditions that call for functional adaptations and self-renewal. It also makes a big difference whether one is studying closed skills that have to be performed in a fixed way in a stable environment or open skills that require continuous development and improvisation of subskills to fit situational variations. Self-efficacy theory specifies conditions under which the contribution of self-efficacy to performance may increase, remain stable, or decline over time (Bandura, 1997). Theoretical specification informs research that can advance knowledge on the role of self-efficacy in the temporal regulation of motivation and action.

One must distinguish between research designed to advance understanding of the determinants and functional properties of self-efficacy in its own right and comparative tests of

theories in their entirety. The Big Five traits are the entire theory. Self-efficacy is one factor operating in concert with many others within the agentic framework of social cognitive theory (Bandura, 1986, 2006a). As mentioned earlier, the influential factors in the self-regulation of motivation and behavior include, in addition to self-efficacy, goal systems, outcome expectations, perceived environmental facilitators and enablers, and environmental impediments. Comparative tests of theories should include the full complement of variables that constitute social cognitive theory, not just the truncated self-efficacy part of it. It remains for future research to determine how inclusion of the omitted sociocognitive factors alters the size of the direct effects of other variables in a causal structure. Full evaluation of the social utility of psychological theories should also extend beyond comparative predictiveness to the principles they provide for developing human capabilities for effecting individual and social change. This is the weak part in our scientific enterprise.

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