

Emotion-Related Impulsivity and the Mood Disorders

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Neurobiology of Abnormal Emotion and Motivated Behaviors

Abstract

This chapter focuses on emotion-related impulsivity and its relation to mood disorders. We begin with a brief overview of emotion-related impulsivity, in which we discuss theory and measure development. We then review a growing literature on the relevance of emotion-related impulsivity to depression, suicidality, and bipolar disorder. With the mounting evidence that this form of impulsivity is particularly important for understanding these syndromes, we consider newer research on possible mechanisms. We end by considering future directions.

Key words: emotion-related impulsivity, depression, suicidality, bipolar disorder, response inhibition

Emotion-Related Impulsivity and the Mood Disorders

Introduction

Impulsivity has been identified as a correlate and a prospective predictor of a broad range of psychopathologies (Cyders et al., 2007; Eisenberg et al., 2009). For some time, however, it has been noted that impulsivity is something of an umbrella construct (Depue & Collins, 1999). That is, across theories, self-report measures, and behavioral paradigms, many different forms of poor self-control over speech, cognition, and behavior have been identified, including absence of forethought, inability to delay gratification, inability to sustain attention, and inability to persevere in the pursuit of goals (Depue & Collins, 1999; Patton, Stanford, & Barratt, 1995). All of these, and more, have been identified with the term impulsivity, rendering that term more than a little ambiguous.

Measures of Emotion-Related Impulsivity

Facing this broad range of constructs and definitions, Whiteside and Lynam (2001) assembled a large number of self-report scales relevant to impulsivity, administered them to 437 undergraduates, and conducted a factor analysis. This yielded four subscales, which formed the foundation for the measure they termed the UPPS. The UPPS comprises Urgency, (lack of) Perseverance, (lack of) Premeditation, and Sensation seeking. Urgency was defined as a tendency toward engaging in impulsive speech and behavior during periods of mostly negative emotional states; this subscale also included items referring to inability to withstand cravings. This dimension was only modestly related to the other forms of impulsivity in the UPPS, $r_s = .18$ to $.29$, suggesting that responding impulsively to emotion states may differ in important ways from the other forms of impulsivity.

Cyders and colleagues (2007) extended this work by developing a measure designed to

capture tendencies toward engaging in impulsive speech and behavior specifically in the presence of *positive* emotion states. Initial studies established that the resulting Positive Urgency Measure was distinguishable (by factor analysis) from several other impulsivity-related measures, including the UPPS Urgency scale (hereafter Negative Urgency) (Cyders et al., 2007; Cyders & Smith, 2007). Though clearly distinguishable from Negative Urgency, Positive Urgency is also moderately correlated with it ($r = .37$ in Cyders et al., 2007; $r = .49$ in Cyders & Smith, 2007). Further study established that the most parsimonious model is one in which Positive and Negative Urgency are distinguishable facets of an overall Urgency construct (Cyders & Smith, 2007).

In a separate line of work, Carver and colleagues (2011) assembled a number of measures bearing on impulsivity, including both Negative Urgency and Positive Urgency, and also including several item sets newly created for the project to capture poor behavioral and cognitive constraint over emotion and motivational states. Factor analysis of the scale scores yielded three factors. One factor, labeled Pervasive Influence of Feelings, had loadings from scales whose items reflected mostly cognitive aspects of impulsiveness in response to mostly negative situations; Negative Urgency loaded on this factor, despite its items' behavioral as well as cognitive content. Negative Urgency also loaded on another factor, labeled Feelings Trigger Action; this factor also had even stronger loadings from Positive Urgency and a newly created item set called Reflexive Reaction to Feelings, the items of which mostly do not specify either positive or negative emotional valence. This factor thus reflected mostly behavioral responses to a wide range of emotion states: negative, positive, and feelings in general, mirroring the conclusion of Cyders et al., (2007), that negative and positive emotions can reflexively guide action for some people. Yet another factor (labeled Lack of Follow Through) loaded none of

these three scales, but only scales whose item content does not reflect emotions as precipitators of impulsiveness. The three-factor impulsivity scale, then, includes two subscales to assess emotion-related impulsiveness.

Broadly, then, difficulties with impulsivity during emotion states can be differentiated from more general difficulties with impulsivity that are not specific to emotion. The evidence also suggests that emotion-related impulsivity might be a relatively broad construct that involves saying and doing things one regrets during periods of emotion in general, but that it is also important to consider difficulty controlling thoughts and motivation in response to positive or negative emotional states.

Initial Validation and Links to Psychopathology

Since the development of the Negative and Positive Urgency scales, many validation studies have been conducted, including research on the links to psychopathology. Berg and colleagues (Berg, Latzman, Bliwise, & Lilienfeld, 2015) identified 115 studies involving more than 40,000 participants that were listed in Google Scholar using the term UPPS. Their meta-analyses indicated that Negative Urgency was more closely tied to alcohol and substance problems, depressive symptoms, suicidality, aggression, anxiety, borderline personality disorder symptoms, and disordered eating than were the other forms of impulsivity measured by the UPPS. The overall effect size was $r = .34$ for Negative Urgency compared to effect sizes of .08 to .14 for the three other subscales (Berg et al., 2015). Although there were fewer articles to be summarized, associations of the Positive Urgency Measure with psychopathology were parallel to those observed for the Negative Urgency scale, with an $r = .30$ of Positive Urgency with alcohol/substance use. In a second meta-analysis, Negative Urgency had strong predictive validity in the prediction of problematic behaviors in daily life, including alcohol, drug, and

cigarette use, as well as difficulties with aggression, gambling, and sex, mean $r = .25$ (Sharma, Markon, & Clark, 2013). The Positive Urgency and Negative Urgency scales both predict the onset and course of psychopathology in multiple prospective studies (cf. Farstad et al., 2015; Guller et al., 2015; Kaiser et al., 2016; Lopez-Vergara et al., 2016; Pearson & Smith, 2015; Riley, Rukavina, & Smith, 2016; Settles et al., 2014; Stojek & Fischer, 2013; Zapolski, Cyders, & Smith, 2009). A wide range of work, then, suggests the unique importance of emotion-related impulsivity for psychopathology and a behavioral problems.

Toward A Model of Emotion-Related Impulsivity in Mood Disorders

In the remainder of this chapter, we focus on a more limited range of problems: the mood disorders and suicidality. We will discuss evidence that emotion-related impulsivity is a uniquely important form of impulsivity for understanding depression, bipolar disorder, and suicidality. We will use this evidence to develop a model of emotion-related impulsivity in the mood disorders.

To do this effectively, however, we must first say a bit more about the process of impulsively responding to emotion. It is well understood that there are direct links between emotion and motivation. Indeed, emotions are viewed by many theorists as signals to take particular kinds of action (e.g., Frijda, 1986). Desire is a signal to seize something. Fear is a signal to escape. Anger is a signal to attack.

Sadness is a signal for a rather different sort of behavior. Sadness is a signal to be immobile. Thus, impulses triggered by sadness may lead to absence of action. When we address the idea that a particular disorder may reflect impulsive reaction to an emotion, it will be important to keep in mind what emotion is being experienced by persons suffering from that disorder.

Depression

Depression has consistently been linked to heightened trait impulsivity (e.g., Ekinici, Albayrak, & Caykoylu, 2011) and impulsive behavior (e.g., Dussault, Brendgen, Vitaro, Wanner, & Tremblay, 2011). Prospective evidence indicates that impulsivity is a significant risk factor for the development of depression (e.g., Granö, Keltikangas-Järvinen, Kouvonen, et al., 2007). Such findings have emerged across multiple measures of impulsivity, including the Barratt Impulsiveness Scale (Patton, Standform, & Barratt, 1995) and the Karolinska Scale of Personality (Schalling & Edman, 1987). In addition, across multiple studies, depressive symptoms have been consistently linked to scores on Negative Urgency (d'Acremont & Van der Linden, 2007; Kayardi & King, 2011; Smith, Guller, & Zapolski, 2013; Miller, Flory, Lynam, & Leukefeld, 2003), with larger effect sizes than those observed for other impulsivity dimensions measured by the UPPS (Berg et al., 2015).

Carver, Johnson, & Joormann (2013) conceptualized a key factor in depression to be the lack of constraint over emotion and motivation. Consistent with this, depression appears tied to tendencies to react impulsively to positive as well as negative emotions. Kayardi and King (2011) found that both Negative Urgency and Positive Urgency were separately correlated with depressive symptoms in a sample of 442 undergraduates. In longitudinal research, Positive urgency scores predicted increases in depressive symptoms from 5th to 6th grade in a sample of 1,906 children (Smith, Guller, & Zapolski, 2013). Carver and colleagues (2013) extended this to the study of lifetime diagnoses of major depressive disorder. In that study, depressive diagnostic status was significantly particularly strongly associated with the Pervasive Influence of Feelings factor described earlier, but also significantly associated with Feelings Trigger Action—but not with a non-emotional impulsivity factor. These analyses controlled for self-reported alcohol use,

in order to reduce the likelihood that observed associations would be attributable to externalizing problems. In addition, the effects of emotion-related impulsivity held even when the analysis was restricted solely to the Positive Urgency Measure. In an analysis of a larger sample from the same study (Johnson, Carver, Mulé, & Joormann, 2013), the severity of lifetime depressive symptoms again correlated with Feelings Trigger Actions and more strongly with Pervasive Influence of Feelings, whereas severity was not associated with non-emotional impulsivity. Emotion-related impulsivity remained significantly correlated with depression when the participants with an episode of major depressive disorder in the past year were removed from analyses, and when current depressive symptoms were controlled (Carver et al., 2013).

The seemingly counterintuitive finding that depression is associated with impulsive responding to positive as well as negative emotions is relevant to the broader conceptualization of emotion-related impulsivity. That a disorder that is typified by negative emotional experiences should also be characterized by elevation in Positive Urgency is a strong piece of evidence suggesting the existence of an underlying reflexive response system that contributes to depression. Findings also indicate that depression is particularly tied to a lack of constraint over the influence of emotions on cognition and motivation.

Bipolar Disorder

Bipolar I disorder, defined on the basis of at least a single lifetime episode of mania, is a natural target for the study of impulsivity. The diagnostic criteria for mania include excessive involvement in pleasurable activities without regard to the potential for painful consequences. Not surprisingly, researchers have documented high levels of impulsivity among those with bipolar disorder on self-report scales such as the Barratt Impulsivity Scale (cf. Strakowski et al., 2010; Swann, 2004), as well as behavioral measures such as the Iowa Gambling Task (see Edge

et al., 2013 for review) and delay discounting task (Mason et al., 2012). Among those who endorse mild manic symptoms during their lifetime, impulsivity predicts the onset of diagnoses of bipolar disorder (Alloy et al., 2012; Kwapil et al., 2000).

Some work has focused on emotion-related impulsivity. In one study, researchers recruited persons diagnosed with bipolar I disorder using the Structured Clinical Interview for DSM (First, Williams, Karg, & Spitzer, 2015), and followed them with monthly interviews until they achieved remission as measured using structured symptom severity interviews. Participants with bipolar disorder ($n = 90$) were asked to complete a set of well-validated impulsivity self-report scales. Their scores were compared to a control group ($n = 81$) that was matched on age, gender, anxiety and substance use diagnoses. Compared to the control participants, those with bipolar I disorder reported significant elevations in impulsivity as measured using the Barratt Impulsivity Scale Attention, Motor impulsiveness, and Self-control subscales (although not on the BAS Fun-Seeking scale). Significantly larger group differences, though, were observed for Positive Urgency and Negative Urgency scales, as compared to the other forms of impulsivity (Muhtadie, Johnson, Carver, Gotlib, & Ketter, 2013).

Although participants were asked to describe their impulsivity during periods of wellness, it remains possible that the experience of manic episodes changes self-perceptions of impulsivity. To control for this possibility, analog studies of those who have not yet met diagnostic criteria for bipolar disorder have been conducted using the Hypomanic Personality Scale (HPS), which covers mild manic symptoms across the life course, as well as personality traits related to manic vulnerability, such as extraversion (Kwapil, Chapman, & Chapman, 2000). The HPS has been well-validated as predicting the onset of bipolar disorder (Kwapil et al., 2000; Walsh, Royal et al., 2012). Findings indicate that higher HPS scores are correlated with higher

levels of emotion-related impulsivity, as measured using the Positive Urgency Measure, across two large samples (Giovanelli, Johnson, Gruber, & Hoerger, 2013). The HPS has also been tied to the Carver et al. (2011) emotion-related impulsivity factors, with a particularly large correlation with Feelings Trigger Action, $r = .49$, $N = 257$, $p < .001$, but also a significant correlation with Pervasive Influence of Feelings, $r = .22$, $N = 257$, $p < .001$ (Johnson, Carver, Mule' & Joormann, 2013). Controlling for alcohol-related symptoms and depressive symptoms, the HPS remained significantly correlated with Feelings Trigger Action (*partial* $r = .43$, $N = 153$, $p < .001$; Johnson, Carver, Mule', & Joormann, 2013).

Taken together, findings suggest that bipolar disorder, even during remission, is related to significant elevations in emotion-related impulsivity. These effects can be documented before onset, and appear to generalize across both positive and negative emotion states. In bipolar disorder, the lack of constraint over emotion appears most expressed in tendencies to act and speak without thinking when experiencing emotions, and does not appear to be explained by comorbid conditions. A natural next question is how well emotion-related impulsivity can help explain poor outcomes within bipolar disorder.

Bipolar I disorder is characterized by significant deficits in quality of life and in function, but also by incredible heterogeneity within those outcomes (Fulford, Peckham, Johnson, K. & Johnson, S., 2014). Positive Urgency was significantly correlated with poor Quality of Life, $r = -.34$, among 76 persons with bipolar I disorder (Victor, Johnson, & Gotlib, 2011). This effect withstood corrections for symptom levels, adequacy of treatment, and comorbid diagnoses. After controlling for Positive Urgency, no other form of impulsivity explained additional variance in Quality of Life scores. Positive Urgency also has been found to correlate with lower scores on the Global Assessment of Functioning scale, $r = -.44$, $N = 90$ (Muhtadie et al. (2013). Again,

these effects withstood corrections for symptom levels, adequacy of treatment, and comorbid diagnoses.

Beyond quality of life and global function, many with bipolar disorder experience difficulties with anger and aggression. In large-scale representative samples, people with bipolar disorder were six times as likely to report physical fights in the past year, and more than eight times as likely to report threatening someone with a weapon during their lifetime as compared to those who did not meet criteria for a psychiatric disorder (Casiano, 2008; Corrigan & Watson, 2005). Much of the difficulty occurs during actively manic periods and so can be addressed with adequate treatment (Witt et al., 2013). Nonetheless, a subgroup of those with bipolar disorder continue to report elevations in anger and aggression compared to those without disorder, and these problems are highly tied to lower functioning (Ballester et al., 2014).

One might expect that emotion-related impulsivity would lead to more difficulty with impulsive expression of anger in physical and verbal aggression. Consistent with this idea, Johnson and Carver (2016) found that Positive Urgency scores, measured during remission among a group of 58 persons diagnosed with bipolar I disorder, were significantly correlated with scores on the Brief Anger Questionnaire for Verbal Aggression, Physical Aggression, Anger, and Hostility, $r_s = .38$ to $.51$. The effects of emotion-related impulsivity on aggression withstood corrections for subsyndromal mania and depressive symptom severity, medication levels, comorbid PTSD and substance use diagnoses, trauma, and personality traits. These findings provide some evidence that this form of impulsivity could help explain the sustained difficulties with anger and aggression that some with bipolar disorder experience.

Although aggression is an important clinical concern, perhaps no issue is more central than the high rates of suicide among those diagnosed with bipolar disorder. In the World Mental

Health Survey, an international large-scale community-based study, 25% of those diagnosed with bipolar disorder report that they have attempted suicide, and more than 50% report suicidal ideation in the past year (Merikangas, Jin, He et al., 2011). In a recent large-scale study of veterans (Ilgen, Bohnert, Ignacio et al., 2011), and in a national cohort study of Norwegian individuals followed for 36 years after first psychiatric contact (Nordentoft, Mortensen, & Pedersen, 2011), bipolar disorder was the psychiatric condition with the highest rate of death by suicide. Among those with bipolar disorder, 8% of men and 5% of women were found to have died by suicide (Nordentoft et al., 2011).

In a recent meta-analysis, long-held theory that impulsivity would explain suicidality within bipolar disorder did not receive support (Watkins & Meyer, 2013), suggesting the need for a more refined model of the forms of impulsivity relevant to this outcome. It would seem likely that emotion-related impulsivity would be important for understanding suicidality within bipolar disorder. Consistent with hypotheses, Johnson, Carver and Tharp (2017) found that emotion-related impulsivity was related to the severity of suicidal ideation, the number of self-harm attempts, and the history of at least one suicide attempt in a sample of 133 persons diagnosed with bipolar I disorder.

Taken together, findings indicate that persons with bipolar disorder struggle with impulsivity, and that this is particularly present during states of high emotion. This difficulty with emotion-related impulsivity predicts troubling outcomes within this disorder, ranging from low functioning and poor quality of life, to verbal and physical aggression, to self-harm, suicidal ideation and suicide attempts.

Suicidality and Self-Harm

Impulsivity is widely cited as a major risk factor for suicidality across multiple theoretical paradigms (e.g., Joiner, Brown, & Wingate, 2005; Mann, Waternaux, Haas, & Malone, 1999), and considerable empirical work supports the role of impulsivity in self-harm across both adult and adolescent populations (Brezo, Paris, & Turecki, 2006; Dougherty, Mathias, Mash-Richard, et al., 2009; Stewart, Kim, Esposito, Gold, et al., 2015). Research has focused increasingly on the question of what specific domains of impulsivity are most pertinent to self-harm. As with depression, Negative Urgency has consistently been found to be correlated with both suicidality (e.g., Anestis, Fink, Bender, Selby, et al., 2012; Anestis & Joiner, 2011; Lynam, Miller, Miller, Bornovalova, et al., 2011) and nonsuicidal self-injury (NSSI) (e.g., Peterson, Davis-Becker & Fischer, 2014). Among the dimensions of impulsivity measured by the UPPS, no other dimension is as strongly tied to suicidality as Negative Urgency (Berg et al., 2015).

In many of the studies in this domain, suicidality indices have been used that combine suicidal ideation and suicidal action. When these two are separated, one cross-sectional study did not find that Negative Urgency distinguished ideators from attempters (Klonsky & May, 2010). In contrast, prospective investigations have linked Negative Urgency to daily urges to engage in NSSI (Bresin, Carter, & Gordon, 2013), onset of NSSI (but not maintenance; Riley, Combs, Jordan, & Smith, 2015), and suicide attempts (Kasen, Cohen, & Chen, 2011; but see also Yen, Shea, Sanislow, Skodol, et al., 2009 for a contradictory finding).

Two recent studies have examined how suicidality is related to the broader conceptualization of emotion-related impulsivity. In the first study (Johnson, Carver, & Joormann, 2013), 120 undergraduates completed an in-person interview of lifetime engagement in self-harm behaviors, suicidal thoughts, and suicide attempt history, which was used to create a

suicidality composite. This index of suicidality was associated with both emotion-relevant factors of impulsivity, but not with non-emotional impulsivity. A subset of Positive Urgency items (extracted from the Feelings Trigger Action factor) was itself significantly associated with suicidality, suggesting that, as with depression, suicidality is related to poor control over both positive and negative emotions.

A second study, conducted by Auerbach et al. (2016), examined whether specific domains of emotion-relevant impulsivity were differentially associated with suicide ideation, plans, and attempts in sample of 230 adolescents receiving residential care. Pervasive Influence of Feelings was uniquely associated with suicidal ideation, whereas Feelings Trigger Action was associated with the occurrence of suicide attempts in the past month. These effects withstood control for age, current depression and anxiety symptoms, the presence of unipolar and bipolar mood disorders, generalized anxiety disorder, psychotic disorders, and eating disorders, and the total number of disorders. In contrast, after controlling for clinical symptoms and other forms of impulsivity, Lack of Follow Through was not related to suicidality. In other words, suicidal ideation was linked to the tendency for one's thoughts to be shaped by negative emotion states, whereas suicide attempts were linked to the tendency to react to emotions reflexively. Results from these studies reinforce the importance of attending to specific facets of impulsivity.

Summary

Considerable research indicates that depression, bipolar disorder, and suicidality involve elevations of emotion-related impulsivity, and key outcomes within bipolar disorder are tied to emotion-related impulsivity. This work also indicates that considering specific dimensions of emotion-related impulsivity is valuable. As shown in Figure 1, difficulty constraining thoughts and motivation in response to negative emotions correlates highly with suicidal ideation and

depression, whereas difficulty constraining speech and behavior in response to emotions is tied with suicidal action, with tendencies toward mania, and with aggression among those diagnosed with bipolar disorder.

Insert Figure 1 Here

Possible Mechanisms: The Role of Response Inhibition

To understand the ties of emotion-related impulsivity with depression, suicidality, and bipolar disorder, it ultimately will be critical to consider underlying mechanisms. Earlier in the chapter we restricted ourselves to a purely descriptive model of what emotion-related impulsivity consists of (i.e., reacting cognitively or behaviorally to an exaggerated degree to the motivational content of an experienced emotion). In this section we consider a somewhat elaborated model. One way to view emotion-related impulsivity is that it reflects deficits in cognitive control over the impulses elicited by heightened emotions, and that the lack of cognitive control in turn interferes with one's ability to regulate behavioral responses.

Extensive evidence points to the presence of a superordinate network often referred to as cognitive control that involves myriad executive functions, including inhibition, working memory, flexibility, and planning (Braver, 2012; Miyake & Friedman, 2012). A core facet of cognitive control, response inhibition, has been theoretically and empirically linked to self-regulation and goal pursuit (Bari & Robbins, 2013; Bechara & Van der Linden, 2005). Response inhibition refers to the ability to withhold a prepotent response (Aichert et al., 2012). Many prepotent responses are quite trivial (e.g., the habit of tapping one's finger when under stress). But some prepotent responses are potentially very important. The same mechanism that can make it difficult to suppress a behavior such as tapping one's finger may also underlie difficulty

in suppressing behaviors such as substance use, binge eating, and non-suicidal self-injury.

Poor response inhibition has been tied to various forms of psychopathology, including major depressive disorder (Bora, Harrison, Yücel, & Pantelis, 2012) and bipolar disorder (Singh et al., 2010), along with many externalizing disorders (Fillmore & Rush, 2002; Nigg, 2001).

Why might poor response inhibition underlie such diverse forms of psychopathology? This may be a key deficit in executive functioning which leads to difficulty in keeping behavior on track with respect to one's intentions (Carver et al., 2011).

There is a robust association between deficits in response inhibition and trait impulsivity (Aichert et al., 2012; Gay, Rochat, Billieux, d'Acremont, & Van der Linden, 2008). Negative Urgency has been shown to relate to poorer performance in multiple behavioral indices of response inhibition, including the go/no-go tasks (Gay et al., 2008), the go-stop task (Bagge, Littlefield, Rosellini, & Coffey, 2013; Gay et al., 2008; Wilbertz et al., 2014), and the antisaccade task (Johnson, Tharp, Peckham, Sanchez, & Carver, 2016; Roberts, Fillmore, & Milch, 2011). Indeed, there now is evidence that the link between emotion-related impulsivity and response inhibition is fairly specific. First, evidence supports Negative Urgency as more strongly related to poor response inhibition than are other dimensions of impulsivity (Cyders & Coskunpinar, 2011). Second, this effect appears to be relatively specific to response inhibition, in that researchers have not found that emotion-related impulsivity was tied to delay discounting, resistance to distractor, proactive interference, shifting, inattention, or other indices of impulsive decision-making (Cyders & Coskunpinar, 2011; Sharma, Markon, & Clark, 2014).

In a recent meta-analysis, the effects of response inhibition on emotion-relevant impulsivity were much more robust in clinical samples (Johnson, Tharp et al., 2016). Consistent with that, the link between emotion-related impulsivity and response inhibition has been found to

be curvilinear in one study, with more pronounced deficits in response inhibition at the more severe range of impulsivity (Johnson, Tharp et al., 2016).

Neurobiological evidence is also consistent with the role of response inhibition in emotion-relevant impulsivity. Wilbertz et al. (2014) found higher Negative Urgency scores related to poorer performance on the stop signal task and less neural activation in the interior frontal gyrus and anterior insula during response inhibition. Furthermore, those high in Negative Urgency have been shown to recruit more inhibitory brain regions when experiencing negative emotions compared with controls (Chester et al., 2016), suggesting a compensatory, overly reactive neurological signature in regulatory networks. In both studies, the neurological findings coincided with behavioral outcomes, indicating coherence across levels of analysis.

Unanswered Questions

There remain a number of important conceptual questions. In this section we pointed to the important role that may be played by inhibition of prepotent responses. Certainly emotional states tend to point directly to responses, rendering those responses prepotent as reactions to the emotions. Yet not all prepotent responses are driven by emotions. Habits represent a form of prepotent responses that often are difficult to override. But habits need not be linked to any particular emotion. An important question is whether people who have difficulty controlling their automatic responses to emotions also have difficulty controlling habits that do not involve emotion.

Several distinct possibilities exist. Perhaps the vulnerability that is captured by the Negative and Positive Urgency scales represents a very broad tendency to be captured by prepotent responses, whether emotion-triggered or not. This is the broadest possibility. If correct, it would mean that the emotion-relatedness is a red herring. Perhaps, in contrast, this

vulnerability represents a tendency to be captured by prepotent responses only when an emotional state is being experienced. One weakness in this literature is that few studies (Gunn & Finn, 2015; Johnson, Tharp et al., 2016) have examined whether emotion states lead to worsened response inhibition among those with emotion-related impulsivity, and both of those studies were limited in the degree of emotion induced. We recommend ongoing research focused on the interface of emotion states, response inhibition, and impulsivity.

Future Directions

Despite the robust evidence for the validity of emotion-related impulsivity, some important gaps remain in this field. A central goal will be to refine and integrate models of the mechanisms driving this deficit with the clinical literature. As researchers have begun to identify behavioral and neural correlates, it will be important to conduct multi-modal studies of how self-reported, interview-based, behavioral and neural indices of this form of impulsivity conjointly relate to psychopathology.

Understanding these mechanisms is vital to treatment development. It would seem particularly promising to investigate clinical treatments designed to help regulate emotion, such as dialectical behavior therapy (Linehan, 1993) or transdiagnostic treatments for emotional disorders (Barlow, Allen, & Choate, 2004), as well as interventions designed to improve cognitive control, such as cognitive remediation (Peckham & Johnson, under review).

Highlights

- Considerable research validates the importance of distinguishing emotion-related impulsivity from other forms of impulsivity.
- Depression, suicidality, and bipolar disorder involve elevations of emotion-related impulsivity, and key outcomes within bipolar disorder are tied to emotion-related impulsivity.
- Difficulty constraining thoughts and motivation in response to negative emotions correlates highly with suicidal ideation and depression, whereas difficulty constraining speech and behavior in response to emotions is tied with suicidal action, with tendencies toward mania, and with aggression among those diagnosed with bipolar disorder.
- Multiple studies now indicate that emotion-related impulsivity is tied to response inhibition deficits, and that these deficits are fairly specific to this aspect of neurocognition.

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Figure 1. A Model of Emotion-Related Impulsivity in the Mood Disorders