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Integrating Affect and Impulsivity: The Role of Positive and Negative Urgency in Substance Use Risk

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Abstract

Background—The personality traits of positive and negative urgency refer to the tendencies to act rashly when experiencing unusually positive or negative emotions, respectively.

Methods—The authors review recent empirical work testing urgency theory (Cyders and Smith, 2008a) and consider advances in theory related to these traits.

Results—Empirical findings indicate that (a) the urgency traits are particularly important predictors of the onset of, and increases in, substance use in both children and young adults; (b) they appear to operate in part by biasing psychosocial learning; (c) pubertal onset is associated with increases in negative urgency, which in turn predict increases in adolescent drinking behavior; (d) variation in negative urgency trait levels are associated with variations in the functioning of an identified brain system; and (e) variations in the serotonin transporter gene, known to influence the relevant brain system, relate to variations in the urgency traits.

Conclusion—A recent model (Carver, et al., 2008) proposes the urgency traits to be markers of a tendency to respond reflexively to emotion, whether through impulsive action or ill-advised inaction (the latter leading to depressive symptoms); this model has received empirical support. The authors discuss new directions for research on the urgency traits.

Keywords

personality; risk; positive urgency; negative urgency

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Conflict of interest

The authors declare no conflicts of interest.

1. INTRODUCTION

An important advance in understanding the personality underpinnings of impulsive behavior, including substance use, has been the recognition of a personality disposition to act in rash, impulsive ways when highly emotional (Cyders and Smith, 2008a; Whiteside and Lynam, 2001). Researchers have identified two related personality traits, positive and negative urgency, which refer to the disposition to act rashly when experiencing unusually strong positive or negative emotions, respectively (Cyders and Smith, 2008a; Whiteside and Lynam, 2001). (There are, of course, many other personality traits that can also lead to impulsive action [see, for example, Smith and Guller (2014), Wills et al. (2011), and Whiteside and Lynam (2001)]. It is well recognized that intense emotion can be an important precursor to impulsive actions such as drug use. Both very intense positive and negative emotions tend to undermine rational decision making (Bechara, 2004, 2005; Dolan, 2007; Dreisbach, 2006), in part by interfering with one's orientation toward the pursuit of long-term goals and increasing focus on short-term needs (Dreisbach and Goschke, 2004). Intense positive emotions increase distractibility (Dreisbach and Goschke, 2004) and make one unduly optimistic concerning possible positive outcomes of situations (Nygren, et al., 1996; Wright and Bower, 1992). In this context, identification of the traits positive and negative urgency highlight that there are individual differences in the degree to which this occurs. These individual differences have proven to be important predictors of the onset of, and increases in, substance use and other addictive behaviors. Thus, developing a sound theoretical account of the operation of these traits will advance understanding of the risk process.

Cyders and Smith (2008a) presented a theory of urgency that integrated genetic contributors, relevant functional brain systems, early temperament, and development to explain the emergence of individual differences in the urgency traits. In that paper, we reviewed existing empirical evidence concerning urgency, leading to conclusions that (a) positive and negative urgency are characterized by high neuroticism, low conscientiousness, and low agreeableness; (b) the two traits are highly related and can be understood as facets of an overall urgency domain; (c) they can be assessed with good convergent and discriminant validity using multi-trait, multi-method matrices (see Cyders and Smith, 2007); and (d) they share little variance with other impulsivity-related traits, such as lack of planning, lack of perseverance, sensation seeking, reward responsiveness, drive, and fun seeking (also see Cyders, et al., 2007). We offered several hypotheses in relation to urgency theory that had yet to be tested. There are three aims to the current paper: First, we examine the degree to which the hypotheses we offered in 2008 have received empirical support. Second, we consider new theoretical advances in understanding urgency and its potentially broader role in psychopathology and substance use risk. Third, we suggest new directions for urgency research. We use the term urgency to refer to the domain that includes both positive and negative urgency. Where necessary, we refer specifically to positive or negative urgency.

2. EMPIRICAL TESTS OF URGENCY THEORY HYPOTHESES

2.1 The urgency traits are particularly important personality predictors of substance use

Cyders and Smith (2008a) proposed that urgency has a unique and clinically important relationship with many different risk-taking behaviors, including substance use. Numerous studies have compared the relative predictive ability of urgency vis a vis other impulsivity-related traits in accounting for risk-taking and substance use and have supported a unique role for urgency in relation to a wide range of risk-taking behaviors, including problematic alcohol use, risky sexual behavior, illegal drug use, tobacco use, and gambling (e.g., Anestis et al., 2007; Coskunpinar, et al., 2013; Cyders and Smith, 2008b; Cyders et al., 2007; Fischer et al., 2003, 2007; Miller et al., 2003; Stautz and Cooper, 2013; Verdejo-Garcia et al., 2007; Zapolski et al., 2009; see also a review by Cyders et al., in press).

Importantly, urgency seems to contribute uniquely to risk specifically for *problematic* levels of risk-taking. For example, whereas sensation seeking relates to the frequency of substance use, negative urgency is a more important factor for problematic levels of alcohol consumption (Fischer et al., 2007). Recent meta-analyses conclude that negative urgency is the strongest impulsivity-related predictor of problematic alcohol consumption (Coskunpinar, et al., 2013) and bulimic symptomatology (Fischer et al., 2008). Positive urgency was identified more recently than negative urgency (see Cyders et al., 2007), and, therefore, the literature concerning this trait is still emerging; however, positive urgency has a similar association with alcohol problems (across 5 studies) and alcohol use (across 3 studies) as negative urgency (Coskunpinar et al., 2013). The results of these quantitative reviews appear to confirm the prominent role played by the urgency traits regarding risk for addictive behaviors.

2.2 The urgency traits prospectively predict the onset of, and increases in, substance use and other addictive behaviors

Cyders and Smith (2008a) proposed that urgency would prospectively predict the onset of and increases in substance use and other addictive behaviors. To date, researchers have examined this hypothesis in youth making the transition from elementary school to middle and high school, and also in individuals making the transition to college life. Considering youth first, prospective prediction of the onset of addictive behaviors in children is important for at least two reasons. First, it would suggest that individual differences in urgency are important at the very beginning of one's substance use history. Second, prediction in children this young is unlikely to be an artifact of prior dysfunction, and thus would highlight more convincingly the possible etiological role of urgency.

This hypothesis has been supported. Positive urgency measured in the spring of 5^{th} grade predicts the subsequent onset of, and increases in, drinking behavior by the spring of 6^{th} grade (Settles, et al., 2014) and 5^{th} grade negative urgency predicts the onset of, and increases in, binge eating behavior measured in the spring of 6^{th} grade (Pearson, et al., 2012). The overall urgency domain also predicts smoking onset in youth making the transition to middle school (Guller, et al., 2015). Most recently, research has spanned the period from the end of elementary school (spring, 5th grade) through the first year of high

school (spring, 9th grade): urgency measured in elementary school predicts drinking levels in high school, controlling for prior drinking, sex, and early pubertal onset (Riley et al., 2015). Importantly, these predictive relationships do not differ across race or gender of participants.

Prospective prediction of substance use during the transition into college life by urgency is also important. The first year of college is a period characterized by high rates of risk-taking behavior (Presley et al., 1996) and rates of many types of risky behaviors increase markedly when adolescents leave home for the first time (Kelley et al., 2006). In addition, risk-taking among college students leads to high rates of unintended injuries, alcohol and drug-related health problems, and other negative health consequences such as sexual assault and abuse (e.g., Engs et al., 1996; Hingson et al., 2002).

Three longitudinal studies on change during the first year of college have been conducted since 2008 and each has documented the predictive role of urgency in relation to college student/young adult substance use. Positive urgency predicts increases in both quantity consumed per drinking occasion and drinking problems (Cyders et al., 2009), and it also predict increases in drug use and risky sexual behavior (Zapolski et al., 2009). There appear to be two separate risk pathways to increases in drinking quantity during the first year of college: one precipitated by positive urgency and one by negative urgency (Settles et al., 2010). Additionally, negative urgency and sensation seeking predict smoking initiation early in college (Doran, et al., 2013) and increased drinking over a one-year college period (Kaiser et al., 2015).

Overall, urgency predicts the onset of and increases in several forms of risk-taking in both youth and young adults. Subsequent research has, therefore, sought to better understand mechanisms by which urgency imparts this risk; the most prominent area covered in this research is urgency's effects on psychosocial learning.

2.3 The urgency traits may increase risk by biasing psychosocial learning

Cyders and Smith (2008a) suggested that urgency biases one's psychosocial learning about risk-taking behaviors, which, in turn, leads to increased engagement in risk taking. The Acquired Preparedness model of risk (AP Model; Smith and Anderson, 2001) is an extension of person-environment transaction theory (Caspi, 1993), which is based on the premise that individuals are differentially prepared to acquire certain learning experiences as a function of their personalities (Davis et al., in press; Smith and Anderson, 2001). Support for this premise was provided by a basic science longitudinal laboratory study, where individuals were exposed to the same learning event (investment in a mock stock market), received the same outcomes (same rates of success for their chosen investments), but formed different expectancies for future anticipated outcomes and behaviors; this differential learning was predicted by baseline individual differences in personality, assessed at a time point prior to the learning event (Smith et al., 2006).

The AP model holds that urgency imparts risk for addictive behaviors because it biases learned associations for risk-taking, which in turn increases risk-taking tendencies over time (Davis et al., in press). The previously mentioned longitudinal studies examining urgency

effects on risk-taking have supported the AP model, both in elementary school students (Settles et al., 2014) and in first year college students (Settles et al., 2010). Specifically, 5th graders' positive urgency scores predict increased drinking frequency at the end of 6th grade, mediated by increases in expectancies for positive social effects of drinking measured at the beginning of 6th grade (Settles et al., 2014). Furthermore, negative urgency in the fall of 7th grade predicts increased drinking frequency in 8th grade, mediated by increases in expectancies for positive, social experiences from drinking in the spring of 7th grade (Guller and Smith, 2014). The pattern is similar among first year college students as well (Settles et al., 2010): Positive urgency predicts increased expectancies for positive arousing effects from drinking over time, and, in turn, this expectancy predicts subsequent increases in drinking quantity (that is, increased expectancy endorsement mediates the predictive influence of positive urgency on subsequent drinking quantity). Negative urgency predicts increases in the motive to drink to cope with distress, which in part reflects the expectancy that drinking does help one manage distress, and the motive in turn predicts subsequent increases in drinking quantity. This longitudinal process appears to operate for other addictive behaviors as well, including smoking (Doran et al., 2013) and binge eating (Pearson et al., 2012).

2.4 Urgency levels increase following pubertal onset

Cyders and Smith (2008a) suggested that urgency is a particularly important trait during adolescence. Although personality traits, including urgency, are generally quite stable over time (Costa and McCrae, 1996; Riley et al., 2015), there is evidence for personality change during periods of transition (Roberts et al., 2003). One such transition is during the onset of puberty. Because pubertal onset is associated with increased emotional reactivity and an increase in rash, impulsive action (Maggs and Hurrlemann, 1995; Moffitt, 1993; Steinberg, 2004), Cyders and Smith (2008a) hypothesized that pubertal onset would be associated with an increase in negative and positive urgency. Boyle et al. (2015) studied the predictive influence of pubertal onset as a time-varying predictor of increases in negative urgency and subsequent increases in adolescent drinking behavior. Pubertal onset predicts both a mean increase in negative urgency and a slope increase, such that prior to puberty negative urgency levels were not changing at all and following pubertal onset they increased linearly. Negative urgency, in turn, predicts a subsequent mean and slope increase in drinking frequency. Davis and Smith (2015) found that this puberty-based increase in negative urgency also predicts subsequent increases in binge eating behavior. Neither study found a similar effect for positive urgency; pubertal onset does not appear to alter the development of positive urgency.

2.5 Urgency may relate to variation in functional brain systems

As Cyders and Smith (2008a) observed, there appears to be a functional brain system involved in the processing of emotion-laden experiences and preparing for action that involves interconnections between the amygdala and the orbitofrontal cortex (OFC) and its medial sector (the ventromedial prefrontal cortex, or VMPFC) (Barbas, 2007; Bechara et al., 2000; Ghashghaei and Barbas, 2002; LeDoux, 2000; Lewis and Todd, 2007). The amygdala appears to be involved in the experience of emotionally salient stimuli, perhaps particularly negative affect (Davidson, 2003), whereas the OFC and VMPFC appear to be involved in the

modulation of emotion-based reactivity (Davidson, 2003). Both areas receive direct projections from the sensory areas (Barbas, 2007), from one another, and from the anterior cingulate cortex (ACC; Devinsky et al., 1995).

When the amygdala is activated in response to emotionally arousing stimuli, its projections to the OFC/VMPFC operate (referred to as “bottom-up” processing; Lewis and Todd, 2007); these projections appear to have the effect of alerting the OFC/VMPFC to attend to emotionally important stimuli. At the same time, projections from the amygdala to the striatum, the nucleus accumbens, and the ventral tegmental area enhance the activation of both limbic and cortical structures, thereby further preparing for action in response to the emotional experience (Cardinal et al., 2002). This sequence of processing from the amygdala to higher level cortical areas helps orient one to what is important and also helps one prepare for possible behavioral responses. In turn, projections from the OFC and VMPFC back to the amygdala (referred to as “top-down” processing; Lewis and Todd, 2007) have the apparent effect of regulating the amygdala and the brain stem (Bechara, 2005; Ghashghaei and Barbas, 2002; Hariri et al., 2006; Lewis and Todd, 2007). Thus, the PFC structures provide information about the anticipated consequences of possible actions, with a bias toward long-term, goal-directed behavior, and can override the emotional response of the amygdala (Lewis and Todd, 2007), with two effects: (a) shortening the time course of the experience of negative affect and attention to stressful stimuli and (b) reducing the likelihood of emotion-driven rash responses to the emotion and thus increasing the likelihood of responses that are consistent with one’s ongoing interests and goals (Davidson, 2003).

In a well-functioning system, individuals recognize emotionally salient stimuli and attend to them, choosing behaviors designed to meet the needs of the underlying emotion but in a way that does not harm their long-term interests or goals, which requires effortful control (Rothbart et al., 2000) and maintenance of an emotional connection to one’s long-term goals and interests (Davidson, 2003). Cyders and Smith (2008a) proposed that reduced top-down processing results in higher levels of urgency, in that the focus primarily resides on short-term goals and immediate responses to emotional experiences that fail to maintain focus on long-term goals and interests.

Recently, work has begun that examines how urgency relates to brain system functioning and, to date, findings have generally suggested that negative urgency is related to increased “bottom-up” responding to emotional cues and reduced top-down modulation of such responding. Negative urgency relates to (1) reduced activation in the OFC and anterior cingulate in response to positively and negative valenced stimuli (Joseph et al., 2009), (2) increased activation in the left amygdala and right orbitofrontal cortex in response to negatively valenced images (the former hypothesized by Cyders and Smith, the latter not; Cyders et al., 2014), and (3) increased activation in the amygdala during negative emotion maintenance and reappraisal (Albein-Urios et al., 2013). As anticipated by urgency theory, there is a lack of relationship between urgency and self-reported mood (e.g., Cyders et al., 2010; Cyders and Coskunpinar, 2010), but urgency appears to reflect hyperactivity in limbic regions associated with emotional reactivity. Because urgency is understood to reflect the disposition to act rashly when in extreme mood states, findings showing it relates to brain

regions involved in emotional reactivity but not to baseline mood are consistent with urgency theory (Cyders and Smith, 2008a).

Negative urgency is related to additional indicators of reduced top-down processing, including reduced right intra-frontal gyrus activation during response inhibition while performing a stop signal reaction time task (Wilbertz et al., 2014) and increased right insula activation during a decision making task (Xue et al., 2010). Additionally, although not previously hypothesized, research suggests that negative urgency is associated with increased reward circuitry responding, including (1) increased activation in the medial prefrontal cortex during the Monetary Incentive Delay Task (Weiland et al., 2014), (2) increased VMPFC activation to alcoholic drink aromas in social drinkers (Cyders et al., 2014), and (3) increased caudate nucleus activation to alcohol images (Chester et al., under review-a). This latter finding suggests that urgency might relate to an increase in attention to and salience of rewarding cues in the environment, which then cue subsequent craving that is not as effectively modulated via top-down circuitry, perhaps due to excessive activation of and fatigue in inhibitory brain regions (Chester et al., under review-b). Strikingly, in two of these studies, the relationship between increased responses to emotional stimuli and increased responses to alcohol cues and risk-taking was mediated by negative urgency (Cyders et al., 2013, 2014), suggesting that physiological hyperreactivity to emotional stimuli and reward cues is related to later risk taking in part by increasing the tendency toward rash action in negative emotional states.

Urgency has also been associated with reduced cortical thickness in the ventral and dorsomedial prefrontal cortex, including the right frontal and temporal poles, the medial and lateral orbitofrontal gyrus and inferior frontal gyri, and the rostral anterior cingulate cortex (Hoptman et al., 2014; Muhleter and Lawrence, in press). Many of these regions are related to emotion appraisal, regulation, and emotion-based decision-making, suggesting that urgent behaviors might be driven by reduced capacity to engage in rational emotion-based decision-making.

To date, positive urgency has been largely unrelated to brain system functioning (e.g., Cyders et al., 2013, 2014), although this might be due in part to limited positive mood induction effects (as suggested by Cyders et al., 2012). One recent study (Gable et al., in press) found that positive urgency is associated with greater frontal asymmetry during electroencephalographic (EEG) and positive urgency has also been associated with reduced cortical thickness (Hoptman et al., 2014); however, this work is in its infancy and should continue to determine whether or not positive urgency shows as robust relationships with emotion and reward brain circuitry as does negative urgency.

2.6 Variability in serotonin and dopamine levels related to identified gene polymorphisms contribute to urgency

Cyders and Smith (2008a) hypothesized that low levels of serotonin (5HT) in the functional brain systems described above would contribute to the development of urgency, by leading to reduced prefrontal modulation of amygdala-driven emotional reactivity. For some receptor subtypes and in some brain areas, 5HT modulates dopamine (DA) activity (Morelli et al., 2011; Spoont, 1992), with the result that low levels of 5HT can be associated with

high levels of DA. The combination of low 5HT and high DA is associated with a tendency to act (Depue, 1995; Depue and Collins, 1999; Spoont, 1992; Zald and Depue, 2001) and increasing reward-seeking and risk-taking behaviors (Spear, 2000). In particular, high levels of DA activity in the amygdala-OFC/VMPFC circuit are associated with high rates of rash or reckless acts (Floresco and Tse, 2007).

There are many factors that influence brain levels of 5HT and DA; Cyders and Smith (2008a) emphasized one: gene polymorphisms related to neurotransmitter activity. They emphasized specific patterns of alleles on the serotonin transporter gene (5HTTLPR) and three DA receptor genes: D2, D3, and D4 as possible contributors to negative urgency due to their influence on 5HT and DA brain levels.

Carver et al. (2011) found that the hypothesized allele pattern on 5HTTLPR interacts with childhood adversity to predict a construct they called “feelings trigger actions,” which consisted of a factor defined by positive urgency, negative urgency, and a measure they created on reflexive reactions to feelings. This finding constitutes some support for the Cyders and Smith (2008a) genetic hypothesis, although the effect was present only at high levels of childhood adversity.

Researchers have identified an additional link between negative urgency and a gene polymorphism beyond that hypothesized by Cyders and Smith (2008a). Specifically, there is a link between negative urgency (measured as the impulsiveness facet on the NEO PI-R personality measure, Costa and McCrae, 2008; Whiteside and Lynam, 2001) and the g allele of the inhibitory gamma-amino butyric acid α2 receptor subunit (GABRA2) gene, which encodes the $GABA_Aa2$ receptor units and has been consistently related to alcoholism risk (e.g., Edenberg et al., 2004). This influence of negative urgency on increased alcohol risk likely exists through (1) increased insula activation in the anticipation of reward (Villafuerte et al., 2012) or (2) the reduction of GABA in the dorsolateral prefrontal cortex (Boy et al., 2011). Even more compelling, the relationship between GABRA2 and lifetime alcohol problems is mediated by negative urgency, suggesting that genetics play a role in the development of alcohol use problems in part through affecting urgent action, at least such action in response to a negative emotional state (Villafuerte et al., 2013).

Thus, research to date somewhat supports a genetic role underlying negative urgency. However, possible relationships between polymorphisms on DA receptor genes and urgency have not yet been tested. Interestingly, negative urgency has been linked to lower rates of [11C]-raclopride binding potentials in problematic gamblers, suggesting differences in dopaminergic function related to negative urgency (Clark et al., 2012).

2.7 Similarities and differences between positive and negative urgency

As noted above, we use the term urgency to refer to the personality domain that includes both positive and negative urgency. An important, ongoing question in the literature concerns whether and when the two traits operate differently from each other. Most basically, across the first year of college positive urgency predicted positive mood-based rash action and negative urgency did not, and negative urgency predicted negative mood-based rash action and positive urgency did not (Cyders and Smith, 2010). Concerning specific

addictive behaviors, negative urgency is associated with bulimic behaviors but positive urgency is not (Cyders et al., 2007). This finding is consistent with risk models for bulimia nervosa, which identify bulimic behaviors as responses to intense negative mood but not as responses to positive mood (Pearson et al., 2015). Many addictive behaviors, such as alcohol and drug use, risky sex, and gambling behavior can occur during either extreme positive moods (such as parties and celebrations) or extreme negative moods (such as to achieve negative reinforcement; Baker et al., 2004). In those cases, either trait could be predictive. It may be the case that which trait is operative depends on the context (celebratory versus drowning your sorrows).

It is important to appreciate that the two urgency traits correlate highly with each other, with correlation values ranging from .46 (Cyders and Smith, 2007) to .69 (Settles et al., 2014). For that reason, when the two traits do not predict differently (which may be the case in the prediction of problem drinking or drug use), it may be wise to combine them and use the overall urgency trait. When the traits are hypothesized to predict differently and have been shown to do so (as is the case with bulimia nervosa and, more generally, positive or negative mood-based action), it may be important to analyze them separately.

2.8 Gender and the urgency traits

Cyders (2013) conducted a meta-analysis of the relationship between gender and several impulsivity-related traits, including positive and negative urgency. Men appear to have higher mean levels of positive urgency than women, but the two sexes do not differ in mean levels of negative urgency. The relationships between the urgency traits and risky behavior outcomes did not differ by gender. Studies of youth have similarly found invariance in prediction by both positive and negative urgency across gender (Pearson et al., 2012; Settles et al., 2014).

2.9 Summary

An extensive body of research has provided empirical support for most hypotheses offered by Cyders and Smith (2008a) in their development of urgency theory. There is evidence that (1) urgency has a unique and clinically relevant association with a wide range of problematic risk-taking behaviors, (2) urgency can be measured prior to the onset of addictive behaviors and predicts the onset of and increases in risk-taking during adolescence and young adulthood, (3) one mechanism by which urgency predicts later addictive behaviors is through alterations in learning, (4) urgency is related to brain functioning in response to emotional and reward cues, suggesting that hyperreactivity to emotional and reward cues leads to risk taking through, in part, increased urgency tendencies, and (5) altered function in specified brain systems relate to genetic risk associated with urgency. There is clear evidence for the role of emotion-driven impulsivity in the substance use risk process. Positive and negative urgency operate differently in some cases as predicted by theory, and their predictive role does not vary by gender.

There are certainly aspects of urgency theory that have not yet been tested. For example, there is only suggestive evidence tying gene polymorphisms on the DA receptor genes to urgency levels. Although Cyders and Smith (2008a) hypothesized a link between early

temperament, particularly deficits in effortful control, and the urgency traits, that hypothesis has not been tested.

3. INTERVENTIONS THAT FOCUS ON INTERRUPTING THE SEQUENCE FROM DISTRESS TO RASH ACTION MIGHT BE USEFUL FOR MULTIPLE ADDICTIVE BEHAVIORS

It appears to be the case that risk for engagement in an addictive behavior involves both general risk factors (such as the urgency traits) as well as behavior-specific risk factors (such as behavior-specific expectancies and many other factors, such as low reactivity to alcohol as a risk factor for problem drinking: Schuckit et al., 2004). Thus, one potentially important aspect of fruitful treatments for addictive behaviors may be to reduce the general tendency to engage in rash, impulsive behaviors when highly emotional. The recent success of other personality-based interventions (Conrod et al., 2011) suggests the value of such approaches. Dialectical Behavior Therapy (DBT; Linehan, 1993) is one prominent intervention that emphasizes teaching skills to enable one to respond adaptively to the experience of extreme emotional states. A number of researchers have adapted DBT-like interventions for use with addictive behaviors, including among adolescents (Baer et al., 2005; Clyne and Blampied, 2004; Robins and Chapman, 2004). A recently developed treatment for bulimia nervosa, known as Integrated Cognitive-Affective Therapy for Bulimia Nervosa (ICAT-BN; Wonderlich et al., 2014) was heavily influenced by urgency theory and offers skills for affective management in the eating disorders context.

Each of these interventions emphasizes extreme negative moods, and less is known about possible interventions to reduce positive urgency-based risk. Although individuals experiencing high levels of positive affect may be less likely to come to clinical attention, it is nevertheless true that a disposition to act rashly when in an unusually positive mood does predict drug use, alcohol use, smoking, gambling, and risky sex (Cyders and Smith, 2008b; Cyders et al., 2009; Settles et al., 2010, 2014; Zapolski et al., 2009). Possible interventions that might be investigated include (a) creative efforts to help individuals appreciate that maintenance of their positive mood might be facilitated by careful consideration of the consequences of prospective actions; (b) teaching clients how to savor one's success in an integrative cognitive-affective way, by replaying or reviewing the success with colleagues or friends; (c) working with clients to identify alternative, safer behaviors that can enhance one's existing positive mood; and (d) helping clients identify warning signs that they are at risk to behave impulsively, and develop reminder cues to help them remain cognizant of their long-term interests and goals (Zapolski, et al., 2010b).

4. THE POSSIBLE ROLE OF THE URGENCY TRAITS IN PREVENTION

Two important recent findings are that (a) the urgency traits are present at least as young as 5th grade and (b) they predict the subsequent onset of addictive behaviors (Settles et al., 2014; Smith et al., 2013). If the disposition to act rashly when highly emotional contributes to the initiation of substance use, it might well be a useful target for prevention-based intervention. Teaching children to manage their extreme mood states in ways that do not lead

to impulsive, ill-advised action has, indeed, shown promise in a pilot prevention study (Zapolski, 2012).

5. THEORETICAL ADVANCES IN UNDERSTANDING URGENCY AND ITS ROLE IN PSYCHOPATHOLOGY

In the urgency theory offered by Cyders and Smith (2008a), high levels of urgency are thought to dispose individuals to rash, impulsive actions when highly emotional. For that reason, high levels of urgency are understood to increase risk for engagement in substance use. As noted above, this conceptualization has received clear support in the empirical literature.

Carver et al. (2008) offer a broader conceptualization of the role of urgency, identifying it as part of a larger overall construct: reflexive responsivity to emotion (RRE; Carver et al., 2008). This alternative conceptualization may prove important for the development of more comprehensive models describing the role of intense affect in substance use risk. In their model, individuals may respond reflexively to emotions either with rash action (which can lead directly to substance use) or with ill-advised inaction (which can result in increased subjective distress). Similar to our theory, rash action such as heavy drinking or drug use can be a response to intense emotion that provides either the negative reinforcement of relief by providing a distraction from the source of the distress or positive reinforcement by enhancing a celebratory mood (Cyders and Smith, 2008a). However, in contrast to our theory, in Carver et al.'s (2008) model, ill-advised inaction can also be a response to intense emotion, with the similar goal of relief from distress. For example, choosing not to ask a date to the prom or failing to ask one's boss for a raise can provide immediate relief from distress, even though these forms of inaction work against one's ongoing interests. Failure to act to pursue one's interests or to obtain potential reinforcement is associated with depressive symptomatology (Jacobson et al., 2001; Lewinsohn, 1975).

Thus, counter to our theory, Carver et al. (2008) identify urgency as a marker of RRE, and therefore as a predictor of both rash action and ill-advised inaction. From this alternative conceptualization, urgency should predict dysfunction reflecting rash action (such as heavy drinking) as well as dysfunction reflecting ill-advised inaction (such as depressive symptomology). Depressive symptomatology is also a risk factor for substance misuse (Kidorf and Lang, 1999; Kou et al., 2006; Swendsen et al., 2000), so if elevations in urgency are a marker of risk for increases in depression, then urgency may increase substance misuse risk through two different pathways.

There is good reason for the Carver et al. (2008) hypothesis. Essentially the same functional brain system identified by Cyders and Smith (2008a) as underlying variation in urgency also underlies variation in depressive symptomatology (see review by Carver et al., 2008). Low 5HT in this brain system, then, may increase risk for both impulsive action and ill-advised inaction. Presumably, what determines whether RRE is expressed as rash action or ill-advised inaction is determined by two factors: individual differences in reward and punishment sensitivity. That is, a high RRE, high reward sensitive individual will engage in rash actions and risky behaviors; whereas a high RRE, high punishment sensitive individual

will tend to engage in ill-advised inaction, and thus be at increased risk for internalizing dysfunction, such as depression (Carver et al., 2008).

A recent longitudinal test compared the two models (Smith et al., 2013). The authors tested whether 5th grade urgency (measured as the overall domain) not only predicted the subsequent onset of, and increases in, drinking and smoking, but also predicted increases in depressive symptoms over the 12 months from the end of elementary school to the end of the first year of middle school. Both the Cyders and Smith (2008a) and Carver et al. (2008) models anticipate successful prediction of drinking and smoking, but only the Carver et al. (2008) model hypotheses successful prediction of depressive symptoms.

Smith et al. (2013) found support for the Carver et al. (2008) framework. In addition to successful prediction of subsequent drinking and smoking, 5th grade urgency scores predicted increased depressive symptomatology at the end of 6th grade. This prediction was above and beyond prediction from the following variables also measured in 5th grade: gender, early pubertal onset, depressive symptomatology, negative affectivity, positive affectivity, drinking frequency, smoking frequency, binge eating frequency, sensation seeking, and low conscientiousness. Smith et al. (2013) used such extensive controls to provide a stringent test of the Carver et al. (2008) prediction and to rule out increased depressive symptomatology due to addictive behavior involvement, rather than to urgency levels.

Assuming this finding survives replication attempts, a broader model of urgency as one marker of an overall tendency to respond reflexively, rather than thoughtfully, to intense emotion is indicated. Regarding risk for substance misuse, it may be the case that elevations in the urgency traits increase risk both directly, by increasing the likelihood of substance use when highly emotional, and indirectly, by increasing depressive symptoms and the subsequent likelihood of substance use for self-medication purposes.

6. NEW DIRECTIONS FOR URGENCY RESEARCH

There are many avenues for future research regarding urgency. First, further investigation of the Carver et al. (2008) model is likely to prove useful for understanding substance misuse risk. If there does exist a tendency to engage in reflexive or ill-advised inaction, for which urgency is a marker, and if that tendency leads to increases in depressive symptoms that further heighten substance misuse risk, the study of urgency could shed light on multiple risk pathways.

Second, there is a need for prospective work testing urgency's predictive value (a) over longer time periods and (b) at different stages of development. Concerning longer time periods, the Riley et al. (2015) four year study is important in this regard; that work needs to be developed further. Concerning different stages of development, one established phenomenon, at least for European American drinkers, is the maturing out of heaving drinking as individuals make the transition into adulthood (Dawson et al., 2004; Fillmore, 1988; Johnston et al., 1998; also see Zapolski et al., 2014 for a discussion of possible race difference in this process). To date, nothing is known about whether elevations in the

urgency traits undermine the maturing out process and so help account for those individuals who develop more ongoing substance use problems in early adulthood. Similarly, there has been no investigation of the role of emotion-driven rash action among the elderly.

Third, there is a need to integrate urgency theory with other models that identify affect-based processes as central to substance misuse risk. An extensive body of research (cf. Wills, this issue; Wills et al., 2006, 2011) has focused on similar concepts involving both good and poor emotional and behavioral self-control and self-regulation. Their concepts include markers of affective lability, distractibility, lack of perseverance, and acting without forethought. Work integrating emotion-driven rash action with these constructs is clearly necessary. Smith and Guller (2014) review this model and other models that are highly relevant to urgency conceptualizations of risk.

Fourth, the development of a behavioral assay for urgency may prove worthwhile. Recent work suggests very little overlap between urgency and behavioral lab tasks for impulsivity (Cyders and Coskunpinar, 2011); this may be true in part because historically lab tasks were not constructed based on the urgency model. Having a task that can assess urgency that is not subject to self-report biases may prove useful in neuroimaging studies and other biological assessments of urgency-related phenomena.

Fifth, more work to validate animal models of urgency can be especially helpful to targeting pharmacological interventions to address and treat urgency tendencies. The recent development of animal models to probe urgency effects on learning and addiction are offering novel advances to the study of urgency. In rats, drug seeking increased following unexpected reward omission (Gipson et al., 2012), a finding that closely parallels a human study in which negative urgency predicted dyscontrolled food consumption following a negative mood induction (Davis Becker et al., 2015). The development of valid and reliable animal models of urgency will allow for more direct examinations of genetic underpinnings and can allow for the testing of potential therapeutics, such as modification of neurotransmitter systems and brain networks, that can eventually be applied to humans.

Sixth, In addition to influencing psychosocial learning, urgency also likely influences other forms of learning, such as classical conditioning processes that increase the risk for addictive behaviors. Through classical conditioning, cues, such as the smell of alcohol or sight of a bottle opener, become associated with the effects of alcohol and become capable of engaging and holding one’s attention (referred to as “attentional bias”), which then leads to increased drug craving, drug seeking and relapse risk (Cox et al., 2002; Field et al., 2009; Field and Cox, 2008; Robbins and Ehrman, 2004). Initial work suggests that urgency is related to attentional biases toward alcohol and drug cues (see a review by Coskunpinar and Cyders, 2013). A recent doctoral dissertation (Coskunpinar, 2015) found a significant relationship between biased attention toward alcohol stimuli (as measured using eye-tracking software) and both negative and positive urgency, but only during negative and positive mood manipulation conditions; the relationship was not present during a neutral mood condition. The finding that negative and positive urgency-based attentional bias toward drug stimuli is conditional on mood state is consistent with urgency theory (Cyders and Smith, 2008a, 2010), and could lead to novel intervention strategies.

Finally, further work on urgency-related interventions is necessary. As effective as DBT is (Linehan, 1993), there is a need to further improve clinicians' capacity to interrupt the tendency to act rashly (or fail to act when necessary) when highly emotional. It is likely to be the case that substance-specific interventions will benefit by targeting both the transdiagnostic risk process reflected in urgency elevations as well as substance-specific risk processes, such as expectancies for reinforcement from drinking (Darkes and Goldman, 1993) or differential responsivity to drug effects (Schuckit et al., 2004).

6. CONCLUSION

Substance use researchers have taken advantage of advances in personality research (cf. Buss and Plomin, 1975; Whiteside and Lynam, 2001) to recognize individual differences in the personality disposition to act rashly when highly emotional (referred to as positive and negative urgency) for understanding an important personality precursor to substance use risk. Research on urgency since the publication of Cyders and Smith's (2008a) urgency theory has provided clear support for many aspects of the theory. Urgency predicts the subsequent onset of, and increases in, multiple addictive behaviors including drinking, smoking, drug use, gambling, binge eating, and risky sex (Cyders et al., 2009; Cyders and Smith, 2008b; Doran et al., 2013; Kaiser et al., 2015; Pearson et al., 2012; Settles et al., 2014; Zapolski et al., 2009). Negative urgency appears to increase with pubertal onset and predict subsequent increases in drinking behavior.

One mechanism by which the traits may operate is through alterations in learning: elevations in the urgency traits may influence attentional processes and may result in heightened expectancies that addictive behaviors provide reinforcement (Coskunipar and Cyders, 2013; Pearson et al., 2012; Settles et al., 2010, 2014). There is some evidence specifying functional brain systems related to negative urgency and research ties gene polymorphisms on the serotonin transporter gene to elevations in both positive and negative urgency (Carver et al., 2011; Cyders et al., 2013, 2014). Treatments that emphasize interrupting the tendency to act impulsively when distressed are being applied to many addictive processes with some success (Clyne and Blampied, 2004; Robins and Chapman, 2004; Wonderlich et al., 2014).

Recent alternative models of risk (Carver et al., 2008) suggest it may be possible to integrate impulsivity-based risk processes and depression-based risk processes using elevations in urgency as a marker relevant to both. An important avenue of substance misuse risk research is to further clarify how impulsivity and depression factors transact to increase risk (Guller and Smith, 2014). There are many new lines of inquiry related to urgency theory, including further integrations of the urgency conceptualization with similar models (see Wills, this issue) and investigating the predictive role of urgency across adult developmental transitions. The advances that have occurred in recent years that focus on emotional factors as a contributor to substance misuse risk have been striking. We anticipate continuing advances in this field in the coming years.

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Highlights

- This invited paper provides a review of urgency theory.
- First, the authors reviewed empirical evidence related to urgency theory as specified by Cyders and Smith (2008, Psychological Bulletin).
- Second, the authors discussed new advances in urgency theory. Third, the authors suggested new directions for urgency research.