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Impulse and Constraint: Perspectives From Personality Psychology, Convergence With Theory in Other Areas, and Potential for Integration

Charles S. Carver
Department of Psychology
University of Miami

A behavioral dimension of impulse versus constraint has long been observed by personality psychologists. This article begins by reviewing processes underlying this dimension from the perspectives of several personality theories. Some cases of constraint reflect inhibition due to anxiety, but some theories suggest other roots for constraint. Theories from developmental psychology accommodate both possibilities by positing 2 sorts of control over action. These modes of influence strongly resemble those predicated in some personality theories and also 2 modes of function that are asserted by some cognitive and social psychological theories. Several further literatures are considered, to which 2-mode models seem to contribute meaningfully. The article closes by addressing questions raised by these ideas, including whether the issue of impulse versus constraint applies to avoidance as well as to approach.

Impulsiveness and constraint are important aspects of human behavior. Many theories in personality psychology address these qualities, doing so from widely differing backgrounds of assumptions and meta-theories (Carver & Scheier, 2004). The theories range from psychodynamic, to trait and temperament, to biological process, to cognitive self-regulation models. In some cases, the emphasis is on the existence of stable individual differences in the tendency to be constrained versus impulsive. In other cases, the emphasis is on how processes within the person vary from one context to another, yielding impulsive action at some times and constraint at others.

Both impulse and constraint as qualities of behavior have useful and valuable characteristics in the appropriate contexts. When manifested as spontaneity, impulsiveness brings a sense of vigor and freedom to the human experience (e.g., Dickman, 1990; Hansen & Breivik, 2001). There are also cases in which survival demands impulsive action—when a threat or an opportunity must be reacted to quickly (cf. Langewiesche, 2004). On the other hand, unfettered impulse can interfere with the attainment of longer term goals. It can lead to violation of social norms (Cooper, Wood, Orcutt, & Albino, 2003; Lynam, 1996) and thereby to interpersonal conflict. The potential adverse results range widely, including disruption of marital stability (Kelly & Conley, 1987), job performance (Hogan & Holland, 2003), and health-maintaining behaviors (Bogg & Roberts, 2004; Hampson, Andrews, Barckley, Lichtenstein, & Lee, 2000; Hampson, Severson, Burns, Slovic, & Fisher, 2001; T. C. Skinner, Hampson, & Fife-Schaw, 2002). Thus, consistent expression of impulses without regard to the future and without regard to the needs of others can adversely affect both individual well-being and social relations (Tangney, Baumeister, & Boone, 2004). The ideal, of course, would be to use each mode of functioning in the kind of situations to which that mode is best suited (Block & Block, 1980).[1]

This article considers impulse and restraint from the point of view of personality psychology. I begin by tentatively defining these qualities as they are examined here. I then briefly review some of the ways that both traditional models of personality and more recent models of personality have conceptualized these qualities of behavior. Of particular interest in that review is the mechanisms that seem to underlie behavioral constraint as it is viewed from various theoretical perspectives.

I then consider some aspects of recent literature in developmental, cognitive, and social psychology and their relevance to the conceptualizations of personality previously reviewed. My goal in that section is to

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Reprint requests should be sent to Charles S. Carver, Department of Psychology, University of Miami, Coral Gables, FL 33124–0751. E-mail: Ccarver@miami.edu

[1]Interestingly enough, the desirability of balancing deliberative and reactive modes of operation is an issue that has arisen even with regard to mobile robots (Kim & Kim, 2003).

point to intriguing similarities among concepts and lines of thought that are emerging in several other areas of psychology—ideas that seem to be quite relevant to impulse and constraint in personality psychology. The next section applies the type of model that emerges from the previous sections to four additional areas of research, with the goal of illustrating the integrative potential of the ideas under discussion. I close by considering some questions that are raised by these ideas.

Let me begin, then, with what in some ways is the hardest part of the task: specifying the subject of this review. The concepts of impulse and constraint, and related concepts such as inhibition and disinhibition, have been used in diverse ways, at varying levels of abstraction, with varying implications (e.g., Barratt, 1985; Block, 2002; Dickman, 1990; Eisenberg, 2002; Nigg, 2000; Solanto et al., 2001; Stanford & Barratt, 1992; White et al., 1994; Whiteside & Lynam, 2001, 2003). In this article I use the term *impulse* to refer to the tendency to act spontaneously and without deliberation; I use the terms *restraint* and *constraint* to refer to the tendency to reflect and deliberate before acting.

The terms *restraint* and *constraint* often carry the additional connotation of resisting or overriding an impulse, as do the terms *inhibition* and *disinhibition*. It is not clear, however, that all cases in which behavior follows from reflection or deliberation entail the overriding of impulses. For this reason, I wish to minimize the connotation of overriding in the definition with which I begin. I return at several points to the question of why behaviors are constrained. Indeed, that question is an important one in reviewing various perspectives on personality, because different theorists answer it differently.

Psychodynamic Views of Personality

Id and Ego

Perhaps the best known approach to the concepts of impulse and restraint in all of psychology, and certainly one of the oldest, is the structural model of psychoanalysis (Freud, 1923/1962). In this model, the id generates impulses and the ego restrains impulses. Indeed, the ego was said to evolve as a mode of functioning precisely because of the need for a mechanism to take the pressures and restrictions of social and physical reality into account. That is, the ego functions to restrain the id's impulses until an appropriate time and place is found to gratify them.

The mechanism by which constraint occurs in the structural model of psychoanalysis is at least somewhat ambiguous. In that theory, the ego (the mechanism of restraint) emerges as the id repeatedly runs up against the realities of the physical and social environment. Presumably what makes such confrontations problematic is partly that socializing agents (and to some extent the physical aspects of reality) punish impulses that are released at unsuitable times and places. It might be argued on those grounds that the restraint exercised by the ego is motivated by anxiety (i.e., the desire to avoid the danger that follows from inappropriate expression of impulses). Indeed, the ego has been said to develop an elaborate array of defenses to reduce anxiety or prevent it from arising.

In contrast to this view, however, descriptions of the ego's mode of functioning rarely emphasize anxiety. By far the most common characterization of ego-guided behavior is that it is rational, pragmatic, and planful. Perhaps this depiction simply reflects the fact that an efficient ego avoids anxiety quite successfully. Perhaps, however, more is involved in this function than avoidance of anxiety.

What about the role of the superego in these phenomena? It is common to view conscience as the part of personality that induces restraint of prohibited urges. It is true that a presumed function of the superego is to specify particular rules to use in deciding how to act. However, what appears to be added here is primarily the particular rules themselves. The deliberating and decision making and the consequent restraint remain functions of the ego.

Ego Control and Ego Resilience

Many other personality theories also have overtones of a dynamic among forces. Some such theories are referred to with the phrase *ego psychology*, because they emphasize ego functions. Two influential 20th-century ego psychologists, who drew on both psychoanalytic and Lewinian ideas, have been Jeanne Block and Jack Block (1980; J. Block, 2002). They argued (as did others) that the ego functions to foster adaptation to the environment. In their view, good adaptation has two aspects. One aspect is learning to restrain impulses when such impulses would create problems. Another aspect is being flexible in dealing with the world and its affordances. That is, good adaptation means knowing when to restrain yourself and when to behave instead more freely and spontaneously.

The extent to which a person tends to inhibit the expression of impulses is called *ego control*. At one extreme are people who undercontrol, who cannot seem to delay gratification, who express their feelings and desires immediately. (In psychoanalytic terms, they might be seen as dominated by the id.) At the other extreme are those who overcontrol, who delay gratification endlessly (even to the point of seeming to deny themselves pleasure altogether). These are people who inhibit their actions and feelings and who insulate themselves from outside distractions. They are con-

forming, planful, and organized. (They might be seen as ego-dominated.)

The second aspect of adaptation in this theory is captured by the dimension of *ego resiliency.* This is the capacity to modify one's usual level of ego control in either direction to adapt to the demands of a given situation. People low in ego resilience cannot break out of their usual way of relating to the world, even when it is good to do so. People who are ego resilient, in contrast, are resourceful and adapt well to changing circumstances. They behave in different ways—more impulsive or more constrained—in different circumstances.

In theory, ego control and ego resilience are independent. However, it is intrinsically harder for someone at either extreme of ego control to be resilient than someone with average ego control. As a result, those who are most likely to be high in ego resilience are the ones who are moderate in ego control (Asendorpf & van Aken, 1999; Eisenberg, Fabes, Guthrie, & Reiser, 2000; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996). To put it differently, people who are high in ego resilience are the least likely to display uniformly high levels of ego control or uniformly low levels of ego control; they thus are more likely to appear intermediate in ego control.

Ego control has been related to many kinds of behavioral restraint. Greater ego control relates to longer delays before engaging in sex (R. Jessor, Costa, L. Jessor, & Donovan, 1983; S. L. Jessor & R. Jessor, 1975). Overcontrol relates to abstinence from alcohol and undercontrol relates to problem drinking (Jones, 1968, 1971; see also Hampson et al., 2001). Similar results have been reported with respect to drug use (Shedler & Block, 1990).

Ego control has also been related to restraint in the lab in the form of delay of gratification. Funder and Block (1989) studied 14-year-olds who were paid $4 for each of 6 sessions. After each session, they had the choice of being paid then or deferring payment until the end. Each time they deferred payment, there would be a small bonus in "interest." Decisions to delay were more likely among those high in ego control (controlling for ego resiliency and intelligence). Ego resiliency also played a role here. Recall that delay is sometimes a good policy, sometimes not. In this case, delay produced extra payoff, so delay was good. Flexible people will pick up on this and delay, even if that is not their usual style. Thus, ego resiliency is related to delaying, controlling for ego control and intelligence.

Why do some people have high levels of ego control in the framework of this theory? Anxiety plays an important role in this theory (Block, 2002), but the extent of a person's ego control does not seem to be driven by anxiety (though see Derryberry & Rothbart, 1997, for a different view). Rather, Block construed level of ego control as an issue of the permeability of the apparatus by which inner tensions become actions. That is, overcontrollers are people for whom an act emerges only when the internal press to act becomes relatively intense.

Trait Models of Personality

Another approach to personality in which constraint and impulse play an important role is the trait approach. Probably the best-known contemporary trait approach is the five-factor model (e.g., Digman, 1990; Goldberg, 1981; McCrae & Costa, 1997; McCrae & John, 1992; Wiggins, 1996).

Five-Factor Model

The five-factor model (neuroticism, extraversion, conscientiousness, agreeableness, and openness or intellect) includes at least two factors that relate to impulse and constraint. One of them is *conscientiousness*. Conscientiousness is defined partly by rashness and lack of organization (at the low end) versus planful, focused deliberation (at the high end). This dimension seems to concern in part the restraint of haphazard impulses, a sense of caution and planfulness. Indeed, conscientiousness is strongly related to a measure developed more specifically to assess the extent to which people consider future consequences in choosing their actions (Strathman, Gleicher, Boninger, & Edwards, 1994). Thus, conscientiousness seems clearly relevant to this issue.

The trait of conscientiousness also predicts a variety of specific behaviors that reflect impulse versus restraint. High conscientiousness relates to preferential use of negotiation as a conflict-resolution strategy (Jensen-Campbell & Graziano, 2001). Low conscientiousness relates to the tendency to use humor aggressively (Martin, Puhlik-Doris, Larsen, J. Gray, & Weir, 2003). In a sample of prisoners, conscientiousness related to fewer arrests (Clower & Bothwell, 2001). People high in conscientiousness even seem to live longer than those who are less conscientious, presumably because they take better care of themselves (Christensen et al., 2002; Friedman et al., 1995). Consistent with this, conscientiousness relates to various kinds of health-linked behaviors (Hampson et al., 2000, 2001; T. C. Skinner et al., 2002; for a meta-analytic review see Bogg & Roberts, 2004).

Another trait from the five-factor model that seems relevant to the issue of impulse and constraint is agreeableness. Agreeableness is often characterized as reflecting the person's level of concern with the maintaining of relationships. It is defined partly by (at its high end) inhibition of negative feelings (e.g., Graziano & Eisenberg, 1999) versus (at its low end) selfish antagonism (Digman, 1990). Agreeableness

seems relevant to the issue of impulse versus constraint because of the fact that a certain amount of impulsive behavior has a selfish, me-first, and even hostile quality.

Fitting this characterization of agreeableness, there is evidence that people low in agreeableness are more likely to choose displays of power as a way of resolving social conflict than people higher in agreeableness (Graziano, Jensen-Campbell, & Hair, 1996). There is also evidence that people low in agreeableness actually experience more conflicts than people higher on this trait (Asendorpf & Wilpers, 1998). People low in agreeableness also tend to use humor aggressively (Martin et al., 2003).

Both agreeableness and conscientiousness have been linked to substance abuse (Chassin, Flora, & King, 2004; Lynam, Leukefeld, & Clayton, 2003; Walton & Roberts, 2004) and to antisocial behavior more generally (Miller, Lynam, & Leukefeld, 2003). Both have been found to predict rule-abiding versus antisocial conduct a full 20 years after the traits were assessed (Shiner & Masten, 2002). Both traits have also been related to mate-poaching (trying to attract someone who is in a relationship already) and to responsiveness when poaching was initiated toward them by others (Schmitt & Buss, 2001). Both of these traits have also been found to relate to HIV risk behaviors (Trobst, Herbst, Masters, & Costa, 2002) and to other risky behaviors (Markey, Markey, & Tinsley, 2003). In all of these cases, people high in agreeableness and conscientiousness were shown to be more restrained in their behavior.

Interestingly, there is evidence that links the ego-control model of Block and Block (1980) to this trait model. Specifically, people classified as undercontrollers in the ego-control model have been found to be low in both agreeableness and conscientiousness (Asendorpf & van Aken, 1999; Robins et al., 1996).

At least some versions of the five-factor model also suggest another source of some aspects of impulsiveness: the trait of neuroticism. Indeed, in the NEO Personality Inventory—Revised (NEO–PI–R, Costa & McCrae, 1992), a well-known inventory based on the five-factor model, one facet scale of neuroticism is called Impulsiveness. Inclusion of impulsiveness within neuroticism appears to be rooted in the fact that some impulsive acts are prompted by negative feelings, which themselves are a hallmark of neuroticism. This facet scale is composed primarily of items reflecting overindulging. It requires an inference beyond the item content to suggest that those actions represent responses to negative feelings. However, in a factor analysis of measures reflecting diverse aspects of impulsiveness, Whiteside and Lynam (2001) found that the Impulsiveness facet scale from the NEO–PI–R loaded on the same factor as the Urgency subscale of their new impulsiveness measure. Two thirds of the items of the Urgency subscale refer to actions that occur in response to negative feelings.

Another facet scale of neuroticism in the NEO–PI–R that may be relevant to constraint is Angry Hostility. This quality is incorporated in neuroticism because of its negative emotional quality, but it has a conceptual link to (low) agreeableness as well.[2]

Do these facets of neuroticism predict impulsive actions? Miller, Lyman et al. (2003) tested the Angry Hostility facet and the Impulsiveness facet of neuroticism along with facet scales from agreeableness and conscientiousness, relating them to measures of antisocial behavior in a large community sample. When all the traits were considered together in the same analyses, the facets of neuroticism rarely made independent contributions (p. 508). In contrast, facets of agreeableness and conscientiousness consistently made independent contributions.

One further point is particularly noteworthy here, with respect to the potential role of neuroticism in impulsiveness. The way in which impulsive action is linked to neuroticism in this version of the five-factor model is antithetical to the idea that behavioral restraint follows from elevated anxiety and impulse follows from an absence of anxiety. Rather, impulsive action in this viewpoint would stem from the same core quality of personality as underlies high levels of anxiety. That is, it is the people who report often being distressed and anxious who also report overindulging and doing things on impulse that they later regret.

Three-Factor Models and Beyond

The five-factor model tends to dominate discussions of trait theories, but it is not the only trait model with wide appeal. Two three-factor theories are also very prominent (H. J. Eysenck, 1970, 1992; Tellegen, 1985). Both of these theories incorporate factors that essentially duplicate neuroticism and extraversion from the five-factor model, and both feature traits that appear to blend elements of conscientiousness and agreeableness (Clark & Watson, 1999; Goldberg, 1993; Zuckerman, Kuhlman, Joireman, Teta, & Kraft,

[2]An interesting side issue concerns the inclusion of both anger-hostility and anxiety in the same overall trait of neuroticism. They are joined to each other by their shared negative valence. However, the idea that anger leads to impulse and anxiety restrains impulse (which is posed as a possibility at several places in this review) does not fit this placement. That logic, as applied to a superordinate trait that includes both anger and anxiety, would argue for both impulse and restraint from the same trait. On the other hand, there is also reason to question this placement of anger together with anxiety (Carver, 2004; Fox & Davidson, 1988; Harmon-Jones & Allen, 1998; Harmon-Jones & Sigelman, 2001; Wacker, Heldmann, & Stemmler (2003).

1993). In Eysenck's (1970, 1992; H. J. Eysenck & S. B. G. Eysenck, 1976) theory, this factor is called *psychoticism*; in Tellegen's (1985; see also Watson & Clark, 1993) theory it is called *constraint*. Both of these traits concern self-control versus impulse and a hostile disregard of others.[3]

Fitting this picture, there is evidence that psychoticism relates to antisocial behaviors and to alcohol and drug abuse (Sher, Bartholow, & Wood, 2000). People high in psychoticism have been found to be hostile, manipulative, and impulsive and to seek out unusual experiences (H. J. Eysenck, 1992). Similarly, although Tellegen's (1985) model places aggressiveness in the negative emotionality factor as was noted previously for angry hostility and neuroticism in the NEO–PI–R), aggressiveness has a substantial secondary loading (inverse) on constraint (e.g., Patrick, Curtin, & Tellegen, 2002; Tellegen & Waller, in press). As was described earlier with regard to conscientiousness and agreeableness, constraint has also been related to criminal behavior over time (Krueger, 2002). Low constraint (in interaction with negative affectivity) has also been related to drug use (Shoal & Giancola, 2003).

One more trait theory that is relevant to this discussion derives from Zuckerman's (e.g., 1971, 1985, 1991, 1993, 1994) analysis of *sensation seeking*. People high in sensation seeking are in search of new, varied, and exciting experiences. Compared to people lower on this dimension, they drive faster (Zuckerman & Neeb, 1980), are more prone to drug use (Zuckerman, 1979), are more likely to increase alcohol use over time (Newcomb & McGee, 1991), and are more likely to engage in risky antisocial behaviors (Horvath & Zuckerman, 1993). They are more sexually experienced (Fisher, 1973) and more dissatisfied in relationships (Thronquist, Zuckerman, & Exline, 1991). In the military they are more likely to volunteer for combat units (Hobfoll, Rom, & Segal, 1989).

Zuckerman's (1991, 1993, 1996) view of the function of this trait relates it to the demands of social living (a function that is similar in some respects to that of agreeableness). In this regard, he has often focused on a higher order factor that he calls impulsive unsocialized sensation seeking (IUSS). This dimension is grounded in a capacity to inhibit behavior in service of social adaptation, which is something people high on IUSS do not do well. IUSS has been implicated in antisocial personality disorder (Krueger et al., 1994; Rowe, 2001; Zuckerman, 1994). There is also evidence that IUSS involves a focus on the immediate consequences of behavior rather than longer term consequences (Joireman, Anderson, & Strathman, 2003). In part, then, it reflects a dimension of impulse versus constraint.

IUSS relates positively to aggressiveness and psychoticism from Eysenck's (1970, 1972) model and inversely to conscientiousness and agreeableness from the five-factor model (Zuckerman, 1996; Zuckerman et al., 1993). It is not too much of a stretch to suggest that these traits represent variations on the same theme, measured from somewhat different conceptual starting points.

Origins of Constraint From the Trait Perspective

What is the basis for behavioral constraint versus impulse from the contemporary trait perspective? As was noted throughout this section, the dominant trait models all include traits that directly concern constraint. The dominant models also have traits that appear to concern the approach of incentives (extraversion or positive emotionality) and the avoidance of threats (neuroticism or negative emotionality). If constraint were the result of high anxiety, there should be substantial relations between traits reflecting constraint and those reflecting threat sensitivity. If impulse were the result of high levels of sensitivity to incentives, there should be substantial relations between traits reflecting constraint and those reflecting incentive sensitivity.

This does not seem to be the case, however. Clark and Watson (1999) reviewed a good deal of evidence on the relations between constraint and other traits and concluded that constraint consistently is separate from extraversion (or positive affectivity) and neuroticism (or negative affectivity). Similarly, Depue and Collins (1999) reviewed 11 studies in which two or more multidimensional measures of personality were jointly factor analyzed. All identified a distinct higher order trait reflecting impulse versus constraint. In another factor analysis of measures of extraversion, neuroticism, threat sensitivity, incentive sensitivity, and impulsivity (Zelenski & Larsen, 1999), a similar result emerged: Scales measuring extraversion and scales measuring incentive sensitivity in ways that did not incorporate a quality of impulsiveness all loaded on one factor; neuroticism and threat sensitivity loaded on a second factor; measures bearing on impulsivity loaded on a third factor.

There are other sources of information relevant to this question as well. There is evidence that people who are high in agreeableness positively value the benefits of good social relations, rather than being motivated primarily by fear of conflict (Jensen-Campbell & Graziano, 2001). Indeed, as described earlier, one version of the five-factor model ties impulsiveness to neuroticism in a positive direction—opposite to the

[3]Eysenck initially placed impulsiveness within extraversion, but later he moved it to psychoticism. In part, the earlier placement seems to have reflected his focus on the positive manifestations of impulsiveness, such as liveliness and venturesomeness. The later placement in psychoticism reflected a more explicit awareness of the adverse manifestations of impulsiveness.

logic by which high anxiety causes low impulsivity. These findings as a group argue that the qualities of constraint versus impulse that are measured by these broad self-report personality inventories are distinct from traits that reflect tendencies to avoid threats and to approach incentives.

Biological Process Models of Personality

A viewpoint that has had an increasing impact on personality psychology in recent decades is a family of biologically based theories that hold that distinct aversive and appetitive motive systems underlie affect and behavior (e.g., Cloninger, 1987; Davidson, 1984, 1998; Fowles, 1993; J. A. Gray, 1994a, 1994b; Henriques & Davidson, 1991; Lang, 1995). As was implied in the preceding section, it is also argued with increasing frequency that these systems underlie two dimensions of personality (Carver, Sutton, & Scheier, 2000; Depue & Collins, 1999; Fowles, 1993; J. A. Gray, 1994a; Lucas, Diener, Grob, Suh, & Shao, 2000; Tellegen, 1985; Watson, Wiese, Vaidya, & Tellegen, 1999).

The appetitive system is often called a behavioral approach system (BAS; J. A. Gray, 1972, 1982, 1994a) or an activation or facilitation system (Depue & Collins, 1999; Fowles, 1980, 1987). When engaged by incentive cues, this system yields approach behavior and positive affect (J. A. Gray, 1994a, 1994b). Both cortical and subcortical areas of the brain are involved in this system's functioning. Neurobiological models of the BAS have emphasized the dopamine-secreting neurons that project from the ventral tegmental area of the midbrain to the nucleus accumbens (Bozarth, 1991). These neurons appear to fire selectively during anticipation of reward (Knutson, Adams, Fong, & Hommer, 2001; Knutson, Westdorp, Kaiser, & Hommer, 2000). In contrast, a region of the mesial prefrontal cortex is activated after rewards are received (Knutson et al., 2000). These findings suggest that anatomically distinct regions may concern anticipation of reward compared to reward outcomes. There is also evidence that functions relating to approach relate to differential activation in the left anterior cerebral cortex. This has led to the view that the substrate of incentive motivation is partly localized there (Harmon-Jones & Allen, 1997; Sobotka, Davidson, & Senulis, 1992; Sutton & Davidson, 1997; Wheeler, Davidson, & Tomarken, 1993; for reviews see Davidson, 1992, 1998; Davidson, Jackson, & Kalin, 2000).

The aversive motivational system is often called a behavioral inhibition system (BIS; J. A. Gray, 1972, 1982, 1994a) and sometimes a withdrawal system (Davidson, 1992, 1998). When activated by cues of threat or novelty, it produces behavioral inhibition or withdrawal (Fowles, 1993; J. A. Gray, 1994a) and emotions such as anxiety (Carver & White, 1994; Davidson, 1992; J. A. Gray, 1982). This system also comprises a number of both subcortical and cortical components (e.g., Williams et al., 2004). J. A. Gray, the theorist most responsible for creating widespread interest in this system, has emphasized subcortical structures in the system's functioning. Gray's view as currently expressed (J. A. Gray & McNaughton, 2000; McNaughton & J. A. Gray, 2000) is that anxiety occurs when the organism is motivated to enter a situation that is also threatening and thus experiences an approach–avoidance conflict. Fear occurs when the threat is great enough to prompt avoidance rather than approach.

As with the approach system, there is evidence from human research linking this system to a region of cortical activity. In particular, functions that appear to reflect threat responsiveness have been related to differential activation in the right anterior cortex. This has led to the view that the substrate of aversive motivation is partly localized there (e.g., Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Sobotka et al., 1992; Sutton & Davidson, 1997).

How does the quality of constraint fit into this picture? In principle, nothing more is needed to account for variability in behavioral constraint than approach and avoidance processes. Consider J. A. Gray's (1972, 1994a, 1994b) theory. The weaker the approach tendency, the lower is the likelihood of impulsive action; the stronger the approach tendency, the greater is the likelihood of impulsive action. Indeed, *impulsivity* is Gray's label for the personality dimension involving approach. In the presence of threat or novelty cues, however, the BIS becomes active, creating anxiety and behavioral inhibition—stifling of ongoing approach. In terms of individual differences, a very reactive BIS presumably permits little impulsive behavior. Low BIS sensitivity, in contrast, allows approach to be expressed impulsively more frequently.

These two systems by themselves thus can yield a dimension of behavioral variability from impulse to restraint. Indeed, several distinct possibilities exist. Impulsivity might reflect a hyper-responsive approach system (Arnett, Smith, & Newman, 1997; Avila, 2001). It might reflect an insensitive inhibition system (Avila, 2001; Fowles, 1980; see also Keltner, Gruenfeld, & Anderson's, 2003, analysis of social power). Finally, it might reflect the balance between these systems (Avila, 2001; Nigg, 2000).[4]

Recall, however, that these biological process models have been linked both conceptually and empirically to the trait models discussed in the previous section. That is, as was noted there, many now believe that the

[4]In contrast to this reasoning, however, J. R. Gray (1999) has found that emotional threat states caused people to become more impulsive, that is, to make choices that had better short-term effects at the expense of worse long-term effects.

trait of extraversion reflects variations in sensitivity of the approach system—sensitivity to incentives and a tendency to experience positive affect (Carver et al., 2000; Depue & Collins, 1999; Lucas & Diener, 2001; Lucas et al., 2000; Tellegen, 1985; Watson et al., 1999). Tellegen's measure of positive emotionality relates strongly to extraversion (Costa & McCrae, 1980; Diener, Sandvik, Pavot, & Fujita, 1992), and measures of extraversion predict positive emotional reactions to reward stimuli in much the same way as do measures designed to reflect incentive sensitivity (Carver & White, 1994; Gross, Sutton, & Ketelaar, 1998; Harmon-Jones & Allen, 1997; Larsen & Ketelaar, 1991).[5]

The avoidance system is also tied to a core trait dimension in many people's thinking. Specifically, neuroticism is widely seen as reflecting threat sensitivity and a proneness to distress, particularly anxiety (Carver et al., 2000; Watson & Clark, 1984; Watson et al., 1999). Indeed, the experience of anxiety seems to be at the core of most measures of neuroticism. Tellegen's (1985) negative emotionality scale relates strongly to neuroticism (Costa & McCrae, 1980; Diener et al., 1992) and neuroticism measures predict anxiety in response to threatening stimuli in much the same way as do measures designed to reflect threat sensitivity (Carver & White, 1994; Gross et al., 1998; Harmon-Jones & Allen, 1997; Larsen & Ketelaar, 1991).

In many respects, this conceptual link between the biological process models and trait models represents an important integration across views of personality. However, there is a complication, which stems from the fact (noted earlier) that the trait models have a separate factor (or factors) reflecting constraint. This suggests that the biological process models, at the level I have described them thus far, are not complete. That is, the approach and avoidance systems certainly provide for some instances of behavioral restraint, but they do not account for the existence of the additional factor that shows up in the trait models (whether one thinks of it as Constraint, Psychoticism, Conscientiousness, or IUSS). It does not seem to be the case that anxiety proneness alone, or anxiety proneness in combination with low incentive sensitivity, fully accounts for constraint.

[5]Some of this research finds that measures explicitly designed to assess incentive sensitivity predict these emotional reactions better than do measures that did not have such a precise focus (Carver & White, 1994; Harmon-Jones & Allen, 1997). Such findings can be viewed as suggesting that the fit between constructs is less than perfect. Alternatively, they can be viewed as suggesting that measures of extraversion are simply broader in scope than measures of incentive sensitivity.

Cognitive Models of Personality

Another broad approach to personality is quite different from those described thus far. This approach is more cognitive in nature. Issues of impulse and constraint have also arisen in these models of personality.

Rational and Experiential Systems

One such model is Epstein's (1973, 1985, 1990, 1994) cognitive–experiential self theory. This theory begins with the premise that humans experience reality through two systems. What Epstein calls the *rational* system operates mostly consciously, uses logical rules, is verbal and deliberative, and thus is fairly slow. This is the symbolic processor we think of as the rational mind. The *experiential* system is intuitive and associative in nature. It provides a "quick and dirty" way of assessing and reacting to reality. It relies on salient information and uses shortcuts and heuristics. It functions automatically and quickly. It is considered to be emotional (or at least very responsive to emotions) and nonverbal.

Epstein (1973, 1985, 1990, 1994) believed the experiential system is the older and more primitive of the two. It dominates when speed is needed (as when the situation is emotionally charged). One cannot be thorough and planful when there is a need to act fast (e.g., to avoid danger). Maybe there's no time even to form an intention. The rational system evolved later, providing a more cautious, analytic, planful way of proceeding. Being able to operate in that way has some important advantages, provided there is sufficient time and freedom from pressure to think things through.

Epstein (1973, 1985, 1990, 1994) also believed that both systems are always at work and that they jointly determine behavior. Each can also be engaged to a greater degree by varying circumstances. For example, asking people to give strictly logical responses to hypothetical events tends to place them in the rational mode. Asking them how they would respond if the events happened to them tends to place them in the experiential mode (Epstein, Lipson, Holstein, & Huh, 1992). The more emotionally charged a situation is, the more the person's thinking is dominated by the experiential system (ef. Simon et al., 1997). Several studies have been conducted in which the modes have been pitted against each other, yielding support for the theory (e.g., Denes-Raj & Epstein, 1994; Epstein et al., 1992).

Hot and Cold Systems

A cognitive model that is very similar to Epstein's in many ways has been proposed more recently by Metcalfe and Mischel (1999). Though it is similar to

Epstein's in many of its core principles, this theory has very different roots. Specifically, it draws on several decades' work on delay of gratification. Delay of gratification is in some ways the paradigm case for the contrast between impulse versus constraint in action. In the typical study, children can have a smaller, less desired reward now or can wait for a while and get a larger, more desired reward (Mischel, 1974). Delay is easier if the children mentally transform the situation (Mischel & Baker, 1975) and distract themselves from consummatory aspects of the rewards (Mischel, Ebbesen, & Zeiss, 1973).

Drawing in part on this large body of work, Metcalfe and Mischel (1999) proposed that two systems influence levels of restraint in a wide variety of contexts. One they called a "hot" system: emotional, impulsive, and reflexive. It is said to operate in a connectionist manner. The other they called a "cool" system: strategic, flexible, slower, and unemotional. How a person responds to a difficult situation depends on which system is presently in charge. Although this line of thought derived from research on delay of gratification, it obviously applies much more broadly.

The two theories just outlined share with each other the idea there are two modes of experiencing reality. In one mode, decisions are made quickly and without deliberation. In the other mode, decisions are thought through more effortfully. This reasoning suggests a clear basis for the distinction between impulse and restraint in behavior. Impulsive behavior dominates to the extent that the person responds through the fast system. Constraint dominates to the extent that the person responds through the slower, more deliberative system. Impulse versus constraint, in this view, depends on which mode of functioning is dominant in the person's functioning, either situationally or by disposition.

It is important to recognize that in these theories the core issue underlying impulse and constraint is not incentive versus threat. Rather, the core issue is the manner of processing (and thoroughness of processing) of the events taking place. In these theories, restraint is not primarily a matter of foregoing a reward to escape a punishment. In delay of gratification, for example, restraint means foregoing a small reward to obtain a larger one (Mischel, 1974). Constraint in that situation is about using time and planning to create more desirable outcomes. These theories suggest that the roots of much of human constraint may lie primarily in acquiring mental strategies that permit a more extended pursuit of larger and more enduring incentives.

Two Mechanisms of Constraint

It is clear from the foregoing that the behavioral quality of impulse versus constraint (or restraint, or inhibition, or reflection) is important in personality psychology. It is represented in one way or another in diverse perspectives on personality that began from very different starting points. The theories reviewed there suggest two different kinds of mechanisms for this quality of behavior, however. In one mechanism, restraint follows from anxiety. That is, if approach of an incentive causes a threat to become salient, the resulting anxiety may cause behavior to be inhibited. In the other mechanism, anxiety is not the issue. The issue is whether the person is being planful. From this viewpoint, a dimension of variability in constraint should exist even in the absence of any threat.

Each of these lines of thought provides a plausible conceptual basis for predicting variability in constraint. Indeed, there is no need to choose between them. Theories also exist in which the two lines of thought underlie two distinct mechanisms for impulse control. The theories come not from the psychology of adult personality, however, but from developmental psychology.

Developmental Temperament Models

Rothbart and her colleagues (e.g., Derryberry & Rothbart, 1997; Rothbart, Ahadi, & Evans, 2000; Rothbart, Ahadi, Hershey, & Fisher, 2001; Rothbart & Bates, 1998; Rothbart, Ellis, Rueda, & Posner, 2003; Rothbart & Posner, 1985; see also Kochanska & Knaack, 2003; Nigg, 2000) have argued for the existence of temperament systems for approach and avoidance (similar to BAS [or extraversion] and BIS [or neuroticism]) and a third temperament termed *effortful control*. This temperament corresponds conceptually fairly well to Tellegen's (1985) trait of constraint, though its markers are somewhat different. The effortful-control construct focuses more explicitly on attentional management (both in terms of sensitivity to new stimuli and in terms of the focusing or persistence of attention during long-lasting tasks) along with inhibitory control (the ability to suppress an approach behavior when doing so is situationally appropriate).

Unlike the Tellegen model (and other adult trait models), the Rothbart model explicitly postulates that effortful control is superordinate to approach and avoidance temperaments (see, e.g., Ahadi & Rothbart, 1994). Thus, this temperament is presumed to modulate behavioral manifestations of the lower level incentive and threat sensitivities. The label *effortful* conveys the sense that this is an executive, planful activity, entailing the use of cognitive resources beyond what would be needed to react impulsively.

Eisenberg and her colleagues (e.g., Eisenberg, 2002; Eisenberg et al., 2004) adopted and expanded on this model in studies of the regulation of emotions in

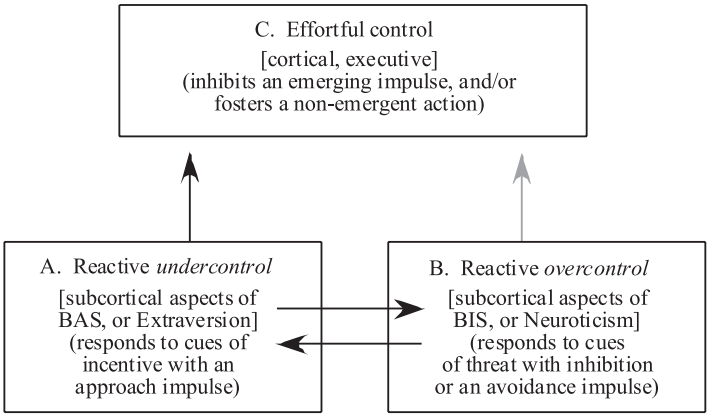

Figure 1. Schematic of the Application of the Eisenberg et al. (2004) Conceptual Analysis to the Issue of Impulse and Restraint in Personality. The model assumes reactive subcortical systems and an effortful cortical system. A. Impulses arise from reactive (subcortical) systems that respond to incentive cues. B. These impulses may be inhibited and restrained by reactive (subcortical) systems that respond to threat cues. C. Even if that does not happen, the emergent impulses may (or may not) be restrained by an effortful (cortical) system that deliberates and chooses among actions. The effortful system can also foster the emergence of an action that is not strongly motivated at the reactive, impulse level. The gray arrow indicates the possibility (addressed later in the article) that avoidance impulses can also emerge directly from the threat-sensitive subcortical system, which may (or may not) be restrained by the effortful system.

children.[6] This research derived from an interest in processes by which children regulate their feeling states in service to the attainment of goals and social adaptation more generally. That focus differs slightly from the focus of this article, with emotion regulation at the core, which is reflected outwardly as control of action. Nonetheless, the processes that Eisenberg and her colleagues examined appear to be quite similar to those under discussion here.

Eisenberg and colleagues (2004) adopted Rothbart's concept of effortful control (e.g., Rothbart & Bates, 1998) and the distinction between it and *reactive control*, which is less voluntary and thus less flexible. Eisenberg et al. further separated reactive control into two aspects. They used the term *reactive undercontrol* to refer to subcortical contributors to the impulsive approach of incentives, essentially equivalent to the subcortical aspects of BAS function (see Figure 1); they used the term *reactive overcontrol* to refer to subcortical contributors to involuntary inhibition or withdrawal in response to threats, essentially equivalent to the subcortical aspects of BIS function.

Even at this level of subcortical structures and functions, there is already the potential for competition between systems, as was noted earlier in discussing BAS and BIS. There may be a tendency toward impulsive action (if the BAS is highly responsive, the BIS is relatively unresponsive, or both). Alternatively, there may be a tendency to inhibit impulses (if the BIS is highly responsive, the BAS is relatively unresponsive, or both). In this view, reactive overcontrol is restraint that is explicitly a consequence of anxiety.

Rothbart (e.g., Rothbart & Bates, 1998), Eisenberg (e.g., Eisenberg et al., 2004), and Kochanska (e.g., Kochanska & Knaack, 2003) saw effortful control as being grounded in cortical functions (Figure 1), and there is a variety of evidence from neuroimaging studies of both adults and children to support that argument (e.g., Durston, Thomas, Worden, Yang, & Casey, 2002; Durston, Thomas, Yang, et al., 2002). In principle, these theorists do not view effortful control as a product of anxiety. On the other hand, there is also some evidence that links stronger anxiety responses in the second year and weaker approach-related affect responses in the second year (joy and anger) to higher levels of effortful control in the third and fourth years (Kochanska & Knaack, 2003). Thus, there may be some connection after all between the reactive and the effortful.

Regardless of whether it derives in part from anxiety, effortful control countermands impulses if there are broader reasons for doing so. Typically this would represent the restraint of an impulse toward one desired outcome in the service of attaining another desired outcome (see Kochanska & Knaack, 2003; Murray & Kochanska, 2002). Eisenberg and colleagues (2004) also pointed out, however, that effortful control is not exclusively a matter of restraining a prepotent action. Part of effortful control is initiating an alternative action. Thus, sometimes effortful control means forcing oneself to do something one does not particularly want to do (overriding the tendency to not act), again in the

[6]There is potential for confusion in comparing across literatures, due to differences in use of terms. For example, Eisenberg uses the terms *self-regulation* and *regulation* to refer specifically to effortful control of emotions. Others use the term *self-regulation* more broadly to refer to the goal-directed management of behavior (e.g., Carver & Scheier, 1981, 1998). Eisenberg uses the term *control* to refer to inhibition, with no implication of the nature of the restraint taking place. Personality and social psychologists have used the term *control* in a wide variety of ways (cf. Skinner, 1996). My point here is not that there is one correct usage for these terms, but rather that care must be taken in translating across literatures.

service of some other desired outcome (ef. Carver & Scheier, 1998, p. 246).

In principle, then, this scheme holds two ways for behavior to be constrained. First, an impulse can be inhibited subcortically, due to competition from a threat. Second, the impulse can be countermanded by an executive process, if there are competing goals that are more salient or more important. There is also evidence that these two kinds of restraint yield two different patterns of cardiovascular activity (Fowles, 1988; Mezzacappa, Kindlon, Saul, & Earls, 1998).

Somewhat less apparent is that this scheme also specifies two ways for approach acts to emerge. One of these is impulsive; the other is not. Impulsive approach actions can emerge because effortful control is weak or lacking. Approach behavior can also emerge because effortful control forces it to emerge. Such an occurrence would not represent an instance of impulsiveness, however.

Much research has focused on what combinations of these temperament variables relate to internalizing and externalizing disorders. Some of this work also relates these ideas to the ego theory of Block and Block (1980; Block, 2002). Eisenberg et al. (2004) found that both reactive impulsiveness and effortful control related positively to a measure designed to reflect ego resilience. This is consistent with the position (from Block & Block, 1980) that ego resilience reflects an ability to use both impulsive and constrained modes of functioning at appropriate times. In other research, Murray and Kochanska (2002) found that both very low and very high levels of effortful control contribute to children's problem behaviors (externalizing and internalizing, respectively). This is consistent with Block and Block's position that either too much or too little ego control can be problematic, with the best adaptation reflecting a situationally appropriate mix of restraint and spontaneity.

Relations to Cognitive Models of Personality

The line of thought described in this section also shares conceptual features with the theories of Epstein (1973, 1985, 1990, 1994) and Metcalfe and Mischel (1999), discussed earlier. Both of those theories assume an experiential system that is impulsive, reflexive, fast-acting, and nonverbal. They also assume a rational system that uses symbolic logical rules, is deliberative and verbal, and is fairly slow. These two aspects of functioning bear strong resemblance to the reactive control and effortful control from the Rothbart and Eisenberg theories (Figure 1).

An additional link between the Metcalfe and Mischel (1999) model and those of Rothbart and Eisenberg concerns the role of attentional management in the effortful control of impulses. It has long been part of Mischel's view that delay of gratification is facilitated by mental strategies, such as attending to nonconsummatory aspects of a reward (e.g., Mischel & Baker, 1975; Mischel et al., 1973). The idea that attentional management is one key to impulse control also appears in other theories that are more specific to the nature of impulsiveness per se, such as that of Barratt (1985; Patton, Stanford, & Barratt, 1995; Stanford & Barratt, 1992).

There also seem to be a couple of differences between conceptualizations, but they may actually reduce to differences of emphasis. For one, the Rothbart and Eisenberg theories are explicit in noting that what Epstein calls the fast experiential system can yield inhibition as well as impulse, and that the slow rational system can yield approach as well as constraint. Though Epstein has emphasized the point less, he takes that position as well (S. Epstein, personal communication, October 29, 2004). Another apparent difference is that the Epstein and the Metcalf–Mischel theories are explicitly two-mode theories. They assume that two systems operate simultaneously, relatively independently, and to some extent in competition with each other. The idea that there are two modes of functioning is less salient in the Rothbart and Eisenberg theories, though the idea could certainly be derived from them easily. That is, the Rothbart and Eisenberg theories view reactive control as subcortical and effortful control as cortical and view the two sorts of phenomena as very different from each other. It would not take a great leap to view these two aspects of control as representing distinct modes of interacting with the outside world.

Two-Mode Theories From Cognitive and Social Psychology

The idea that there are two somewhat distinct modes of interacting with the environment is an idea I want to consider further. This notion is not limited to the theories discussed thus far. It has also appeared in several other literatures in varying forms. One area in which this idea has been relatively prominent is cognitive psychology. That field, dominated for many years by a view of cognition as sequential symbol processing, was challenged two decades ago by a different view, commonly called connectionism (e.g., Bechtel & Abrahamsen, 1991; J. L. McClelland, 1999). The newer view uses neuronal function as a metaphor for cognitive processes, assumes parallel processing as a key feature, and views representation as reflecting patterns of activation in entire networks.

The symbolic and connectionist analyses each have advantages in different contexts, and many cognitive psychologists have concluded that cognition (broadly conceived) employs two kinds of processes. One is

effortful and symbolic. Smolensky (1988) termed this one *conscious*, Sloman (1996) termed it *rule-based*, and Shastri and Ajjanagadde (1993) termed it *reflective*. The other manages heuristic, skilled, and automatic activities, using connectionist processes. Smolensky called this *intuitive*, Sloman called it *associative*, and Shastri and Ajjanagadde called it *reflexive* (see also Norman, 1986). Both modes are assumed to function continuously and simultaneously.

A similar line of argument about two modes of functioning has also emerged in social psychology. Indeed, its essence has existed for some time in the literature of persuasion (Chaiken & Trope, 1999). People sometimes process persuasive messages carefully and thoughtfully, sometimes quickly and superficially. If the message is processed in the deliberative mode, its impact depends on the quality of the arguments it contains. If the message is processed in the superficial mode, its impact depends more on heuristic properties of the message and its surrounding context (see also Smith & DeCoster, 2000; Wilson, Lindsey, & Schooler, 2000).

A recent analysis of automaticity in attribution has also proceeded from the idea that there are two modes of functioning, but taking the idea in a different direction (Lieberman, Gaunt, Gilbert, & Trope, 2002). This analysis starts with the idea that when something is done effortfully over and over it becomes automatic, and the doing of it drops out of consciousness. Lieberman et al. argued that the effortful and the automatic represent two different modes of processing. They called the automatic mode *reflexive* and the effortful mode *reflective* (the same labels as used by Shastri & Ajjanagadde, 1993). After reviewing a range of evidence, Lieberman et al. contended that the effortful and automatic versions of a given behavior (or thought) are managed by different brain areas: controlled processes by the anterior cingulate, prefrontal cortex, and hippocampus; automatic processes by the lateral temporal cortex, amygdala, and basal ganglia (see also Casey, Tottenham, & Fossella, 2002; Posner & DiGirolamo, 2000). Indeed, evidence that implicated different areas of the brain was a key reason for their assertion that there are two separate modes of functioning.

Strack and Deutsch (2004) have recently extended a similar sort of reasoning more deeply into the range of phenomena of interest to social psychologists. They pointed out that earlier work in social psychology on dual-process models tended to focus on judgments and information processing, and they noted that motives and overt behaviors also must taken into account (see also Feldman Barrett, Tugade, & Engle, 2004). They proposed a two-mode model in which overt social behavior is a joint output of two modes of functioning that occur simultaneously and may be mutually supportive or may be in conflict. They used the terms *reflective* and *impulsive* to refer to the two modes.

Consistent with the position of many cognitive psychologists (and with Epstein and Metcalfe and Mischel), the latter two social psychological models (Lieberman et al., 2002; Strack & Deutsch, 2004) assume that the reflective system uses symbolic logic and is slower than the (connectionist) reflexive system. They hold that the reflexive system is attuned to pressured and emotional situations (Lieberman et al., 2002) and that it may underlie intuition (Lieberman, 2000), which had also been suggested by cognitive psychologists (Sloman, 1996; Smolensky, 1988). Strack and Deutsch added that because the reflective system requires substantial cognitive capacity, it is likely to be inefficient under high mental load, whereas the impulsive system requires little capacity and can function well under suboptimal conditions.

To Strack and Deutsch (2004), these presumed differences in the two systems' operating characteristics lead to differences in behavior. The reflective system anticipates future conditions, makes decisions on the basis of those anticipations, and forms intentions. It is planful and wide-ranging in its search for relevant information. In brief, the reflective system is restrained and deliberative. In contrast, the impulsive system acts spontaneously when its schemas or production systems are sufficiently activated. It acts without consideration for the future or for broader implications or consequences of the action. This depiction is very similar in many respects to the ideas of Epstein (1973, 1985, 1990, 1994), Metcalfe and Mischel (1999), Rothbart (Rothbart et al., 2000; Rothbart & Bates, 1998), and Eisenberg (2002; Eisenberg et al., 2004).

How Similar Are the Two Modes Across Theories?

Are the two modes of functioning that are represented in these various two-mode theories the same? The answer is far from clear, partly because the different literatures address quite different concerns. Certainly many aspects of the depictions of the systems' functioning are very similar. Indeed, it is interesting that Epstein's (1973) theory, which predates virtually all other two-mode models in both cognitive and social psychology, characterizes the two modes of experience in terms that are strikingly similar to those used by others in cognitive and social psychology in more recent years.

One area in which the degree of similarity is hard to evaluate is the role of affect. The cognitive models sketched earlier tend to disregard affect altogether, whereas affect is an important feature in the developmental, social, and personality models. It may be that these cognitive models are really intended to be applicable only to perceptual-cognitive phenomena. Alter-

natively, disregard of affect in the cognitive literature may simply be an oversight—a result of other considerations having been more salient to those theorists.

A second, and potentially very important, difference among models concerns the reason why the reflexive system is reflexive. The developmental and personality models tend to assume that a basic, simpler process (reflexive, associationist, connectionist) exists first and that eventually a superordinate deliberative system develops a rule structure, which may (or may not) then take over management of the action. In this case, the reflexive system is simply the more basic mode of processing. This tends to be implied in the cognitive models as well. In contrast, some of the theories that were outlined here focus on what happens when what was once an effortful behavior (or thought pattern) becomes more and more automatic (e.g., Lieberman et al., 2002; Lieberman, Jarcho, & Satpute, 2004; see also Wegner & Bargh, 1998). In this case, the reflexive system is presumed to take over the action because the responses are overlearned.

To put it differently, one of these views assumes a function that is connectionist and intuitive because no rule-based structure exists yet to manage the action from the top down. The other view assumes a function that is connectionist and intuitive because it has been done so often that it is now automatic. There is a very real question about whether, functionally, these two situations are really the same (Carver & Scheier, 1998, chap. 17).

In general, a well-learned behavior that is now occurring automatically can be intruded on and overridden by an effortful system if there is a need or desire to do so. In that sense, it might be regarded as still under the control of the effortful system. Such an intrusion obviously cannot occur if the effortful system either is not fully functioning or has no schemas yet to apply to the behavior. On the other hand, there is some evidence that when a behavior is automatic enough to have become "mindless," the person can lose track of how the behavior is done and have difficulty performing it in the effortful mode (Langer & Imber, 1979; Langer & Weinman, 1981). The latter sort of effect suggests that there may be more commonality to these cases than seems apparent at first.

Certainly questions exist about whether these diverse theorists are all talking about the same thing. Despite these questions, I believe there is enough similarity among these two-mode models to warrant further consideration of whether they are describing the same basic phenomena. If they are, the potential for integration across diverse areas would be substantial. The line of reasoning throughout this discussion seems quite consistent with the idea that reflective processing arises in brain areas that evolved later in human history and that function to create and implement plans of more complexity and longer time course than can be handled by an impulsive system (e.g., Lieberman et al., 2002; Strack & Deutsch, 2004).

Applications of Two-Mode Models in Other Areas

I also think these ideas about two modes of experience are interesting enough to warrant considering their usefulness in additional contexts. The idea of two modes of functioning, one intuitive and impulsive and the other more deliberative, has in fact arisen in several more literatures that are less explicitly tied to theory in personality (see also Nigg, 2000). To further indicate the broad potential relevance of two-mode models to behaviors that are of interest to personality psychologists, this section briefly outlines ways in which this sort of model seems useful in four such additional areas.

Two Phases of Action Control

An influential theory in motivational psychology derives from the idea that planning of behavior and the carrying out of plans entail two different mindsets (Heckhausen & Gollwitzer, 1987). Forming an intention requires weighing possibilities, evaluating pros and cons. This is called a *deliberative* mindset because the person is deliberating about what to do. This mindset is presumed to be relatively unbiased and careful, an open-minded and rational appraisal of evidence. These characteristics result in better decisions (Gollwitzer, 1990, 1996; Taylor & Gollwitzer, 1995).

Once the intention is formed, however, actually doing the behavior entails a different mindset. Now everything is organized around the effort to act. This is called an *implemental* mindset, because it exists to implement the intention. This mindset minimizes potential problems, in the service of staying focused on carrying out the action. Thus, people in implemental mindsets are more prone to positive illusions (Taylor & Gollwitzer, 1995).

These characterizations of what the two mindsets are like have a degree of similarity to the two modes of functioning discussed in the preceding section. People who are in the deliberative mindset are dominated by processes of effortful control and less responsive to reactive influences. People in the implemental mindset are less likely to consider diverse options implied by effortful control and more likely to be reactive. Put differently, it may be that people who are relatively impulsive are chronically in the implemental mindset, whereas people who are more (effortfully) constrained are more chronically in a deliberative mindset.

Clearly the similarity of the Heckhausen and Gollwitzer (1987) theory to the two-mode models has limits. People who are in the implemental mindset do function in verbal and symbolic terms, rather than be-

ing limited solely to intuition and reflexive response. People in this mindset are perhaps not so much impulsive, spontaneous reactors as they are simply focused on doing instead of thinking. Nonetheless, there does seem to be a difference in how much effortful control is being exercised in the two mindsets.

Consistent with this view of the two mindsets, there is also evidence that they may rely on different brain areas. Lengfelder and Gollwitzer (2001) studied patients with frontal-lobe damage and patients with damage in other areas. They found patients with frontal damage were impaired in deliberating. However, if the patients were carefully given explicit *if… then* implementation intentions, they showed no impairment in doing the actions. This suggests that the planning is done in the frontal cortex, whereas the more automatic handling of the action is done elsewhere, which is consistent with a good deal of neuropsychological research (see, e.g., Casey et al., 2002; Stuss & Benson, 1984).

Psychopathy and the Failure to Delay

Another area of work in which the difference between impulse and inhibition is very salient concerns a personality disorder that is often associated with behavior that is both impulsive and hostile. Newman and others (Newman & Kosson, 1986; Patterson & Newman, 1993; see also Lynam, 1996) have for many years studied the behaviors of psychopaths in controlled settings to understand the disorder and the variables that influence its display. They find that psychopaths are not always impulsive; they are impulsive primarily in contexts that incorporate both reward and punishment. In particular, psychopaths appear to perseverate in their behavior after rewards, and they therefore fail to learn from punishment.

A key point, however, is that if they can be induced to slow down, this deficit disappears. Drawing on such findings, Patterson and Newman (1993) posited the existence of a modulating system, which essentially causes a person to stop and reflect before plowing ahead. They proposed that psychopaths have deficient modulating systems, and they therefore fail to pick up contextual cues that do not fit their dominant response set (which, in this context, is approach).

The modulating system posited by Patterson and Newman (1993) has a great deal in common with the system of effortful control of Rothbart and Posner (1985) and Eisenberg (2002). From this point of view, psychopaths have deficiencies in the effortful control system. Such a view would be compatible with a range of evidence indicating that children with weak effortful control are prone to externalizing disorders (Rothbart, Ellis, & Posner, 2004; Valiente et al., 2003). Similarly, there is evidence linking a variety of externalizing problems in adults to a lack of premeditation (Miller, Flory, Lyman, & Leukefeld, 2003).

Patterson and Newman's (1993) modulating system also has substantial conceptual overlap with Block and Block's (1980) concepts of ego control and ego resilience. From Block and Block's frame of reference, psychopaths are undercontrollers, because they behave very spontaneously and impulsively and without premeditation. They also have very low ego resilience, because they do not modulate their level of ego control when situations call for doing so.

Of most interest in this particular context, the Patterson and Newman (1993) theory appears to hold that there are two modes of acting. One mode is impulsive, almost automatic; the other mode involves reflection. Psychopaths tend not to use the latter mode, once they head toward an incentive. The underlying essence of that reasoning also seems quite similar to the two-mode models of Epstein (1973, 1985, 1990) and Metcalfe and Mischel (1999).

Self-Control and Its Failure

Another literature that is relevant to the themes of impulse and constraint and that seems consonant with the two-mode models concerns what has been called self-control and self-control failure (Baumeister & Heatherton, 1996; Baumeister, Heatherton, & Tice, 1994). This literature focuses on cases in which a person is both motivated to act and motivated to restrain that action (essentially the case that represents the focus of work on children's effortful control). In some ways, the logical structure of the cases examined in this literature also resembles the logical structure of the delay of gratification paradigm. A difference is that in the cases now under consideration the intent often is to delay indefinitely rather than temporarily.

The structure of situations entailing self-control arises in a great many circumstances in adult behavior (as well as child behavior), and the conflict that underlies self-control has many applications to very important practical problems (see part VI in Baumeister & Vohs, 2004). This situation exists, for example, in the context of dieting, where the dieter is motivated by hunger to eat and is also motivated to restrain eating. The same conflict arises in circumstances surrounding substance abuse and domestic violence.

The literature on self-control failure tends to portray these cases as involving a relatively automatic tendency to act in one way, which is opposed by a planful and effortful tendency to restrain that act. The action that is being inhibited is often characterized as an impulse, a desire that would automatically be translated into action unless it is controlled (perhaps in part because this action is habitual, perhaps in part because it is more primal). The restraint is presumed to be effortful and to depend on limited resources. If the re-

source is depleted by an extended period of self-control, the person becomes vulnerable to a failure of self-control (Finkel & Campbell, 2001; Muraven, Tice, & Baumeister, 1998).

This characterization of these studies of self-control and potential self-control failure has a good deal in common with the two-mode models that were described earlier. To the extent that the conflicts studied in this literature represent relatively automatic impulses that are generally being overridden or countermanded by an effortful process, the structure seems quite similar to what is posited in those models.

The two-mode models also help to interpret the finding from the self-control literature that an alcohol-induced loss of self-awareness causes behavior to become more impulsive and responsive to cues of the moment (e.g., Hull, 1981; Hull & Slone, 2004; Steele & Josephs, 1990). Carver and Scheier (1998, chap. 13) argued that these effects represent the stripping off of a higher layer of behavioral self-regulation, resulting in the disregard of the principles by which one normally regulates one's actions. The reduced self-focus causes behavior to become more impulsive, less carefully thought out (cf. Marczinsky & Fillmore, 2005). This pattern is easily interpreted as indicating that loss of self-awareness causes an effortful, planful, deliberative system to function less efficiently than it was, leaving in charge an impulsive system that has only very short-term goals (Stuss, Picton, & Alexander, 2001). Again, this seems to fit the two-mode model well.

Implicit and Explicit Attitudes and Self-Concepts

Another area of work to which the two-mode models may be applicable is quite different from those described thus far. This is an emerging literature on implicit attitudes, implicit self-concepts, and the like. The literature derives in large part from the development of a technique called the implicit association test (IAT; Greenwald, McGhee, & Schwartz, 1998), which provides a way to measure the strength of associations between pairs of concepts, including evaluative qualities such as "good" and "bad." The IAT initially drew wide attention because it seemed a useful tool for examining such phenomena as prejudice, which many people prefer not to acknowledge explicitly, even to themselves. More recently this assessment technique has been applied to a variety of other associations, including links from the self to a sense of positivity versus negativity, termed *implicit self-esteem* (Greenwald et al., 2002).

The literature of studies using the IAT (and other related procedures) is developing quite rapidly (for reviews see Fazio & Olson, 2003; Greenwald et al., 2002). That literature has also spawned several controversies, one of which stems from the fact that there often is little or no relation between explicit (self-report) measures of a construct and implicit measures of the same construct. Although it is fairly easy to see why that might be the case for a construct such as prejudice (given the social desirability issues that are involved), it is less obvious why it would be so for such constructs as the self-concept.

The two-mode models suggest a possible reason (see also Fazio & Olson, 2003). The implicit measure is, by definition, associative. It measures only the associative link between pairs of elements. In contrast, the explicit measure is verbal, symbolic—a product of deliberative processing. Implicit knowledge presumably accrues through association learning; explicit knowledge presumably accrues through verbal, conceptual learning. Perhaps the associative and deliberative sources of knowledge about the self (or about anything else) are more independent of one another than has often been assumed. As a result, these two sources of experience may not agree well with each other over time, leading to different outcomes from implicit and explicit measures. Such a view of the information provided by these two kinds of measures, though certainly speculative, would make a good deal of sense from the perspective of two-mode models.

Consistent with this general line of thought, a study has recently been reported in which implicit and explicit attitudes were assessed toward persons with AIDS, and two measures of behavior were also taken, one that was relatively automatic and the other a verbal report of intentions to act (Neumann, Hülsenbeck, & Seibt, 2004). This study found that implicit attitudes predicted the automatic response but not the reported intentions and that explicit attitudes predicted the reported intentions but not the automatic response.

It is worth noting that although studies stimulated by the IAT over the past 8 years or so have brought increasing attention to the contrast between implicit and explicit processes, this contrast has played an important role in at least one other literature for some time. Researchers in the classic motive tradition have long distinguished between implicit and self-attributed motives (D. C. McClelland, Koestner, & Weinberger, 1989). With the more recent source of interest, however, the idea that implicit and explicit mental processes play distinct roles in behavior is now being applied to a steadily expanding range of topics, including (for example) moral judgments (Haidt, 2001) and reactions to cues of stigma (Pryor, Reeder, Yeadon, & Hesson-McInnis, 2004).

Section Summary

In this section I have tried to illustrate the potential usefulness of two-mode models by applying them to four literatures. Although all of these literatures are somewhat peripheral to personality psychology, all

concern phenomena that are relevant to personality psychology. In some of the cases, the two-mode idea was already in place. In other cases, it was hovering nearby, waiting to be noticed. In all of the cases, there seems to be a substantial similarity to the structure of the two-mode models discussed earlier. This, I think, attests to the potential integrative power of these ideas (for other applications, see Feldman Barrett et al., 2004; Strack & Deutsch, 2004).

Questions

The ideas that were reviewed in this article raise several additional questions. This section considers four of them.

Is Impulse Only About Approach?

One question arises from the idea that effortful constraint is a broad tendency to operate in a more versus less "prefrontal" mode. Given such a view, the occurrence of impulse versus constraint should be an issue not just for approach behavior but also for withdrawal and avoidance behavior (see also Metcalfe & Mischel, 1999; Read & Miller, 2002; Strack & Deutsche, 2004). Discussions of impulsive action typically focus on the grabbing of incentives, as though impulsiveness were relevant only to approach. This may not be true, however. People probably vary, as well, in how impulsively versus deliberatively they act to avoid or withdraw from threats. It seems likely that a person high in effortful control or constraint would be more deliberative about responding to a threat than would a person with less of this quality.

Indeed, the strength of the person's reactive control is probably also relevant to this issue (see the gray arrow in Figure 1). That is, it seems likely that when there is no reward salient, a person with a very sensitive subcortical (reactive-control) BIS would be more impulsive in withdrawing from a threat than would a person with less subcortical BIS sensitivity (a pattern that appears to fit a finding reported by J. R. Gray, 1999). This hypothesis assumes a model in which BIS sensitivity relates to withdrawal or avoidance in a context that is purely threat-motivated (Davidson, 1992, 1998; Fowles, 1993; Goldsmith & Davidson, 2004).

These hypotheses about impulsive and constrained avoidance and withdrawal seem not to have received explicit scrutiny thus far. To examine these possibilities, research examining reactive control and effortful control must examine contexts in which the focus is on avoidance of threats, not just approach of incentives. Care must also be taken to identify situations in which the avoidance is readily categorized as either reactive or effortful.

What To Assess in the Person?

Questions also arise from this discussion about optimal assessment of variables influencing impulse and constraint. The ideas discussed here imply that there are at least two distinct sources of restraint of an incentive-related action impulse: anxiety-based inhibition if the impulse would increase exposure to a threat and effortful control for reasons of planfulness or deliberation. Of course, the intensity of the underlying approach impulse itself can also vary, depending on the person's level of incentive sensitivity. Thus, in principle, there are at least three internal sources of influence on this action. If one wished to study the frequency or likelihood of the action, how many different measures should be used?

There is merit in assessing approach separately from avoidance, rather than blending them on a single dimension (Carver, 2004; Watson et al., 1999), because incentive sensitivity and threat sensitivity may vary independently (Schmidt, 1999). In the same way, it seems desirable to assess separately the reflexive mode of a particular kind of functioning (approach, avoid) and the reflective, deliberative mode of that kind of functioning. Eisenberg et al. (2004) used such a strategy in studies of children with substantial success, though it can be difficult to distinguish reactive overcontrol from effortful control (Valiente et al., 2003), and there is evidence that effortful control itself may be multifaceted (Murray & Kochanska, 2002). Surely a picture deriving from this sort of strategy is far more complicated than one that assumes only a single dimension of constraint, but by allowing for greater precision it may also be more accurate.[7]

Indeed, consideration of this issue also raises questions about how differentiated should be the assessment of impulse and constraint as personality qualities in adults. In assessing constraint in adults, there may be an implicit assumption that constraint is one characteristic, albeit manifested in several ways. Yet Tellegen (1985), for example, has characterized constraint in terms that have sufficiently diverse focuses as to represent quite different phenomena. He has referred to constraint with the words "cautious" and "timid" (indeed, one facet scale of constraint is called Harm Avoidance), but also with the word "planful" (Tellegen & Waller, in press). These terms do not suggest the same underlying essence or the same motive behind the surface of the action.

It certainly is normal for large-scope personality inventories to cast a wide net in search of diverse manifestations of a given core trait. This may be the right strategy for assessing personality as personality, but it may

[7]The question of whether constraint should be disaggregated into the sensitivities of multiple systems or viewed instead as a single dimension of variability provides yet one more place where lumpers and splitters can disagree with one another.

not be the best strategy for gaining access to more specific processes. This difference in scope should be kept in mind when trying to compare across literatures. The measures used in the developmental literature, for example, may generally have a narrower focus than the measures used in the trait literature of adult personality.

As was noted in the introduction to this article, the concept of impulsiveness is hard to pin down with precision. Impulsiveness has a number of different manifestations, some functional and some disruptive (e.g., Dickman, 1990; S. B. G. Eysenck & Eysenck, 1978; Parker, Bagby, & Webster, 1994). Impulsiveness can be cognitive or behavioral (White et al., 1994). It can reflect variations in attentional management (Stanford & Barratt, 1992); it can reflect an inability to persevere, or distractibility, or the lack of planning and forethought (Whiteside & Lynam, 2001). These qualities need to be examined separately from each other, perhaps with a view toward more explicitly mapping various qualities onto the organizing domains of reactive control and effortful control.

Where Do Extraversion and Neuroticism Lie?

One more set of questions concerns how to conceptualize the behavioral functions that correspond to the traits of extraversion and neuroticism. A great deal of interest has emerged in the family of biological process theories that was outlined earlier. As a group, they posit approach and withdrawal functions that align well with extraversion (as a reflection of incentive sensitivity) and neuroticism (as a reflection of threat sensitivity). This aspect of the biological models is also embedded in the developmental models of Rothbart and Eisenberg. The latter models appear to treat these dimensions as most meaningful at subcortical levels, however, unlike most applications of these ideas in personality psychology.

This placement does not fit entirely well with other sources of information. For example, as was noted earlier, there is evidence that experiences consistent with approach and positive affect are associated with relatively greater activation of left anterior cortical areas and that experiences consistent with avoidance and distress are associated with relatively greater activation of right anterior cortical areas (e.g., Davidson, 1992, 1998; Davidson et al., 2000; Harmon-Jones & Allen, 1997; Sobotka et al., 1992; Sutton & Davidson, 1997; Wheeler et al., 1993). This sort of finding suggests that both of these systems (and by implication extraversion and neuroticism) are partly dependent on cortical function, though they doubtlessly rely partly on subcortical functioning as well.

I suspect that most personality psychologists would argue that extraversion and neuroticism are reflected in planful decision making as well as in impulses. Whether that argument is correct, however, is uncertain. The role of cortical versus subcortical processes in the behaviors that reflect these two broad dimensions of personality thus is another puzzle that begs for further examination.

What Kinds of Studies?

Some brief comment should also be made about research directions that seem to be called for to assess the usefulness of the ideas discussed here. Some directions for exploration were directly implied by discussion of the issues that were raised in this section and earlier. However, there is one methodological direction not yet mentioned that stands out as potentially a particularly valuable source of information on these matters: the functional brain imaging techniques that are associated with the term *affective neuroscience* (Davidson et al., 2000; Goldsmith & Davidson, 2004; Panksepp, 1998; Posner, 2003).

Although studies using these techniques are sometimes criticized for their exploratory nature, the techniques have already had a great impact on identifying areas that are relevant to the ideas discussed in this article. Indeed, one of the two-mode models described here was based heavily on neuroimaging findings implicating different brain regions in automatic versus effortful versions of thought patterns (Lieberman et al., 2002). Another model described here used a difference between patients with frontal lobe damage and patients with other kinds of damage to buttress the claim of two distinct mindsets in action control (Lengfelder & Gollwitzer, 2001).

Neuroimaging studies already provide much information on the role of cortical and subcortical areas in the regulation of incentive approach behavior (cf. Knutson, Fong, Bennett, Adams, & Hommer, 2003), including information on areas that are relevant to inhibition of such behavior when short-term and long-term goals conflict (Bechara, Damasio, & Damasio, 2000). Elaborated models have been constructed regarding the circuitry that may underlie cognitive control (e.g., Botvinick, Braver, Barch, Carter, & Cohen, 2001; Casey, 2001; Casey, Durston, & Fosella, 2001; Casey et al., 2002). It has also become clear that brain regions active during a task can vary with the familiarity of the task, even over periods as brief as 5 to 10 min (Erickson et al., 2004). This, in turn, can greatly complicate interpretation of results.

It seems certain that these techniques will continue to be extremely valuable in sorting out the multiple processes that underlie impulse and constraint. However, just as is true of assessment of aspects of impulse and constraint in personality, it will be important to pay close attention to the characteristics of tasks that are used in studies of brain activity. One characteristic in

particular that seems desirable to examine is the extent to which a task elicits reactive versus effortful control.

Conclusions

A diverse range of psychodynamic, trait, temperament, biological, and cognitive models of personality address impulse versus restraint as a central issue. All acknowledge that instances of restraint can occur when anxiety countermands approach, but many of the models also assume one or another structure creating constraint that is distinct from competition between approach and avoidance. Several of them either explicitly or implicitly raise the possibility that there are two modes of functioning that underlie action. Theory and research from outside personality psychology converge on this idea, indeed, providing a more explicit conceptual structure through which the personality theories may profitably be viewed. Besides being relevant to personality theory per se, this conceptual structure also proves applicable to several additional literatures.

It is important to recognize the contribution to understanding adult personality that is made in this context by theorists whose primary focus lies elsewhere. Many of us in personality psychology remain generally unaware of work done in developmental psychology that has direct relevance and importance for our own concerns and interests, despite efforts that have been made to point out how relevant these two areas of work are for each other (e.g., Diener, 2000). The topic addressed in this article represents a case in which a cross-over between areas is particularly valuable.

The final point of this article is to suggest the potential usefulness of models that posit two modes of functioning that differ in how they operate and that may reflect the involvement of partially distinct sets of brain structures. As applied to personality, this viewpoint suggests that a dimension of variability in impulse versus constraint is created in part by the degree to which one or the other mode of processing tends to dominate in producing behavior. Indeed, as applied to personality, these two modes of relating to the environment may well underlie variations in behavior that were observed by Freud (1923/1962) many years ago and labeled id and ego.

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