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Impulsivity as a Personality Trait

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Impulsivity is one of the most frequently examined constructs in psychology, and rightly so. Perhaps nothing better characterizes the dilemmas of human existence than the difficulty of balancing long term goals against immediate impulses. No other species appears capable of planning explicitly for a distant future, whereas humans routinely adapt their behavior to goals that will not be obtained for weeks, months, or even years. Humans, therefore, are uniquely vulnerable to impulses that disrupt their plans. When human functioning goes wrong, impulsivity is often at the heart of dysfunction. No symptom, other than subjective distress, appears more often than impulsivity as a diagnostic criterion in the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (Whiteside & Lynam, 2001).

Given the vast literature on impulsivity, a brief review cannot hope to be comprehensive. Following a discussion of definitions of impulsivity, this chapter will focus on impulsivity as a personality trait—that is, a dimension of relatively stable individual differences in the tendency to be impulsive, roughly normally distributed in the general population. After developing a working definition of impulsivity, the chapter considers methods of measuring impulsivity as a trait, then reviews research on different conceptions of impulsivity and the relation of impulsivity to broad taxonomies of personality, focusing primarily on the Five Factor Model or Big Five (John, Naumann, & Soto, 2008). Consideration is given to the psychological and biological mechanisms that underlie trait impulsivity, in relation to a theory of the substrates of the Big Five and their higher-order factors (DeYoung & Gray, 2009), with the goal of developing hypotheses about how and why people differ in their predisposition toward impulsivity.

Defining Impulsivity

For a trait so important, impulsivity exhibits surprisingly little consistency or coherence in definition and measurement, within psychology. Many authors have noted the heterogeneity that exists in descriptions of impulsivity as a trait (Depue & Collins, 1999; Evenden, 1999; Parker, Bagby, & Webster, 1993; Whiteside & Lynam, 2001; Zuckerman, 2005). What constitutes a single impulsive action may be easier to specify than the attributes of an impulsive person. In every impulsive action, two elements must

be present: 1. an impulse—an urge, motivation, or desire—to act in some way, and 2. a lack of inhibition, restraint, or control of that impulse (cf. Carver, Johnson, and Joormann, 2009; Hofmann, Friese, & Strack, 2009). Without the impulse there would be no need for restraint; with sufficient restraint, the impulse would not be expressed in action.

The fact that impulsive action logically requires these two components suggests one reason for the existence of multiple conceptions of trait impulsivity: Individual differences either in the strength of impulses or in the ability and tendency to restrain impulses could influence individual differences in impulsivity. Before proceeding to a more thorough examination of the various conceptions of impulsivity, however, let us consider some additional definitional issues that stem from the question of when and why impulses should be restrained.

The International Society for Research on Impulsivity (ISRI) offers three definitions of impulsivity (<http://impulsivity.org>; accessed Sept. 2, 2009):

1. behavior without adequate thought.
2. the tendency to act with less forethought than do most individuals of equal ability and knowledge.
3. a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions.

The first of these defines individual instances of impulsive behavior, rather than a trait, and begs the question, “Adequate for what?” The implication is that impulsive behavior must be inadequate to achieve some goal. The second definition avoids the question of whether or not the behavior is desirable; any action undertaken with less than average forethought is considered impulsive. The third is most specific and implies that impulsive action entails negative consequences or at least some possibility of negative consequences, which would serve as the reason that impulses should be restrained.

One important question, therefore, is how crucial is the existence of negative consequences for a definition of impulsivity. Does impulsivity, as two of the ISRI definitions imply, necessarily involve action that is in conflict with the longer-term well-being of the individual? This question is not often

considered explicitly. Unsurprisingly, given the clinical focus of much research on impulsivity, negative consequences for impulsivity are usually assumed as a given. However, Dickman (1990) proposed the existence of both “functional” and “dysfunctional” forms of impulsivity, suggesting that impulsivity could be beneficial in some circumstances. The scale he devised to measure functional impulsivity assesses comfort with acting, talking, and making decisions quickly, with little or no deliberation, when the situation calls for it, such as in fast-paced conversation or sport or in the presence of fleeting opportunity. Block (2002) has similarly argued that some degree of “undercontrol” is not detrimental because it allows spontaneous exploration and utilization of unforeseen opportunities. Although impulsivity has typically been considered only as a dysfunctional tendency, the possibility of an adaptive form or level of impulsivity is worth keeping in mind when examining the association of impulsivity with other personality traits.

A more complex set of issues surrounds the question of how negative consequences of impulsive action are to be specified as such. Must they be negative for the individual committing the action, or could they be positive for that individual but negative for others? For example, someone might often steal impulsively, without getting caught, and never regret the action, though it would have negative consequences for others. This example raises a related question: Must the consequences of the action for the impulsive individual be judged as negative by that individual, or could they be judged as negative for that individual by others exclusively? A person who often steals impulsively, without getting caught, might not feel this to be a bad habit, though others might feel that he or she was taking unnecessary risks. Perhaps the most general claim that can be made about negative consequences of impulsivity is that impulsive action is inherently risky, regardless of its evaluation as positive or negative by anyone, because it involves acting on a present desire that might interfere with longer-term goals. Dickman (1990) acknowledged that even functional impulsivity is risky (though by definition usually worth the risk), in that the rapid responding it entails is likely to be error-prone.

One final definitional issue to consider is whether impulsive action must be rapid, as asserted by the third ISRI definition. What if someone experiences the urge to steal something, wanders around the

store for 20 minutes weighing the desire to steal against the fact that stealing would be risky and unnecessary, then decides to steal the item and does so; is this impulsive? Ainsley (2001) would argue that whether this action should be deemed impulsive is related to whether the person's decision is stable—that is, whether he or she would have (1) made the same decision, prospectively, before actually being at the store and (2) regretted the decision at some later time. An unstable choice, one that is rejected in advance and regretted in retrospect, is typically considered impulsive, even if it does not involve the rapid response and lack of deliberation that some definitions of impulsivity require. Such a choice does follow the pattern of an action based on an impulse that fails to be restrained.

This kind of impulsivity with deliberation appears to be possible because people typically discount rewards proportionally to their distance in time from the present (Ainsley, 2001). This allows for the situation in which a person considering a trip to the store the next day might value freedom from legal punishment above the thrill of shoplifting, but then, when faced in the store with the immediate possibility of theft, would decide that the reward of shoplifting was great enough to proceed, and, finally, might change his or her mind again after the theft, feeling that the action had been foolish, not worth the risk. When both the short- and long-term reward were discounted (the day before), the long-term reward was perceived as larger than the short-term reward. When the short-term reward was immediate, however, and thus not discounted, its value spiked above that of the long-term reward, which remained discounted. This spike in value led to the impulsive action, even though the action was previously undesired and subsequently regretted.

This chapter offers a working definition of impulsivity that encompasses both rapid impulsivity, without deliberation, and this slower form of impulsivity, with deliberation. As a personality trait, impulsivity is *the tendency to act on immediate urges, either before consideration of possible negative consequences or despite consideration of likely negative consequences.*

Measurement of Impulsivity

Many instruments have been designed specifically to measure impulsivity. The best established of these are questionnaires, including the Barratt Impulsiveness Scale, version 11 (BIS-11; Patton,

Stanford, & Barratt, 1995), the *I*₇ impulsiveness scale (Eysenck, Pearson, Easting, & Allsopp, 1985), the UPPS Impulsive Behavior scale (Whiteside & Lynam, 2001), the Control vs. Impulsivity scale of the Multidimensional Personality Questionnaire (MPQ; Tellegen & Waller, 2008), and the Impulsiveness scale of the Revised NEO Personality Inventory (NEO PI-R; Costa & McCrae, 1992). Additionally, impulsivity is a central feature of attention-deficit/hyperactivity disorder (ADHD), and ADHD symptoms have been used as the basis for questionnaire assessment of trait impulsivity in non-clinical populations (Avila, Cuenca, Felix, Parcet, & Miranda, 2004; Kuntsi et al., 2004).

Impulsivity is one of the few traits for which the number of performance tests devised may rival the number of questionnaires. The major problem, currently, with performance tests of impulsivity is that much psychometric work remains to be done to ensure that they function properly as reliable measures of a trait. We need to know the degree to which they are stable over time and the proportion of their variance indicative of latent impulsivity rather than task-specific performance. An informative comparison is with IQ tests, which are perhaps the most well developed and validated tests, psychometrically, in all of psychology, and in which the majority of variance is due to a general intelligence factor, rather than to abilities specific to individual tests (Deary, 2001). Research on impulsivity would benefit greatly from a well validated battery of impulsivity tests that would yield summary scores, much like an IQ score. To justify a single summary score would require that all the tests loaded on a single factor, and the few investigations that have factor-analyzed multiple putative impulsivity tests have found that impulsivity seems to comprise multiple dimensions, some of which are only weakly, if at all, correlated (Avila et al., 2004; Reynolds, Ortengren, Richards, & de Wit, 2006). Nonetheless, a battery of impulsivity tests might usefully yield scores for multiple impulsivity factors, just as IQ tests often provide separate scores for “verbal IQ” and “performance IQ,” in addition to total IQ.

Although the available evidence is still slim, two factors appearing in batteries of impulsivity tests may correspond to the distinction, made above, between impulsivity with and without deliberation (Reynolds et al., 2006). These two types of performance test have been described as measuring, respectively, “rapid-response impulsivity,” which lacks “adequate assessment of context,” and “reward-

discounting,” which involves “inability to wait for a larger reward” (Swann, Bjork, Moeller, & Dougherty, 2002, p. 988). Many of the rapid response tests require inhibiting prepotent responses (e.g., the Stroop, go/no-go, and stop-signal tasks). In the go/no-go task, for example, subjects must respond quickly with a button press to a set of frequent stimuli (e.g., letters other than “X”) but inhibit responding to a set of infrequent stimuli (e.g., the letter “X”). Impulsivity is measured as individual differences in failures of inhibition (though variability in response times has also proven to be an important indicator of impulsivity, in this and other paradigms, perhaps because the impulsive person is easily distracted from the task at hand; Leth-Steensen, King Elbaz, & Douglas, 2000). Reward discounting is often assessed by asking people to choose, without time pressure, between smaller sooner rewards, and larger later rewards. These paradigms are a rare case, in the impulsivity literature, in which task performance has been demonstrated to have the long term stability necessary to validate a trait measure (Kirby, 2009). Stable individual differences exist in the degree to which people discount the future, and these should logically be associated with the frequency with which individuals succumb to temptation, despite not intending to beforehand and regretting it afterward.

Another problem regarding performance tests of impulsivity is posed by the fact that the degree to which they correlate with questionnaire measures of impulsivity is still highly uncertain, varying depending on the instruments and samples involved (Avila et al., 2004; Edmonds, Bogg, & Roberts, 2009; Keilp, Sackeim, & Mann, 2005; Logan, Schachar, & Tannock, 1997; Reynolds et al., 2006; Spinella, 2004; Swann et al., 2002). Many studies find only weak to moderate correlations. A lack of reliable correlation between questionnaire and performance measures of impulsivity does not necessarily indicate inadequacy of the latter. Indeed, various impulsivity tests have shown predictive validity for relevant behavior in many studies, and one study pitting questionnaires against performance tests as predictors of health behaviors found that the two types of measure served as independent predictors, each accounting for variance that the other did not (Edmonds et al., 2009). Nonetheless, given that the questionnaire measures are better established and understood psychometrically, I shall consider only questionnaires, in exploring the relations of impulsivity to broader models of personality.

As with the performance tests, questionnaire measures of impulsivity or traits that have been deemed closely related to impulsivity appear to load on multiple factors, which vary greatly in the degree to which they are correlated. Understanding the nature of the different factors contributing variance to impulsivity questionnaires can be facilitated by mapping these factors onto broad structural models of personality. Such a mapping will reveal that impulsivity is a highly complex trait, with a number of different underlying dispositions contributing to it.

Impulsivity in Personality Trait Taxonomies

Understanding the consequences of impulsivity is relatively straightforward. Impulsive people are more likely than others to overeat, overspend, abuse drugs, interrupt, get in fights, break the law, gamble, engage in risky sexual behavior, say things they regret, etc. (Cyders & Smith, 2008; Krueger et al., 2007). What is more difficult to understand are the causes of impulsivity. What predisposes some people to act impulsively even when it runs counter to their own interests? Why are some people consistently so much more impulsive than others? One approach to investigating these questions is to locate the trait of impulsivity within a hierarchical taxonomy of personality traits. Important clues about the nature of impulsivity may be revealed by its association with other traits.

Psychologists have long known that personality can be represented as a hierarchy, with specific, lower-level traits (e.g., talkativeness, sociability, assertiveness) varying together, such that one can deduce the existence of broader, higher-level traits (e.g., Extraversion, for the three traits just mentioned) that account for the covariation of the lower-level traits. A major project in personality psychology, over the last sixty years, has been the development of trait taxonomies that use correlations among the multitude of specific traits to identify a limited number of broader factors that represent the most important dimensions of personality. The fundamental challenge for this project is to find a sufficiently broad and unbiased pool of trait measurements, in which to identify structure. A reasonably representative sample from the universe of all possible traits must be used to ensure unbiased results in factor analysis. No approach ensures a complete lack of bias in the pool of traits, but two of the most promising strategies are the lexical approach, which samples trait-descriptive words from natural language (Saucier & Goldberg,

2001), and the use of trait measurements from many existing questionnaires designed to capture a variety of different personality traits and structures (Markon, Krueger, & Watson, 2005). These two strategies have produced considerable evidence for a five-factor structure, known as the Five Factor Model or Big Five, which includes dimensions of Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness/Intellect (John et al., 2008).¹

In order to understand the location of impulsivity in the Big Five, it is helpful first to examine the development of Eysenck's personality taxonomy, which was perhaps the dominant model of trait structure prior to the emergence of the Big Five. Eysenck (1947) originally assigned traits to two "superfactors," Extraversion and Neuroticism, and located impulsivity within Extraversion. Eysenck later revised his model with the addition of a third superfactor, labeled "Psychoticism," though this label is widely considered misleading, as the trait encompasses antisocial rather than psychotic tendencies (Zuckerman, 2005). In this revised model, Eysenck located impulsivity within Psychoticism, though "venturesomeness" and "sensation-seeking," which he considered aspects of impulsivity, were retained within Extraversion (Eysenck & Eysenck, 1977).

Eysenck's three superfactors are largely compatible with the Big Five, as Extraversion and Neuroticism are very similar in both systems, and Psychoticism (reversed) represents a blend of Agreeableness and Conscientiousness (Golberg & Rosolack, 1994; Markon et al., 2005). The major addition in the Big Five is a fifth factor, Openness/Intellect, encompassing imagination, creativity, intellectual engagement, and aesthetic and artistic interests.

Eysenck located impulsivity in two different traits; the Big Five model adds a third. In the NEO PI-R, a widely used measure of the Big Five that divides each broad trait into six lower-level traits, called "facets," Impulsiveness is a facet of Neuroticism (Costa & McCrae, 1992). Similarly, the Abridged Big Five Circumplex for the International Personality Item Pool (AB5C-IPIP; Goldberg, 1999) locates Impulse Control as a facet of Emotional Stability, which is Neuroticism reversed. However, the location of impulsivity within the Big Five is not necessarily incompatible with Eysenck's scheme: In the lexical version of the AB5C (Hofstee, Goldberg, & de Raad, 1992), the adjective "impulsive" has its primary

loading on Conscientiousness, which would fall within Eysenck's Psychoticism; and Excitement Seeking, a facet of Extraversion in the NEO PI-R, is very similar in content to sensation seeking and venturesomeness. The Big Five thus appears to spread impulsivity across multiple dimensions, which may explain why impulsivity has been difficult to measure consistently.

Whiteside and Lynam (2001) have substantially clarified the diversity of conceptions of trait impulsivity and their relation to the Big Five. In factor analysis of many of the most common impulsivity questionnaires, they found four factors, each of which was strongly marked by a facet of the NEO PI-R. Their labels for these factors are listed below, followed by their corresponding NEO PI-R facet and Big Five dimension:

1. Urgency (Impulsiveness, Neuroticism)
2. (lack of) Premeditation (Deliberation, Conscientiousness)
3. (lack of) Perseverance (Self-Discipline, Conscientiousness)
4. Sensation Seeking (Excitement Seeking, Extraversion).

Thus, there appear to be at least four different types of impulsivity. The items that best marked these four factors were used to create the four subscales of the UPPS Impulsive Behavior scale. A follow-up study, analyzing the latent structure of the UPPS scale, found that Premeditation and Perseverance were strongly correlated and could best be described as separable but related facets of one broader trait (Smith et al., 2007)—hardly surprising, given that both are facets of Conscientiousness. Other factor analyses of smaller numbers of impulsivity questionnaires have found smaller numbers of factors, which are recognizable as subsets of the UPPS factors (Flory et al., 2006; Parker et al., 1993).

The UPPS model demonstrates that, in the Big Five, the traits most directly related to impulsivity are located in Conscientiousness, Neuroticism, and Extraversion. Consideration of the psychobiological mechanisms underlying these three traits, in conjunction with the two elements of impulsive action (discussed above), suggests why all three traits would be associated with impulsivity. Conscientiousness appears to reflect the ability and tendency to use effortful, top-down control to follow rules and pursue long-term plans (DeYoung & Gray, 2009; Van Egeren, 2009), and it is associated with volume in the

brain region (lateral prefrontal cortex) most strongly implicated in that form of control (DeYoung et al., in press). Thus, increased Conscientiousness should lead to more frequent restraint of impulses that are disruptive of rules and plans.² However, unless an impulse emerges in the first place, there will be nothing for the conscientious individual to restrain. Impulses are reactions to motivationally salient internal or external stimuli—rewards and punishments, or predictors thereof—and a large body of self-report, behavioral, and neurobiological evidence suggests that Extraversion and Neuroticism reflect the primary manifestations in personality of sensitivity to reward and punishment, respectively (DeYoung & Gray, 2009; Clark & Watson, 2008). Extraversion involves positive affect and approach behavior, whereas Neuroticism involves negative affect and reactivity to threat. At any level of Conscientiousness, increased Extraversion or Neuroticism would be associated with increases in the strength and frequency of urges to approach rewards or react to threats, respectively, and this should lead, in turn, to more instances in which the individual's effortful control is insufficient to restrain impulses. Thus, Extraversion and Neuroticism may influence impulsivity independently of Conscientiousness (and of each other). Of course, this model also suggests the possibility of interactions. Increased Extraversion or Neuroticism may be particularly likely to lead to increased impulsivity in those with low Conscientiousness.

Premeditation, Perseverance, Sensation Seeking, and Urgency

Because a tendency toward impulsive behavior is associated with four different factors, falling within three Big Five dimensions, Whiteside and Lynam (2001, p 687) argued that impulsivity is “an artificial umbrella term” that should no longer be used as a trait descriptor. In subsequent articles, however, they softened this argument because the correlations among the UPPS subscales (even outside the Premeditation-Perseverance pair) tend to be moderate, “suggesting that in general the scales measure overlapping yet distinct constructs” (Whiteside, Lynam, Miller, & Reynolds, 2005, p. 564).³ This overlap among the UPPS traits does suggest the existence of a general tendency toward impulsivity, even if that general tendency is influenced by variability in multiple, distinct traits and their associated psychobiological systems. Nonetheless, discriminant validity has been demonstrated for each of the four UPPS scales, in relation to a variety of impulsivity-related criteria, such as aggression, psychopathology,

and drug use (Cyders & Smith, 2008; Miller, Flory, Lynam, Leukefeld, 2003). Treating these four different impulsivity-related traits as if they were interchangeable is inadvisable and may result in contradictory or ambiguous findings. Thus, it is worth considering each UPPS trait in more depth.

Premeditation reflects “the tendency to think and reflect on the consequences of an act before engaging in that act,” and lack of Premeditation appears to be the most common conceptualization of impulsivity in personality psychology (Whiteside & Lynam, 2001, p. 685). The working definition of impulsivity, presented above, described two modes of failure to restrain impulses: (1) failure to consider possible negative consequences before acting and (2) succumbing to temptation despite considering negative consequences. Lack of Premeditation clearly indicates the former.

Premeditation has a complicated status in the Big Five. Although it is a facet of Conscientiousness, it is less central to this broad dimension than Perseverance or most other Conscientiousness facets. Deliberation (the NEO PI-R equivalent of Premeditation) shows the weakest loading on Conscientiousness of any facet of that domain, in the normative data for the NEO PI-R (Costa & McCrae, 1992), and it loads relatively weakly on both Industriousness and Orderliness, the two major subfactors within Conscientiousness (DeYoung, Quilty, & Peterson, 2007). Perhaps the most informative demonstration of what is different about Premeditation/Deliberation, relative to other Conscientiousness facets, is a factor analysis of many traits conceptually related to Conscientiousness (Roberts, Chernyshenko, Stark, & Goldberg, 2005). In this analysis, Deliberation was the only NEO facet to load primarily on a factor other than Industriousness and Orderliness, and this factor was also marked by two scales that have their primary loading on Extraversion (in the AB5C system) and their secondary loadings on Conscientiousness (Johnson, 1994). In the AB5C system, Deliberation loads primarily on Conscientiousness but has a secondary, negative loading on Extraversion (Johnson, 1994). These findings suggest that Premeditation, as a latent trait, may represent a roughly equal blend of high Conscientiousness and low Extraversion. This conclusion echoes that of Depue and Collins (1999), who argued that impulsivity was a compound trait reflecting the conjunction of high Extraversion and low Conscientiousness. Indeed, rapid action without deliberation should be potentiated by Extraversion,

which has been described as the “energizer” of behavior (Van Egeren, 2009), and Extraversion is positively correlated with reaction time in many behavioral tasks (Zeidner & Matthews, 2000). Nonetheless, Conscientiousness seems the most appropriate primary location for Premeditation, from a conceptual standpoint, because planning is related to effortful control and the functions of lateral prefrontal cortex (Miller & Cohen, 2001). However, when considering research using impulsivity scales that primarily tap lack of Premeditation (such as the BIS-11; Whiteside & Lynam, 2001), one must remember that effects may be attributable to variance shared with Conscientiousness or to variance shared with Extraversion.

Perseverance reflects the “ability to remain focused on a task that may be boring or difficult” (Whiteside & Lynam, 2001, p. 685). A major factor in the ability to work at a task that is not immediately rewarding is the ability to avoid succumbing to the temptation to do something more immediately rewarding instead. Unlike Premeditation, Perseverance is quite central to Conscientiousness. Self-Discipline, the NEO PI-R equivalent of Perseverance, loads strongly on Conscientiousness generally and on its Industriousness subfactor specifically (Costa & McCrae, 1992; DeYoung et al., 2007). Working hard requires the ability to restrain impulses that would conflict with one’s ongoing plan, and people low in Perseverance are likely to act on such impulses, even when they are aware of the negative consequences for their longer-term goals. Perhaps the existence of Perseverance and Premeditation as two separable but closely related traits reflects the difference between impulsivity with and without deliberation. Both traits seem likely to rely on prefrontal effortful control systems, but perhaps they emphasize different components of those systems or interact differently with additional systems. These possibilities should be explored in future research.

Sensation Seeking reflects “willingness to take risks for the sake of excitement or novel experiences” (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993, p. 759). One could argue that high levels of Sensation Seeking need not be associated with impulsivity at all, as those who decide to take risks for fun (e.g., hang gliding, mountain climbing, gambling, taking drugs) may do so with full consideration of possible negative consequences, may often take steps to ensure that the risk is not higher

than they wish it to be (e.g., safety equipment for the mountain-climber, a limited amount of money in the wallet of the gambler), and may have a stable preference for their behavior, eagerly anticipating the experience beforehand and having no regret afterward. Indeed, when Sensation Seeking has been used as a predictor while controlling for the other UPPS traits, “it consistently predicts, both concurrently and prospectively, the frequency of engaging in risky behaviors (such as drinking and gambling), but it does not relate to problem levels of involvement in those behaviors” (Cyders & Smith, 2008, p. 810). Notably, Dickman’s Functional Impulsivity scale loads on the Sensation Seeking factor (Whiteside & Lynam, 2001). Nonetheless, Sensation Seeking is associated with the other UPPS traits (except Perseverance; Miller et al. 2003; Whiteside et al., 2005), and Zuckerman found that it correlated strongly enough with other measures of impulsivity to indicate a single Impulsive Sensation Seeking dimension (Zuckerman et al., 1993; Zuckerman, 2005).⁴ Sensation Seeking’s location in Extraversion suggests that it reflects a strong sensitivity to the possibility of reward, which should make impulsive action more likely, by increasing the strength and frequency of reward-seeking urges. Thus, although Sensation Seeking may not be inherently impulsive, it is associated with impulsivity. As one might expect, it appears to be those high in Sensation Seeking and also low in Premeditation who are especially likely to take risks with negative outcomes, in addition to risks with positive outcomes (Fischer & Smith, 2004).

Urgency, in Whiteside and Lynam’s (2001, p. 685) original conception, reflects “the tendency to experience strong impulses, frequently under conditions of negative affect,” which lead to “impulsive behaviors in order to alleviate negative emotions despite the long-term harmful consequences of these actions” (e.g., overeating, abusing drugs, or speaking or arguing rashly). That Urgency is associated with Neuroticism is in keeping with its emphasis on negative emotion as the trigger for rash action. However, since the original publication of the UPPS model, Cyders and colleagues (2007) have developed a measure of Positive Urgency (renaming the original scale Negative Urgency), based on evidence that strong positive emotion can also lead to rash action with harmful consequences (such as celebratory binge drinking by college students or resumption of gambling by pathological gamblers). Like Premeditation and Perseverance, Positive and Negative Urgency appear to be distinct facets of a single broader trait

(Cyders & Smith, 2008). This general Urgency trait appears to describe dysfunctional impulsivity in which emotions are particularly salient, whereas lack of Premeditation and Perseverance appears to describe impulsivity in which emotions are less salient.

One might expect that Positive Urgency would be primarily associated with Extraversion and Sensation Seeking, given that positive affect is a central component of Extraversion. Instead, however, Positive Urgency displays a profile of correlations with the Big Five similar to that of Negative Urgency (Cyders & Smith, 2008). Closer inspection of this pattern provides an additional insight into the nature of impulsivity as a personality trait. Despite the fact that Impulsiveness (the NEO PI-R equivalent of Negative Urgency) is a facet of Neuroticism, it has the lowest loading on Neuroticism (.49) of any facet of that domain (Costa & McCrae, 1992). The trait that the general Urgency dimension most strongly reflects does not appear to be Neuroticism. Rather, it appears to be one of the higher-order factors of the Big Five.

Impulsivity and the Higher-Order Factors of the Big Five

The Big Five were originally conceived as orthogonal dimensions and the broadest level of personality description. However, measures of the Big Five display a consistent pattern of intercorrelation, which reveals the existence of two higher-order factors or metatraits, labeled *Alpha* or *Stability* and *Beta* or *Plasticity* (DeYoung et al., 2002; DeYoung, 2006; Digman, 1997; Markon et al., 2005; McCrae et al., 2008). Stability consists of the shared variance of Conscientiousness, Agreeableness, and Neuroticism (reversed), whereas Plasticity consists of the shared variance of Extraversion and Openness/Intellect. Stability appears to reflect a general tendency toward restraint and lack of disruption in emotion, motivation, and social relationships, whereas Plasticity appears to reflect a general tendency toward exploration and engagement with novel phenomena (DeYoung, 2006; Hirsh, DeYoung, & Peterson, 2009). Stability, therefore, seems likely to be associated with impulsivity generally, whereas Plasticity seems particularly likely to be associated with Sensation Seeking (indeed, Sensation Seeking is related to Openness/Intellect as well as Extraversion; Aluja, Garcia, & Garcia, 2003; Flory et al., 2006).

In a factor analysis of the 30 facets of the NEO PI-R and the two Urgency scales, Cyders and Smith (2008) found that both Positive and Negative Urgency showed a similar pattern of factor loadings in a five factor solution, with each loading on Neuroticism (PU = .28, NU = .58), Conscientiousness (PU = -.39, NU = -.40), and Agreeableness (PU = -.30, NU = -.37). Additionally, in both their sample and the normative data for the NEO PI-R, a similar pattern of factor loadings is evident for the NEO PI-R Impulsiveness facet (Costa & McCrae, 1992; Cyders & Smith, 2008). Cyders and Smith also examined a two factor solution and found that Positive and Negative Urgency and Impulsiveness strongly marked the Stability factor. Urgency, therefore, appears to be a form of impulsivity that is most clearly described in personality taxonomies as a manifestation of low levels of the metatrait Stability.

Another scale that exhibited this pattern of correlations with the Big Five is the Self-Control Scale (SCS; Tangney, Baumeister, & Boone, 2004), in which nearly all items are face-valid as markers of three of the four UPPS factors (the SCS does not appear to include Sensation Seeking items). One item especially, "People would describe me as impulsive," highlights the fact that this is a reversed impulsivity scale. The SCS was correlated almost equally with Neuroticism, $r = -.50$, and Conscientiousness, $r = -.54$, and somewhat more weakly with Agreeableness, $r = .29$ (Tangney et al., 2004). In this context, it is interesting to note that "Self-Control" has been suggested as an alternative label for Stability (Olson, 2005).

Finally, another variable, even broader in scope than impulsivity and clearly related to a lack of self-control, is associated with the same three Big Five dimensions and with the metatrait Stability (DeYoung, Peterson, Seguin, & Tremblay, 2008; Miller & Lynam, 2001). This is externalizing behavior, which is a broad category of behaviors that tend to be correlated, including aggression, impulsivity, antisocial behavior, and drug abuse (Krueger et al., 2002, 2007). Behavior genetic research indicates that the various types of externalizing behavior share a single underlying factor that is strongly genetically influenced and accounts for their correlation (Krueger et al., 2002). This factor appears to represent a continuous trait that is normally distributed in the general population (Markon & Krueger, 2006). Associations with broad personality models offer one approach to understanding the sources of this

externalizing factor. In a sample of adolescent males, Stability was a strong predictor of externalizing behavior, as measured by both self- and teacher reports (DeYoung et al., 2008). Additionally, Plasticity predicted externalizing behavior positively, but only when controlling for Stability. In other words, if one compares two groups or individuals of equal Stability, the one with more of the exploratory tendency described by Plasticity will be likely to express higher levels of externalizing behavior.

The association of the metatraits with various types of impulsivity and with externalizing behavior more generally is consistent with a theory of the neurobiological substrates of personality that links Stability to the neurotransmitter serotonin and Plasticity to the neurotransmitter dopamine (DeYoung et al., 2002; DeYoung & Gray, 2009; DeYoung et al., 2008). Although many brain systems have been implicated in impulsivity, one consistent set of findings is that impulsivity and other forms of externalizing behavior are associated with serotonergic and dopaminergic function (Carver et al., 2009; Chambers, Taylor, & Potenza, 2003; Congon & Canli, 2008; Cyders & Smith, 2008; Depue & Collins, 1999; Kruesi *et al.*, 1990; Zuckerman, 2005).

Serotonin acts very widely in the brain as a neuromodulator, with regulatory or inhibiting effects on mood, behavior, and cognition (Spooont, 1992). Serotonin not only potentiates the function of effortful control processes that allow the top-down restraint of impulses (Carver et al., 2009), it also serves to suppress the bottom-up hypothalamic and brainstem systems (including the dopaminergic system) that generate impulses in the first place (Chambers et al., 2003; Gray & McNaughton, 2000). Serotonin acts to limit negative affect and aggression, while maintaining behavioral and motivational stability, and it has been directly linked to Conscientiousness, Agreeableness, and low Neuroticism, the traits constituting Stability (e.g., Jang, et al., 2001; Manuck, et al., 1998). Increasing serotonergic function thus appears to modulate both elements of impulsive action—the impulses and the lack of restraint—so as to reduce impulsivity. Individual differences in serotonergic function are therefore likely to be a key substrate of all impulsivity-related traits, perhaps most strongly related to the dimension labeled Urgency because this dimension explicitly describes strong impulses as well as weak restraint of those impulses.

Dopamine is another important neuromodulator, but with primarily activating effects on behavior and cognition. Dopaminergic circuitry modulates exploration and approach behavior, sensitivity to possible rewards, desire, and curiosity, as well as cognitive control and flexibility (Berridge & Robinson, 1998; Braver & Barch, 2002; Panksepp, 1998). Considerable evidence links Extraversion to variation in dopaminergic function (Depue & Collins, 1999; Wacker, Chavanon, & Stemmler, 2006), and a smaller body of evidence suggests that Openness/Intellect may also be related to dopamine (DeYoung, Peterson, & Higgins, 2005; Harris, et al., 2005). The association of Extraversion, a trait reflecting sensitivity to reward, with various aspects of impulsivity is consistent with the role of dopamine in potentiating impulses and increasing the subjective value of temptations. Interestingly, dopamine plays complementary and potentially conflicting roles in different brain areas: In the striatum, it potentiates impulses, whereas in the prefrontal cortex, it enhances the ability to control attention (up to a point—either too little or too much dopamine disrupts prefrontal function) (Arnsten & Robbins, 2002; Depue & Collins, 1999). Associations of dopamine with impulsivity, therefore, may be more complex than those of serotonin. In sum, both biological and psychometric considerations indicate that the metatraits and their biological substrates should be investigated in conjunction with impulsivity.

Conclusion

As a personality trait, impulsivity has been conceived in many different and often competing ways, but personality psychology is beginning to clarify the different varieties of impulsivity. The development of the UPPS model (Whiteside & Lynam, 2001) has provided a set of dimensions, emerging from many questionnaire measures of impulsivity, that provides an excellent jumping-off point for research on individual differences in impulsive behavior. (Eventually, similar clarity may be brought to performance tests of impulsivity, though much additional psychometric work will be necessary.) The complex set of associations, reviewed in this chapter, of the UPPS traits with the Big Five and their metatraits is likely to be indicative of multiple underlying processes that determine impulsive behavior, including multiple systems that generate impulses and multiple processes that restrain impulses. Individual differences in any of these processes are likely to affect the general tendency toward

impulsivity, defined as acting on immediate urges, either before consideration of possible negative consequences or despite consideration of likely negative consequences.

As it becomes feasible to develop theories of the neurobiological sources of basic personality traits like the Big Five and their metatraits (DeYoung & Gray, 2009, DeYoung et al., in press), these theories may provide a useful lens to help us understand individual traits of interest, particularly traits as complex as impulsivity. Systems responsible for sensitivity to reward and punishment and for effortful control are likely sources of individual differences in impulsivity that can be mapped onto specific Big Five traits. Additionally, the association of impulsivity with the functions of the serotonin and dopamine systems (which overlap with the three systems just mentioned but are more broadly acting than any one of them) may help to explain the relation of different forms of impulsivity to the metatraits, Stability and Plasticity, which represent shared variance among the Big Five.

Although Whiteside and Lynam (2001) made an excellent case for considering Conscientiousness, Extraversion, and Neuroticism in relation to impulsivity, the evidence reviewed above suggests that we should cast our net even more widely. One limitation of the analysis that produced the UPPS model is that it did not include measures of Agreeableness and Openness/Intellect. Both traits have important links to impulsivity. Agreeableness predicts the tendency to restrain aggressive impulses (Meier, Robinson, & Wilkowski, 2006), and impulsive aggression is a major concern in research on impulsivity. Openness/Intellect has been positively associated with substance use disorders (Trull & Sher, 1994). Additionally, both Agreeableness and Openness/Intellect are of interest because of their role in the metatraits, which appear to be associated with impulsivity and externalizing behavior.⁵ All of the Big Five should be included in any future research on the relation of impulsivity to personality taxonomies.

The study of impulsivity as a personality trait cannot shrink from complexity, either in the traits that may be related to impulsivity or in the behaviors that are considered impulsive. One might question the wisdom of introducing the construct of externalizing behavior into this investigation, given that it is a broader construct even than impulsivity. However, externalizing behavior is highly relevant to research on impulsivity because antisocial behavior, aggression, and drug abuse are among the most common

criteria for prediction by trait measures of impulsivity. Conceiving of the general externalizing behavior factor as a target for research on impulsivity may help researchers identify the shared mechanisms influencing the great variety of behaviors that are likely to be performed impulsively.

Human impulsivity reveals the fundamental struggle between phylogenetically old brain systems that drive us to pursue immediate gratification of simple desires and the newer brain systems that evolved to restrain those systems, in order to pursue complex and distant goals. On both sides of this conflict, these systems are multiple and complex; an effective explanatory model cannot be boiled down to a monolithic restraint system in conflict with a monolithic impulse system. Individual differences in impulsivity reflect this complexity, as is evident in the multiple dimensions of impulsivity as a personality trait. This chapter has attempted to describe trait impulsivity in a manner that respects the complexity of the systems involved, while rendering the logic of their manifestation in personality more comprehensible.

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Footnotes

1. Recently, lexical research has discovered a six-factor solution that appears to be more widely replicable across languages than the Big Five (Ashton et al., 2004); however, this model appears to be only a minor variation on the Big Five, splitting Agreeableness into two factors (DeYoung et al., 2007). Social salience is likely to be a biasing factor in lexical studies, and traits within Agreeableness are highly socially salient, as Agreeableness reflects cooperation versus antagonism in social relationships.

2. The kind of restraint or inhibition of impulsive behaviors associated with Conscientiousness, which has been described as “nonaffective constraint” (Depue & Lenzenweger, 2005), must be distinguished from behavioral inhibition associated with anxiety. Gray and McNaughton (2002) posited a behavioral inhibition system (BIS) that detects threats to the accomplishment of goals (regardless of whether they are immediate or distant goals) and generates anxiety that inhibits ongoing behavior, in order to avoid or resolve conflicts with one’s goals. However, this inhibition is automatic and emotional, rather than voluntary and effortful, and is not controlled by the prefrontal cortex. Someone who is anxious may well be less impulsive in relation to potential rewards (due to detection of conflicts between the distracting reward and longer-term goals) but may be more impulsive in relation to threats, as the BIS automatically triggers threat-related impulses.

3. Aside from the correlation between Perseverance and Premeditation, Smith et al. (2007) found that correlations among the four UPPS traits were weak or nonexistent, but there are two reasons to question the reliability of this finding. First, Whiteside and Lynam (2001) used an orthogonal factor rotation, which artificially forces factors to be uncorrelated, even when they would be correlated if an oblique rotation were used. The UPPS scales based on these orthogonal factors might be less correlated than they should be. Second, Smith et al. used an undergraduate sample. In a large community sample, another study found that the correlations among UPPS scales ranged from .29 to .56, with the exception of the correlation between Sensation Seeking and lack of Perseverance, which was .06 (Miller et al., 2003). A

very similar pattern of correlations was found in a sample with high rates of borderline personality disorder, pathological gambling, and alcohol abuse (Whiteside et al. 2005), suggesting that populations with higher levels of impulsivity than college undergraduates may tend to show stronger associations between distinct impulsivity-related traits.

4. Note that Zuckerman's (1979) earlier Sensation Seeking Scale (SSS) is broader than the UPPS Sensation Seeking scale or the NEO PI-R Excitement Seeking Scale. In addition to Thrill and Adventure Seeking and Experience Seeking subscales, Zuckerman's SSS also includes Disinhibition and Boredom Susceptibility scales. Whiteside and Lynam (2001) found Disinhibition to load equally on Sensation Seeking and lack of Perseverance, whereas Boredom Susceptibility loaded primarily on lack of Perseverance. In keeping with these findings, the SSS is associated with low Conscientiousness at least as strongly as with high Extraversion (Zuckerman, 2005; Zuckerman et al., 1993).

5. The association of impulsivity and externalizing behavior with Openness/Intellect is likely to be complex because, in addition to being associated with Extraversion, Openness/Intellect is the only Big Five trait consistently positively associated with intelligence (DeYoung et al., 2005). Intelligence, however, is negatively associated with impulsivity and externalizing behavior (DeYoung, et al., 2008; Kuntsi et al., 2004). The apparent paradox can be resolved by the observation that Openness/Intellect is associated with intelligence independently of its association with Extraversion (DeYoung et al., 2005, 2008). Thus, there are two distinct pools of variance in Openness/Intellect, and we found them to be associated in opposite directions with externalizing behavior (DeYoung et al., 2008). This suggests that, to the degree that Openness/Intellect entails being exploratory, it may increase impulsivity, or at least sensation seeking, whereas, to the degree that it entails being intelligent, it reduces impulsivity.