

SPERRY, SARAH H., M.A. Examining the Role of Impulsivity in Bipolar Spectrum Psychopathology: Identification and Expression in Daily life (2016)
Directed by Dr. Thomas R. Kwapil. 69 pp.

Impulsivity is a core feature of bipolar spectrum psychopathology and may confer risk for poor outcomes or progression along the bipolar spectrum. However, the associations between different multidimensional impulsivity facets and bipolar spectrum psychopathology are not yet clear. Study 1 was a large correlational study that examined the association of the UPPS-P multidimensional model of impulsivity and a measure of bipolar spectrum psychopathology, the Hypomanic Personality Scale (HPS), in a large non-clinically ascertained sample of undergraduates ($n=780$). As predicted, the HPS was associated with negative and positive urgency, lack of premeditation, and sensation seeking with the largest effect for positive urgency. Study 2 examined the moderating role of the UPPS-P impulsivity facets with expressions of bipolar spectrum psychopathology in daily life using experience sampling methodology ($n=222$). The HPS was associated with relevant affective, cognitive, and behavioral components of bipolar spectrum psychopathology as well as impulsivity in daily life. Overall, positive and negative urgency did not moderate the association of bipolar spectrum psychopathology and impulsivity in daily life. Trait impulsivity appears to be a core feature of bipolar spectrum psychopathology across the continuum; however, it may not specifically confer additional risk for engaging in impulsive behaviors in daily life above and beyond having trait bipolar spectrum psychopathology. Additionally, these results suggest that ESM is a promising method for examining dynamic constructs such as bipolar spectrum psychopathology and impulsivity in daily life.

EXAMINING THE ROLE OF IMPULSIVITY IN BIPOLAR
SPECTRUM PSYCHOPATHOLOGY: IDENTIFICATION
AND EXPRESSION IN DAILY LIFE

by

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A Thesis Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Arts

Greensboro
2016

Approved by

Committee Chair

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CHAPTER I

INTRODUCTION

Impulsivity is a multidimensional construct that is present in subclinical manifestations of bipolar psychopathology (Alloy et al., 2006; Walsh, Royal, Brown, Barrantes-Vidal, & Kwapil, 2012) and clinical bipolar disorders (Strakowski et al., 2009; Swann et al., 2007). The present studies examined multidimensional impulsivity in bipolar spectrum psychopathology and assessed the moderating role of different impulsivity facets in the expression of bipolar spectrum psychopathology in daily life. Examining associations between impulsivity and bipolar spectrum psychopathology and the impact of impulsivity on the expression of bipolar psychopathology in daily life should aid in the investigation of risk factors for the development of bipolar disorders.

Classification of Bipolar Disorders

Bipolar psychopathology has traditionally been defined in terms of categorical disorders such as those specified in the *Diagnostic and Statistical Manual of Mental Disorders-5th edition* (DSM-5; American Psychiatric Association, 2013). These disorders are characterized by manic or hypomanic episodes that involve changes in mood such as abnormally elevated positive affect or irritability, changes in cognitions such as inflated self-esteem, racing thoughts, and distractibility, and changes in behaviors including decreased need for sleep, pressured speech, increased activities, as well as involvement in risky or impulsive behaviors. Diagnoses are based upon frequency, duration, and intensity of manic or hypomanic episodes in conjunction with presence of depressive symptoms. These disorders are characterized by episodic courses in which manic or hypomanic episodes often alternate with episodes of depressive symptoms. Given that traditional diagnostic systems do not capture the full range of bipolar psychopathology, Akiskal (2004)

proposed a broader spectrum of bipolar disorders that expandson DSM diagnoses and includes individuals who experience a variety of depressive symptoms superimposed on cyclothymic temperament (bipolar II-½), depression in addition to hypomania induced by somatic therapies (bipolar III), and depressive symptoms superimposed on hyperthymic temperament (bipolar IV). Although Akiskal expanded beyond DSM diagnoses, he continued to characterize bipolar psychopathology as categorical.

Evidence suggests that discrete diagnoses, including Akiskal's (2004) expansion, do not sufficiently capture the full spectrum of bipolar psychopathology. The identification of individuals experiencing subclinical bipolar spectrum psychopathology is increasingly recognized as necessary as these individuals have worse outcomes and functioning than healthy individuals. In a 20-year prospective study, Angst et al. (2003) found that 9.4% of young adults experienced bipolar symptoms that did not meet diagnostic criteria. These individuals were primarily characterized by hypomanic symptoms with or without history of depression. Despite not meeting diagnostic criteria, this sample was characterized by poor social and occupational functioning. In addition, Angst (1998) found that individuals with subthreshold hypomania had a significantly increased rate of suicide attempts compared to controls. Merikangas and colleagues (2007) found that 2.4% of a sample of 9282 adults met criteria for subthreshold bipolar disorder, defined as hypomania without depression or subthreshold hypomania, and, that 46% of these individuals experienced severe role impairment; however, those with subthreshold bipolar were significantly less impaired than those with bipolar I disorder or bipolar II disorder. Lastly, Judd and Akiskal (2003) found that individuals with subthreshold bipolar symptoms experienced greater marital discord, were more likely to utilize health, welfare, and disability services, and were more likely to contemplate or attempt suicide compared to controls. Thus, subthreshold bipolar symptoms are associated with impaired functioning and poor psychological outcomes compared to healthy

individuals, although not to the degree observed in DSM bipolar diagnoses. Furthermore, individuals with subclinical symptoms are at heightened risk for developing clinical bipolar disorders (Angst & Cassano, 2005; Kwapil et al., 2000; Walsh, DeGeorge, Barrantes-Vidal, & Kwapil, 2015).

Bipolar spectrum psychopathology refers to symptoms and impairment that underlie both clinical and subclinical manifestations of bipolar psychopathology. This spectrum is characterized by both trait-like and episodic disruptions of mood, cognitions, and behaviors typically seen in mania and hypomania. These include experiences such as elevated or irritable mood, inflated self-esteem, decreased need for sleep, and racing thoughts. Unlike most other forms of psychopathology, subclinical manifestations of bipolar spectrum psychopathology have the potential to be adaptive. Nevertheless, these characteristics are referred to as bipolar spectrum psychopathology given that they convey risk for the development of bipolar disorders.

Assessment of Bipolar Spectrum Psychopathology

The Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) was developed to measure trait-like hypomanic personality, which was thought to characterize individuals at risk for bipolar spectrum disorders. Eckblad and Chapman's (1986) initial validation study found that 77% of high HPS scorers (raw score >36) experienced a hypomanic episode, and at a 13-year follow-up the HPS predicted elevated rates of bipolar disorders (Kwapil et al., 2000). The HPS is associated with a range of bipolar spectrum characteristics including impulsivity with moderate effect sizes (Johnson, Carver, Mule, & Joorman, 2013), increased positive affect and irritability (Gruber, Oveis, Keltner, & Johnson, 2008), and sensitivity to positive stimuli (Trevisani, Johnson, & Carver, 2008).

Walsh and colleagues (2012) found that HPS scores were associated with interview ratings of DSM bipolar diagnoses, broad bipolar disorders, and episodes of hypomania in a non-

clinically ascertained sample. In addition, bipolar spectrum psychopathology was associated with disrupted thoughts (racing thoughts, daydreaming, increased grandiosity, difficulty concentrating), behaviors (risky behavior, restlessness, pursuing exciting activities, and doing many things), and affect (negative affect and energetic enthusiasm) in daily life as assessed by experience sampling methodology (ESM). At a three-year follow-up assessment Walsh and colleagues (2015) found an association between the HPS and DSM and broad bipolar diagnoses using structured clinical interview (the odds ratio was 3.25 for HPS predicting DSM bipolar disorders and 3.51 for broad bipolar disorders). Furthermore, the HPS predicted subclinical bipolar features with moderate to large effect sizes, providing further evidence of its validity as a measure of bipolar spectrum psychopathology.

Impulsivity and the Bipolar Spectrum

Impulsivity is a core component of the bipolar spectrum and is present in both subclinical and clinical manifestations of bipolar spectrum psychopathology. Impulsivity is one of seven criteria that define (hypo)manic episodes, and involves excessive involvement in activities that have a high potential for painful consequences (American Psychiatric Association, 2013). Examples include engaging in unrestrained buying sprees, sexual indiscretions, or foolish business investments. Impulsivity appears to be a trait component of bipolar disorders present across manic, depressive, and euthymic (non-symptomatic) states (Peluso et al., 2007; Strakowski et al., 2009; Swann, Pazzaglia, Nicholls, Dougherty, & Moeller, 2003). In addition, bipolar spectrum psychopathology, as assessed by the HPS, is associated with mood-based and reward-based impulsivity (Giovanelli, Hoerger, Johnson, & Gruber, 2013; Johnson, Carver, Mulé, & Joorman, 2013), as well as trait impulsivity (Alloy et al., 2006; Walsh et al., 2015; Walsh et al., 2012).

Numerous studies indicate that impulsivity is related to poor outcomes for both individuals with clinical bipolar disorders and those displaying bipolar spectrum psychopathology. For individuals with clinical bipolar disorder, typical impulsive behaviors include unsafe sex (Meade, Graff, Griffin, & Weiss, 2008), cigarette smoking and substance use (Heffner, Fleck, DelBello, Adler, & Strakowski, 2012), suicide attempts (Ekinci, Albayrak, Ekinci, & Caykoylu, 2011; Swann et al., 2005; Swann et al., 2007) and result in impaired psychosocial functioning (Jiménez et al., 2012; Muhtadie, Johnson, Carver, Gotlib, & Ketter, 2014) and longer duration of illness (Dawson et al., 2014). In addition, impulsivity seems to be associated with poor outcomes for those displaying bipolar spectrum psychopathology (Alloy, Bender, Wagner, Whitehouse, et al., 2009; Alloy et al., 2012; Kwapil et al., 2000; Molz et al., 2013; Nusslock, Alloy, Abramson, Harmon-Jones, & Hogan, 2008). Furthermore, self-reported impulsivity traits may predict conversion to clinical bipolar and therefore represent a vulnerability to the onset of the disorder (Alloy, Bender, Wagner, Abramson, & Urosevic, 2009; Alloy et al., 2012; Kwapil et al., 2000).

Although the literature seems to support that self-reported trait impulsivity characterizes bipolar spectrum psychopathology, very few of these studies investigate impulsivity as a multidimensional construct. Current conceptualizations view impulsivity as multidimensional (Whitseite & Lynam, 2001) as it includes cognitive, affective, and behavioral components that are associated with 18 different diagnoses in the DSM-5. For example, individuals with bipolar disorder tend to engage in highly pleasurable but risky activities, whereas individuals with attention-deficit/hyperactivity disorder often have difficulty waiting their turn and frequently interrupt others. Impulsivity is also part of numerous personality traits and is represented in almost every major model of personality (Cloninger, Przybeck, & Svrakic, 1991; Eysenck & Eysenck, 1985; Tellegen, 1985; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). Despite

this, many researchers fail to address trait impulsivity as a multidimensional construct, and many competing models and measures make the literature difficult to interpret.

Whiteside and Lynam (2001) proposed the comprehensive four-factor UPPS model of impulsivity based upon the Five-Factor Model of Personality (Costa & McCrae, 2010). The model includes negative urgency, lack of premeditation, lack of perseverance, and sensation seeking. A fifth facet, positive urgency, was subsequently added to this model to form the UPPS-P model (Cyders et al., 2007; Lynam, Smith, Whiteside, & Cyders, 2006). This model posits that there are unique personality pathways that lead to trait impulsivity.

Negative urgency is a reactive and mood-based facet of impulsivity characterized by impulsive behaviors in response to stress or distress (Whiteside & Lynam, 2001). Specifically, individuals who are reactive to negative affect or stress are especially likely to act rashly to alleviate those emotions. For example, an individual who is experiencing negative distress may be unable to resist cravings (food, alcohol, self-harm) that they regret later. Negative urgency is associated with aggression and eating problems (Miller, Flory, Lynam, & Leukefeld, 2003), borderline personality disorder and pathological gambling (Whiteside, Lynam, Miller, & Reynolds, 2005), and excessive reassurance seeking, drinking to cope, and bulimic symptoms (Anestis, Selby, & Joiner, 2007). Negative urgency is moderately associated with bipolar spectrum psychopathology (Fulford, Eisner, & Johnson, 2015; Johnson et al., 2013; Walsh et al., 2012), bipolar II disorder (Bøen et al., 2015), and bipolar I disorder (Muhtadie et al., 2014).

Lack of premeditation involves acting in the moment without regard to consequences and is characterized by the low deliberation facet of conscientiousness (Whiteside & Lynam, 2001). Lack of premeditation is thought to be associated with disorders that involve executive functioning deficits. It is primarily represented in substance use, hyperactivity, (Miller et al., 2003) and antisocial personality traits (Miller et al., 2003; Whiteside et al., 2005). Lack of

premeditation is moderately associated with bipolar spectrum psychopathology (Walsh et al., 2012); however, this facet of the UPPS has been relatively understudied in bipolar disorders.

Lack of perseverance is characterized by the inability to remain focused on boring or difficult tasks and is characterized by low levels of the self-discipline facet of conscientiousness (Whiteside & Lynam, 2001). Lack of perseverance has been primarily linked to inattention (Miller et al., 2003). The literature suggests that lack of perseverance is generally unrelated to bipolar spectrum psychopathology (Johnson et al., 2013; Walsh et al., 2012). However, one study showed that individuals with bipolar II disorder had significantly higher levels of lack of perseverance than healthy controls (Bøen et al., 2015).

Sensation seeking involves being open to and pursuing exciting and risky activities. It is characterized by the excitement seeking facet of extraversion (Whiteside & Lynam, 2001). Sensation seeking is linked to seeking out positively reinforcing activities (Berg, Latzman, Bliwise, & Lilienfeld, 2015). It is a feature of antisocial personality traits (Miller et al., 2003), borderline personality disorder, pathological gambling, and alcohol abuse in conjunction with antisocial personality traits (Whiteside et al., 2005). Sensation seeking was linked to bipolar spectrum psychopathology in one study (Walsh et al., 2012), but was unassociated with bipolar II disorder in another study (Bøen et al., 2015).

Positive urgency involves the tendency to act rashly in response to positive affect and is characterized by low conscientiousness and agreeableness, and high neuroticism (Cyders & Smith, 2007, Cyders & Smith, 2008). Positive urgency and negative urgency are thought to be two distinct facets of the broader trait of urgency and are reported to be moderately correlated ($r=0.37$; Cyders & Smith, 2008). Positive and negative urgency are reported to have unique predictive value and are associated with differential maladaptive behaviors. For example, positive urgency is related to alcohol and drug use and risky sexual practices (Cyders & Smith, 2007;

Zapolski, Cyders, & Smith, 2009) and taps different traits than reward-based impulsivity as defined by the behavioral approach system (Cyders & Smith, 2007). Positive urgency seems especially relevant in bipolar spectrum psychopathology in which individuals experience heightened positive affect (Johnson, Carver, Mule, & Joorman, 2013; Fulford, Eisner, & Johnson, 2015). Giovanelli and colleagues (2013) found that positive urgency was strongly associated with the HPS and increased emotion-focused and dampening responses to positive affect. Positive urgency showed the strongest group differences between individuals with bipolar I disorder and healthy controls compared to other UPPS-P facets and additionally predicted worse psychosocial functioning for individuals with this disorder (Muhtadie et al., 2014). In fact, positive urgency, compared to other forms of impulsivity, was found to account for 14% of the variance in overall quality of life in bipolar disorder after accounting for comorbid anxiety and substance use (Victor, Johnson, & Gotlib, 2011).

Although trait impulsivity seems to be associated with a wide spectrum of bipolar psychopathology, there is no consensus regarding which facets of impulsivity characterize bipolar spectrum psychopathology. This is likely due to inconsistent conceptualizations of impulsivity. For example, previous literature examining impulsivity and bipolar spectrum psychopathology has used models that define impulsivity as: attentional, motor, and non-planning impulsiveness (Patton, Stanford, & Barratt, 1995); the UPPS facets (Whiteside & Lynam, 2001); or dysregulation of the Behavioral Activation System (BAS; Alloy et al., 2006). Based on the literature, the UPPS-P model captures a broad multidimensional view of trait impulsivity that enables the comparison of different facets of impulsivity within bipolar spectrum psychopathology. However, the UPPS-P model has been understudied in both subclinical and clinical bipolar psychopathology and findings have generally been based on laboratory and cross-sectional studies that fail to address the reciprocal relationship between impulsivity and social and

emotional functioning related to bipolar spectrum psychopathology in daily life. In addition, studies investigating trait impulsivity in subclinical and clinical psychopathology have typically used the original UPPS model and have not included the positive urgency facet.

Experience Sampling Methodology

One way to understand impulsivity in bipolar spectrum psychopathology is to examine its expression in daily life. ESM (or ecological momentary assessment, as it is sometimes known) is a daily diary method that examines cognition, behavior, affect, and symptoms in daily life. ESM offers the advantages of enhanced ecological validity through repeatedly assessing individuals in their real world environments, minimizing retrospective bias by assessing individuals' experiences in the moment, and allowing for the examination of context of those experiences. ESM is especially useful for examining dynamic constructs like bipolar spectrum psychopathology and impulsivity.

A few studies have examined the expression of bipolar spectrum psychopathology in daily life. For example, in an ESM study of 321 nonclinically ascertained young adults, the HPS was associated with increased reports of euphoria and energy, dysphoria, irritability, racing thoughts, overconfidence/grandiosity, and likelihood of getting in trouble (Kwapil et al., 2011). Walsh et al. (2012) found that the HPS was associated with reports of thought disruption, risky behavior, negative affect, and energy and enthusiasm in daily life in a similar sample to Kwapil and colleagues (2011). In addition, they found that bipolar spectrum psychopathology moderated the expression of exuberance throughout the day, such that exuberance increased for high HPS scorers and decreased for low HPS scorers.

Daily diary methods and ESM have also been used to examine associations between impulsivity and daily life outcomes. Bresin, Carter, and Gordon (2013) found that self-reported high urgency and daily reports of sadness (but not guilt or general negative affect) predicted urge

to engage in non-suicidal self-injury. Trait impulsivity was a moderator of daily life measures of urge to binge in bulimia samples (Engel et al., 2007; Myers et al., 2006; Steiger, Lehoux, & Gauvin, 1999). Miller, Vachon, and Lynam (2009) found that impulsivity, as measured by the NEO-PI-R, predicted negative affective instability. In addition, impulsivity and negative affect were associated with alcohol problems (Simons, Gaher, Oliver, Bush, & Palmer, 2005) and negative urgency moderated the association between daily reports of anxiety and intoxication (Simons, Dvorak, Batién, & Wray, 2010). Lastly, Sperry, Lynam, Walsh, Horton, and Kwapil (2016) found that the UPPS dimensions were differentiated in daily life: negative urgency was associated with negative outcomes in daily life including negative affect, thought disruption, negative sense of self, and troublesome behavior; lack of premeditation was associated with negative yet energetic affect; lack of perseverance was associated with negative affect, sense of self, and having difficulty with current activities, and; sensation seeking was associated with positive affect and enjoying current activities. However, Sperry and colleagues' study did not examine the expression of positive urgency or the relationship of the UPPS-P model with bipolar spectrum psychopathology.

Current Study

Although impulsivity is a primary component of bipolar disorders, there is no consensus regarding the specific associations of bipolar spectrum psychopathology with facets of trait impulsivity or how different facets of impulsivity might predict outcomes for those experiencing bipolar spectrum psychopathology. Understanding the associations between different facets of impulsivity, bipolar spectrum psychopathology, and daily outcomes may aid in early identification of and intervention for those at risk for the development of bipolar disorders. The goal of this research was to examine the associations of impulsivity facets with bipolar spectrum psychopathology and the extent to which different impulsivity facets moderate the expression of

bipolar spectrum psychopathology in daily life. Specifically, Study 1 examined the relation between the UPPS-P model of impulsivity and the HPS. Study 2 examined whether the UPPS-P facets moderated the expression of bipolar spectrum psychopathology (as assessed by the HPS) in terms of cognition, affect, and behavior in daily life.

CHAPTER II

STUDY 1

Goals and Hypotheses

Study 1 was a large-scale correlational study that examined the relation of UPPS-P impulsivity facets with bipolar spectrum psychopathology. Specific hypotheses included:

1a The HPS will be associated with negative urgency, lack of premeditation, sensation seeking, and positive urgency, but not lack of perseverance, with moderate effect sizes.

1b It is expected that the HPS will be associated with positive urgency above and beyond other impulsivity dimensions with a moderate effect size.

Methods

Participants

Participants enrolled in study 1 via two methods. First, undergraduate students enrolled in psychology courses at the University of North Carolina at Greensboro (UNCG) completed self-report questionnaires as part of departmental mass screening over the course of two semesters ($n=668$). In addition, participants who completed self-report questionnaires as part of study 2 (who did not take part in mass screening) were also included (see study 2 for specific procedures; $n=112$). Note that if participants completed both mass screening and the study 2 session, we used their data from the mass screening so that all subjects had scores from their first testing on the questionnaires used in this study. Undergraduates have been widely used in studies of bipolar psychopathology and impulsivity and are appropriate in that they are just entering into the period of greatest risk for developing bipolar disorders. A total of 780 participants had usable data (mean age=18.99 years, $SD=2.51$, Range=18-53; 75.4% female). The sample was 48.3% Caucasian,

31.2% African American, 6.4% Asian, 6.2% Hispanic/Latino, 4.4% Biracial, 2.3% other, and 1.3% Native American. Note that 87 additional participants were dropped due to invalid protocols and 9 were dropped due to incomplete questionnaires. A sample of 780 provided adequate power for examining the associations of bipolar spectrum psychopathology and impulsivity¹. Note that Study 1 provided the basis for recruiting participants who had elevated scores on the HPS and UPPS-P subscales for Study 2 (see study for specific procedures). Both studies were approved by the UNCG Institutional Review Board and all participants provided informed consent. Participants in both studies received course credit for their participation.

Materials and Procedures

Participants completed a brief demographic questionnaire, the HPS the UPPS-P, and an infrequency scale (Chapman & Chapman, 1983). The HPS, which assesses bipolar spectrum psychopathology, consists of 48 true-false items, including, “When I feel an emotion, I usually feel it with extreme intensity” or “I am usually in an average sort of mood, not too high and not too low (reverse scored).” In general, items tap affective lability and grandiosity and do not explicitly ask about impulsivity. The HPS has good internal consistency (coefficient alpha = .87) and test-retest reliability ($r = .81$; Eckblad & Chapman, 1986). The HPS was intermixed with the 13-item infrequency scale. If more than two infrequency items were endorsed, participants were dropped from the study. The UPPS-P Impulsive Behavior Scale (Lynam et al., 2006) is a 59-item self-report questionnaire that includes Whiteside and Lynam’s (2001) original UPPS Impulsive Behavior Scale and the Positive Urgency Measure (PUM) developed by Cyders and colleagues (2007). Responses are based on a 4-point scale ranging from 1 (*agree strongly*) to 4 (*disagree*

¹ With a sample size of 780, *alpha* set at .001, and power of .80, we had the ability to detect effect sizes of at least .15, between a small and medium effect according to Cohen’s guidelines (calculated in G*Power). In addition, this sample size enabled us to have confidence in our effect sizes as evidenced by a small point of stability ($w = 0.1$) (Lakens & Evers, 2014).

strongly). Examples of questions include “When I feel bad, I will often do things I later regret in order to make myself feel better” (negative urgency – reverse scored), “I have a reserved and cautious attitude toward life” (lack of premeditation), “I tend to give up easily” (lack of perseverance – reverse scored), “I quite enjoy taking risks” (sensation seeking – reverse scored), and “When I am in a great mood, I tend to get into situations that could cause me problems” (positive urgency-reverse scored). Coefficient alpha reliability is reported to range from .83 to .95 for the UPPS-P subscales (Cyders et al., 2007; Whiteside et al., 2005).

Results

Pearson correlations were used to analyze the association of bipolar spectrum psychopathology, as measured by the HPS, and the UPPS-P impulsivity subscales (hypothesis 1a). For all analyses, the HPS and UPPS-P were treated as continuous. In order to address hypothesis 1b, a series of multiple linear regressions were computed entering in four of the UPPS-P subscales as predictors at step 1 and each UPPS-P subscale entered in independently at step 2 with the HPS as the criterion. The change in R^2 was interpreted to examine the effect of the fifth UPPS-P subscale over and above the four other subscales. Note that for all analyses in study 1 the alpha level was set at .001 due to the large sample size in order to minimize Type I error and to reduce the likelihood of reporting statistically significant but inconsequential findings (i.e., findings that accounted for a trivial amount of variance). Furthermore, correlational and regression results were interpreted in light of effect sizes. Following Cohen (1992), the value of the Pearson correlation was interpreted as the effect size, with a correlation of .1 being considered a small effect, .3 a medium effect, and .5 a large effect. For the regression analyses, f^2 was used, with .02 being considered a small effect, .15 a medium effect, and .35 a large effect.

Means, reliability (Cronbach’s alpha), and intercorrelations of the HPS and UPPS-P subscales are presented in Table 1. The reliability values were good for all the measures (> .80)

and were consistent with those published in the literature. Correlations of the four original UPPS subscales were consistent with those reported by Whiteside & Lynam (2001); however, negative and positive urgency were highly correlated contrary to Cyders and Smith's (2008) report. Note that correlations up to .65 have been reported in the literature for positive and negative urgency, consistent with our findings (Dinc & Cooper, 2015; Grimaldi, Napper, & LaBrie, 2014). As hypothesized, the HPS was associated with negative urgency, lack of premeditation, sensation seeking, and positive urgency, but not lack of perseverance. The correlation of the HPS with lack of premeditation was a small effect size, with sensation seeking and negative urgency was a medium effect size, and with positive urgency approached a large effect size.

Multiple regressions analyzing the association of the HPS with each UPPS-P subscale over and above the other UPPS-P subscales are presented in Table 2. As expected, positive urgency was associated with the HPS above and beyond the other UPPS-P subscales. Negative urgency, lack of perseverance and sensation seeking were also uniquely associated with the HPS; however, positive urgency accounted for the largest amount of added variance (between a small and moderate effect). The 99.9% confidence intervals were computed for the unstandardized beta coefficients for each of the UPPS-P subscale. The confidence interval around positive urgency contained the beta value for sensation seeking – indicating that the unique association of positive urgency with HPS was not significantly greater than the unique association of sensation seeking and HPS. However, the betas for the other UPPS-P subscales fell outside of the 99.9% confidence interval for positive urgency, suggesting that the effect was significantly larger for positive urgency than for lack of perseverance, lack of premeditation, and negative urgency. Note that lack of perseverance had an inverse relationship with HPS in the regression analyses. This is contrasted with the positive associations of HPS with the other dimensions and the nonsignificant

zero-order association of HPS and lack of perseverance. The inverse relationship in the regression analyses likely reflects a suppression effect.

CHAPTER III

STUDY 2

Goals and Hypotheses

Study 2 examined the expression of bipolar spectrum psychopathology in daily life using ESM and the extent to which impulsivity moderated this expression. For the following hypotheses, the association of the UPPS-P facets with daily life experiences was examined independently². Specific hypotheses included:

- 2a We expected to replicate Walsh and colleagues (2012) findings that bipolar spectrum psychopathology, as assessed by the HPS, is associated with energetic-enthusiasm, negative affect, irritability, thought disruption, and grandiosity as well as feeling like ones emotions are out of control. We hypothesized that the HPS will be unassociated with measures of social functioning in daily life.
- 2b We hypothesized that the HPS will be associated with impulsive behaviors assessed in daily life.
- 2c Positive urgency, negative urgency, and lack of premeditation will moderate the relation of the HPS with impulsive behaviors reported in daily life. In other words, the association of HPS scores with impulsive behaviors in daily life will be greater in highly impulsive individuals than in those lower in impulsivity.

² Based on the recommendation by Dr. Donald Lynam and findings from Sperry et al. (2016), it was decided that the UPPS-P facets would not be entered simultaneously, but rather entered individually due to multicollinearity between the sub-scales.

- 2d Positive urgency will moderate the cross-level interaction of the HPS with positive affect and impulsive behavior in daily life. Individuals who are high on positive urgency and the HPS will be expected to be more likely to engage in impulsive behaviors in daily life when experiencing positive affect.
- 2e Negative urgency will moderate the cross-level interaction of the HPS with negative affect, stress and impulsive behavior in daily life. It is expected that individuals who are high on negative urgency and the HPS will be more likely to engage in impulsive behaviors in daily life when experience negative affect or stress.
- 2f Positive urgency will moderate the cross-level interaction of the HPS with positive affect and feeling emotionally out of control. It is expected that individuals high on positive urgency and the HPS will be more likely to report feeling like their emotions are out of control when experiencing positive affect.
- 2g Negative urgency will moderate the cross-level interaction of the HPS with negative affect, stress, and feeling emotionally out of control. It is expected that individuals high on negative urgency and the HPS will be more likely to report feeling like their emotions are out of control when experiencing negative affect and stress.

Methods

Participants

Participants were enrolled via two methods. First, enrollment was open to any students who were currently enrolled in general psychology courses. We also recruited elevated scorers on the HPS or the UPPS-P from the sample in study 1. All participants who score at least 1.5 standard deviations above the mean on the HPS or any of the UPPS-P subscales in mass screening were invited to participate to ensure adequate representation of high scorers on the scales. Low scorers on the scales were also included in the contact list to ensure that

experimenters were unaware of HPS and UPPS-P scores. Usable data were available for 222 of the 283 enrolled participants (71.6% female, 52.7% Caucasian, Age = 18.81, SD = 3.19)³. Participants were dropped for endorsing more than 2 infrequency items while completing self-report questionnaires ($n = 10$) or for having problematic ESM protocols ($n=51$). Note that participants were dropped if they completed less than 15 ESM surveys or when they had an excess of invalid ESM protocols (variance associated with responding $< - 1.5$ SD below the mean). In addition to course credit, participants who completed at least 70% of the ESM questionnaires were entered into a drawing each semester for \$100 gift cards.

Materials and Procedures

Table 3 shows the questions included in the ESM protocol. The items tap different aspects relevant to bipolar spectrum psychopathology including affect, thought disturbances, feeling out of control in terms of emotions and behaviors, and impulsive behaviors. This questionnaire is based off of previous ESM protocols (Kwapil et al., 2011; Walsh et al., 2012); however, additional items were included to tap different aspects of impulsive behavior. We examined these items individually; however, we also created an impulsivity index as these items were highly correlated. All of the items were scored on a 7-point scale from “not at all” to “very much,” except for question 26, “Are you alone right now?” that was answered “yes” or “no.”

Participants attended a one-hour information session in which they completed the HPS (with infrequency items) and the UPPS-P regardless of whether they completed them during mass-screening (study 1). This enabled the enrollment of participants who did not take part in

³ Determination of power and sample sizes in multilevel designs is considerably more complicated in part because the optimal sample size for estimating one parameter in a multilevel design may not be the optimal sample size for estimating a different parameter (Snijders & Bosker, 1999). Hox (2002) advocates the “50/20” rule for assessing cross-level interactions which suggested that the study should have a minimum of 20 measurements nested within a minimum of 50 participants. Each of the studies exceeded this sample size, and the protocol required that participants complete a minimum of 15 ESM questionnaires.

mass-screening and ensured that all study 2 participants completed these questionnaires at the start of the ESM study. After completing self-report questionnaires, research assistants described the procedures for the ESM study and participants completed an ESM questionnaire.

Participants completed ESM surveys on their personal smartphones through two methods. The initial 69 participants were notified via text message to complete the ESM surveys using the UNCG Qualtrics system. Their cellphones signaled them and administered and time-stamped the ESM questionnaires and their responses were uploaded to Qualtrics. The remaining 153 participants completed the ESM questionnaires through an ESM application, MetricWire (Trafford, 2015), which was downloaded on participants' phones during the information session. The MetricWire app administered questionnaires and uploaded results to their server. Both methods signaled participants eight times daily between noon and midnight for 7 days to complete the same questionnaire. Participants were told that they must begin the surveys within 5 minutes of the signal, after which the link expired (Qualtrics) or the survey disappeared (MetricWire), ensuring that participants did not skip questionnaires and complete them at a later time. The ESM questionnaires required approximately two minutes to complete. Participants returned to the lab for one follow-up session mid-way through their participation to ensure appropriate practices and to troubleshoot any problems.

Note that there were some technical difficulties for initial participants who completed the protocol with MetricWire using iPhones – iPhones had a limit on how many notifications could be sent from an application in one day limiting the amount of notifications they received. Once aware of the problem, MetricWire wrote a new algorithm to re-set notifications daily for their iOS app which corrected the problem. However, these technical difficulties contributed to low response rates from some users initially.

Results

ESM data have a hierarchical structure in which ratings in daily life (level 1 data) are nested within participants (level 2 data). Hierarchical linear modeling is recommended for ESM data as it provides a more appropriate method of analyzing nested data than conventional unilevel analyses (Nezlek, 2011). Level 1 predictors were group mean centered and level 2 predictors were grand mean centered. Analyses were computed with Mplus 7 (Muthén & Muthén, 1998-2010).

Initial analyses examined whether the HPS predicted daily life experiences. Direct effects assessed whether the level 2 predictor (HPS) predicted level 1 criterion (ESM daily life ratings). Note that the direct effects of the UPPS-P scales with daily life ratings are including in the results tables for illustrative purposes (although they were not part of the specific hypotheses of the study). In order to investigate hypothesis 2c, the level 1 dependent variables were impulsive behaviors measured in daily life. The HPS and the UPPS-P subscale were entered simultaneously at step 1, and the interaction between the HPS and the UPPS-P subscale was entered at step 2. Hypotheses 2d-2g involved cross-level interactions or slopes-as-outcomes. These models tested whether the level 2 predictors were associated with the slope of the level 1 predictor and criterion (e.g., the slope of situation stressful predicting impulsivity in the moment). The HPS was entered at step 1, the HPS and the UPPS-P subscale were entered at step 2, and the interaction between the HPS and the UPPS-P subscale was entered at step 3. Alpha was set at the conventional .05 level for study 2.

Participants completed an average of 37.3 ESM surveys (SD = 11.5). The number of completed surveys was not significantly associated with HPS or UPPS-P scores (see Table 4). Means and intercorrelations for the HPS and UPPS-P subscales for this sample are presented in Table 4. Note that that the means appear slightly higher in study 2 than study 1 suggesting that

the recruitment procedure successfully oversampled participants with elevated scores on the HPS and the UPPS-P subscale. Additionally, the pattern of correlations is generally consistent with that of study 1; however, the magnitudes of the correlations are somewhat larger in study 2.

Association of HPS with Daily Life Experiences (Hypotheses 2a-b)

Associations of the HPS with daily affect and cognition are presented in Table 5. Results were consistent with Kwapil et al. (2011) and Walsh et al. (2012). As expected, the HPS was associated with both positive and negative affect in daily life - feeling energetic, sad, anxious, and irritable, but not happy in the moment. In addition to replicating previous findings regarding affect, we found that the HPS was associated with feeling like one's emotions are out of control in the moment. As hypothesized, the HPS was also associated with thought disruption, including difficulty concentrating and racing thoughts.

Associations between the HPS and one's sense of self in the world and social interactions are presented in Table 6. As expected, the HPS was associated with measures of grandiosity – feeling confident and like the center of attention. Despite this, the HPS was also associated with feeling uncertain and criticized by others. Consistent with previous findings, the HPS was relatively unassociated with measures of social interaction; however, contrary to Walsh et al. (2012), the HPS was associated with feeling like one is alone because he/she is not wanted.

Associations between the HPS and daily activities are presented in Table 7. As hypothesized, the HPS was associated with increased activity (e.g., doing many things) and valuing one's activities as exciting; however, it was also associated with reporting that one's situation is stressful. Consistent with Walsh and colleagues (2012), despite feeling energetic and excited, individuals high on the HPS were not more likely to report that their current situations were positive. Contrary to Walsh and colleagues (2012), the HPS was not associated with feeling bored, but was associated with feeling lonely.

Associations between the HPS and daily impulsivity are presented in Table 8. Dependent variables included the impulsivity index and individual impulsivity items. As hypothesized, the HPS was associated with all of the daily reports of impulsivity.

Moderating Role of UPPS-P Subscales with HPS and Impulsivity in Daily Life

(Hypothesis 2c)

Contrary to our hypothesis, there were no significant interactions of HPS with negative urgency, lack of premeditation, or positive urgency in the prediction of impulsive behaviors in daily life (Tables 9-11). Specifically, the HPS predicted impulsive behavior in daily life regardless of whether individuals were high or low on negative urgency, lack of premeditation or positive urgency. Despite lack of interactions, we did see additive effects of the UPPS-P subscales with the HPS and impulsivity in daily life. For example, both HPS and negative urgency were associated with impulsive behaviors in daily life in an additive fashion (Figure 1). The same was true of positive urgency (Figure 2). Negative and positive urgency significantly predicted every impulsivity item despite already having the HPS in the model, whereas lack of premeditation only predicted engaging in troublesome behavior and acting without thinking. Note that the hypotheses only addressed positive urgency, negative urgency, and lack of premeditation as moderators of HPS. However, supplemental tables examining sensation seeking and lack of perseverance were included for illustrative purposes (Tables 12 and 13).

There was a significant interaction between lack of perseverance and the HPS in predicting report that there was something they should be doing that they were not (Table 12). Note that this item taps a core characteristic of lack of perseverance. This interaction is presented in Figure 3 indicating that whether someone is high or low on the HPS does not seem to matter for those high in lack of perseverance – they are neglecting to do things they are supposed to be doing regardless of their level of bipolar spectrum psychopathology. However, for those who are

low on lack of perseverance, higher HPS scores predicted increasing levels of putting off/not engaging in what one should be doing in the moment. In other words, for those who are not already predisposed to be neglectful of their activities, having risk for bipolar disorder increases the likelihood that they will not do the things they are supposed to do.

Table 8 indicated that the HPS predicted impulsivity in daily life. Furthermore, the HPS predicted impulsivity in daily life even when it was entered simultaneously with each of the individual UPPS subscales (see Tables 9 to 13). To examine this further, we conducted an exploratory analysis in which the HPS and all five UPPS-P subscales were entered simultaneously in the prediction of the ESM impulsivity index. The HPS significantly accounted for variance over and above all five UPPS-P subscales ($\Upsilon = .019$, $SE = .007$, $p < .01$).

Moderating Role of UPPS-P Subscales with HPS Predicting Cross-level Interactions

(Hypotheses 2d-g)

Contrary to our hypotheses, positive urgency did not moderate the cross-level interaction of the HPS with the slope of positive affect with impulsivity or feeling like ones emotions are out of control in daily life (Table 14). In other words, the effect of HPS on the level 1 association of emotion and impulsivity in daily life was not moderated by positive urgency. This was tested across three levels of positive affect in the moment: feeling happy, energetic, and being in a positive situation. Of note, the HPS did not significantly moderate the relationship of positive affect and impulsivity in daily life suggesting that being high in bipolar spectrum psychopathology does not necessarily put one at risk for engaging in impulsive behavior when specifically experiencing positive affect.

Similarly, negative urgency did not moderate the cross-level interaction of the HPS, with the slope of negative affect with impulsivity or feeling like ones emotions are out of control suggesting that there is no interaction between the HPS and negative urgency (Table 15).

Individuals who were high on negative urgency and the HPS were not more likely to engage in impulsive behaviors in daily life when experiencing dysphoria, irritability, or stress compared to those high on the HPS alone. Of note, the HPS did moderate the association of irritability and impulsivity in daily life (Figure 4). In other words, irritability in daily life predicted impulsivity, but especially so for those high on the HPS. In addition, negative urgency moderated the cross-level interaction of irritability, stress and feeling like ones emotions are out of control. In other words, stress and irritability predicted feeling like ones emotions are out of control, but especially so for those high on negative urgency regardless of their bipolar risk.

CHAPTER IV

DISCUSSION

Evidence supports that bipolar psychopathology is best characterized as a continuum that ranges from subclinical, and in some cases adaptive, expressions to full-blown manic and depressive episodes, rather than as discrete, categorical diagnoses. Examining bipolar psychopathology on a spectrum enables the examination of key characteristics such as disruption and dysregulation of affect, cognition, behavior, and functioning across a broad range of severity. People with bipolar spectrum psychopathology often engage in impulsive, unrestrained, and poorly thought out behavior – and much of the impairment in bipolar disorders is associated with such behavior (e.g., financial problems resulting from excessive spending, relationship problems, impaired school and work performance). Thus, impulsivity is an important factor to examine as it may be associated with worse outcomes for those on the spectrum and may predict conversion to clinical disorders (Kwapil et al., 2000).

Previous literature examining the association of impulsivity and bipolar psychopathology has for the most part considered impulsivity to be a unidimensional construct and examined this association in laboratory based correlational studies. However, impulsivity is best conceptualized as multidimensional. Examining the daily life expression of multidimensional impulsivity may shed light on why and when impulsivity results in worse outcomes for individuals on the bipolar spectrum. The purpose of this study was to examine the association of impulsivity and bipolar spectrum psychopathology and their expression in daily life using experience sampling methodology. This was one of the first studies to our knowledge to examine the expression of

impulsivity in bipolar spectrum psychopathology in daily life using a specific theoretical framework for multidimensional impulsivity, the UPPS-P model.

The present findings provide further support for the construct validity of bipolar spectrum psychopathology by demonstrating that nonclinically ascertained young adults with elevated scores on the HPS experience disrupted affect, cognition, and behavior in daily life. Bipolar spectrum psychopathology was characterized by affective dysregulation, grandiosity, racing thoughts, and increased activities in daily life. These findings appear robust and closely replicate results from Kwapil et al. (2011) and Walsh et al. (2012). Most notably, this study provided evidence that bipolar spectrum psychopathology was associated with multiple presentations of impulsive behaviors in daily life.

As hypothesized, bipolar spectrum psychopathology was associated with the UPPS-P facets of negative and positive urgency, lack of premeditation, and sensation seeking. Among the impulsivity facets, positive urgency accounted for the largest amount of added variance in bipolar spectrum psychopathology. These results indicate that those experiencing bipolar spectrum psychopathology are characterized by trait impulsivity; however, they seem especially at risk to engage in impulsive behaviors specifically when experiencing positive affect. These findings are consistent with the extant literature suggesting that positive urgency, above and beyond other types of impulsivity, is associated with bipolar disorder (Giovanelli et al., 2013; Muhtadie et al., 2014; Victor et al., 2011). Given that individuals who experience a range of subclinical and clinical manifestations of bipolar psychopathology a) experience elevated positive affect during daily life (Kwapil et al., 2011; Walsh et al., 2012) and during euthymia (Gruber, Harvey, and Purcell, 2011) and b) are more likely to engage in impulsivity in response to positive affect, future prevention and intervention may specifically target emotional lability and positive affective states. This will be especially important given that positive urgency has been proposed to account

for 14% of the variance in quality of life (Victor et al., 2011) and 24% of global functioning in those diagnosed with bipolar disorder (Muhtadie et al., 2014). Future research should additionally examine the mechanisms by which those at risk for bipolar disorder engage in poorly constrained behaviors during positive states and whether the breakdown of emotion regulation strategies contributes to the experience of positive affect and impulsivity. It may be worthwhile to further consider the nature of the positive affect experienced by people with bipolar spectrum psychopathology. The present ESM study, along with Kwapil et al. and Walsh et al. found that HPS scores were significantly associated with energetic-exuberant forms of positive affect, but only Kwapil et al. reported a significant association of HPS with happiness. Finally, Gruber et al. (2011) has suggested that persistent activation of positive emotion across contexts may be an important characteristic of dysfunction in bipolar psychopathology.

Bipolar spectrum psychopathology was also associated with negative urgency in the present study suggesting that in general, those at risk for bipolar spectrum disorders display increased emotion-based impulsivity in reaction to both elevated negative and positive affect. Interestingly, evidence previously suggested that negative urgency, but not positive urgency, differentiates borderline personality traits from bipolar spectrum psychopathology consistent with the notion that borderline is uniquely characterized by increased negative affectivity (Fulford, Eisner, & Johnson, 2015). Future research should further examine the extent to which negative and positive urgency differentially predict behaviors in bipolar spectrum psychopathology from those of other disorders and whether they are truly unique constructs, especially given the high correlation between them.

Validation studies of the UPPS-P reported a correlation of .37 for positive and negative urgency (Cyders & Smith, 2008), indicating moderate overlap between the two facets. However, our studies reported correlations of .66 (study 1) and .76 (study 2), more consistent with recent

reports (Dinc & Cooper, 2015; Grimaldi, Napper, & LaBrie, 2014). One possible interpretation of these differences is that in Cyders and Smith's original validation study, the items tapping positive urgency were given as a unitary scale (PUM) separate from the traditional UPPS Impulsive Behavior Scale. It could be that there are differences based on being asked these questions in isolation versus being intermixed with other impulsivity questions (shared method variance). Nevertheless, this leaves the question of whether urgency is best considered as a unitary construct that is generally reactive to strong affect or separate domains of positive and negative urgency. Grimaldi et al. and Dinc and Cooper found differential moderation of negative and positive urgency in that high negative urgency moderated the association of being aggressive and later negative alcohol consequences whereas high positive urgency moderated being a target of aggression and later negative alcohol consequences. In addition, as discussed previously, we found that despite the high correlation between negative and positive urgency, both facets accounted for unique variance in bipolar spectrum psychopathology.

Moderating Role of Impulsivity in Bipolar Spectrum Psychopathology

Contrary to hypotheses, there were no significant interactions of bipolar spectrum psychopathology and the UPPS-P facets in predicting impulsive behaviors in daily life. However, being especially high on bipolar and impulsivity traits simultaneously resulted in more impulsive behavior in daily life in an additive fashion. Being high in bipolar spectrum psychopathology, negative or positive urgency, and being high in both (e.g., HPS and positive urgency) increased the likelihood of engaging in impulsive behavior in daily life; however, being high in one but not the other also resulted in increased impulsivity. These results suggest that trait impulsivity does not exacerbate the expression of bipolar spectrum psychopathology in daily life contrary to previous findings (Kwapil et al. 2000).

Similarly, trait positive and negative urgency did not moderate the cross-level interaction of the HPS with affect and impulsivity in daily life. For example, the combination of being high in positive urgency and bipolar spectrum psychopathology did not mean people were more likely to report impulsivity specifically when experiencing positive affect in the moment (i.e., to be reactive to the experience of affect). So, even when examining the expression of impulsivity in daily life when participants were reporting being in the concurrent mood state, being high in trait positive and negative urgency did not matter. Note that this was true for the HPS as well – those high on the HPS were not significantly more reactive to positive affect in the moment compared to those low on the HPS.

The HPS did, however, moderate the association of irritability and impulsivity in daily life suggesting that when individuals high in bipolar spectrum psychopathology experience irritability, they are more likely to engage in impulsive behaviors compared to those who are low on bipolar spectrum psychopathology. This is not surprising given that one of the diagnostic criteria for (hypo)mania is irritable mood (American Psychiatric Association, 2013); however, it is interesting to note that irritability is not necessary for the diagnosis, and if present without increased positive affect, an additional symptom must be met. This finding may have implications for intervention – targeting irritability in addition to positive affect in treatment could have benefits for reducing impulsivity and thus improving quality of life in those experiencing bipolar psychopathology. Not seeing a synergistic effect of the HPS and UPPS-P in predicting impulsivity in daily life suggests that one does not necessarily need to be high in trait impulsivity above and beyond being predisposed to having bipolar spectrum psychopathology in order to be reporting increased impulsivity in daily life.

Thus, the present study found that: a) bipolar spectrum psychopathology is associated with facets of trait impulsivity, b) bipolar spectrum psychopathology is associated with impulsive

behaviors in daily life, and c) contrary to hypotheses (and previous findings) trait impulsivity did not potentiate or exacerbate the negative expression of bipolar spectrum psychopathology. The latter finding is surprising in light of previous findings such as Kwapil et al. (2000) who reported that the combination of high HPS scores and trait impulsivity was especially problematic at their 13-year follow-up assessment. Furthermore, the combination of conditions that result in being highly energized and poorly constrained seems like a potent mix for problematic outcomes. So, what might explain the lack of significant interactive findings?

First of all, it is important to keep in mind that we did see additive effects for HPS and UPPS-P facets. So the combination of high bipolar spectrum and impulsive traits is problematic, but impulsivity seems to have the same effect regardless of the extent to which one has bipolar spectrum characteristics (and vice versa). Interestingly, we found that the HPS was robustly associated with impulsivity in daily life above and beyond measures of trait impulsivity. First, the HPS remained significant in the prediction of impulsivity items after the UPPS-P facets were individually entered into the model. In fact, negative and positive urgency were the only facets that remained significant in the prediction of every daily life impulsivity item after accounting for the HPS. Second, when the HPS was entered into the model with all five of the UPPS-P facets simultaneously, it accounted for unique variance in impulsivity in daily life above and beyond all of the UPPS-P facets. Despite not explicitly inquiring about impulsivity, scores on the HPS not only predict impulsive behaviors in daily life, but they do so after accounting for the variance predicted by the five UPPS-P facets. This would seem to suggest that impulsivity is an engrained aspect of bipolar spectrum psychopathology and that to an extent, the predisposition to engage in poorly constrained behavior is measured by the HPS without explicitly asking about these behaviors (note that HPS items primarily tap grandiosity and excesses in emotions, thoughts, and energeticness). There seems to be shared variance in bipolar spectrum psychopathology and trait

impulsivity (i.e. positive urgency) that is integral to predicting increased impulsivity in daily life. We are not suggesting that the HPS is a better measure of impulsivity than the UPPS, but that measuring bipolar spectrum psychopathology seems to provide unique variance in predicting actual impulsive behavior in daily life above and beyond trait impulsivity.

Another potential interpretation is that impulsivity may not have an interactive effect unless one is at the more severe end of the bipolar spectrum or once past the typical age of onset of more severe expressions of bipolar. This could potentially explain Kwapil et al.'s (2000) finding that impulsivity moderated functioning 10 years later, yet cross-sectional or shorter follow-up studies (3 years) did not find this association (Walsh et al., 2015). In addition, despite the fact that individuals are reporting impulsivity in daily life, we do not know the severity of the impulsive behaviors in which they are engaging in. This is one potential limitation of the study. In the most severe manifestation of bipolar spectrum psychopathology, individuals are engaging in excessively dangerous risk-taking behaviors that could potentially lead to hospitalization, jail, or even death. This type of behavior may more likely confer risk for poorer outcomes compared to potentially more trivial (or juvenile) impulsive thoughts and behaviors that could be more common in undergraduate students. Note that the present study provides much more detailed assessment of daily life impulsive behaviors than did Walsh et al. (2012) or Kwapil et al. (2011). However, future ESM research should consider the specific type of impulsive behavior in which participants are engaging in.

Conclusions

Bipolar psychopathology encompasses a broad spectrum of symptoms and impairment. Examining it from a continuous perspective enhances the identification of risk and protective factors for transition along the continuum. Trait impulsivity appears to be a core feature of bipolar spectrum psychopathology across the continuum and provides an additive increment in risk for

engaging in impulsive behaviors in daily life above and beyond having trait bipolar spectrum psychopathology; however, it did not moderate the expression of bipolar spectrum characteristics, as expected. In fact, trait impulsivity in reaction to the experience of intense emotion (especially positive affect) may be an engrained feature of bipolar spectrum psychopathology rather than external predictor. ESM is a promising method for examining dynamic constructs such as bipolar spectrum psychopathology and impulsivity. It has the potential to be a strong research and clinical tool in the study of the progression of psychopathology, the experiences that individuals have out in the real world, and how we might be able to intervene in the moment.

REFERENCES

- Akiskal, H. S. (2004). The bipolar spectrum in psychiatric and general medical practice. *Primary Psychiatry, 11*(9), 30-35.
- Alloy, L. B., Abramson, L. Y., Walshaw, P. D., Cogswell, A., Smith, J. M., Neeren, A. M., . . . Nusslock, R. (2006). Behavioral Approach System (BAS) sensitivity and bipolar spectrum disorders: A retrospective and concurrent behavioral high-risk design. *Motivation and Emotion, 30*, 143-155. doi: 10.1007/s11031-006-9003-3
- Alloy, L. B., Bender, R. E., Wagner, C. A., Abramson, L. Y., & Urosevic, S. (2009). Longitudinal predictors of bipolar spectrum disorders: A behavioral approach system perspective. *Clinical Psychology: Science and Practice, 16*(2), 206-226. doi: 10.1111/j.1468-2850.2009.01160.x
- Alloy, L. B., Bender, R. E., Wagner, C. A., Whitehouse, W. G., Abramson, L. Y., Hogan, M. E., . . . Harmon-Jones, E. (2009). Bipolar spectrum–substance use co-occurrence: Behavioral approach system (BAS) sensitivity and impulsiveness as shared personality vulnerabilities. *Journal of Personality and Social Psychology, 97*(3), 549-565. doi: 10.1037/a0016061
- Alloy, L. B., Urošević, S., Abramson, L. Y., Jager-Hyman, S., Nusslock, R., Whitehouse, W. G., & Hogan, M. (2012). Progression along the bipolar spectrum: A longitudinal study of predictors of conversion from bipolar spectrum conditions to bipolar I and II disorders. *Journal of Abnormal Psychology, 121*(1), 16-27. doi: 10.1037/a0023973

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. Arlington, VA: American Psychiatric Publishing.
- Anestis, M. D., Selby, E. A., & Joiner, T. E. (2007). The role of urgency in maladaptive behaviors. *Behaviour Research and Therapy*, *45*(12), 3018-3029. doi: 10.1016/j.brat.2007.08.012
- Angst, J. (1998). The emerging epidemiology of hypomania and bipolar II disorder. *Journal of Affective Disorders*, *50*, 143-151.
- Angst, J., & Cassano, G. (2005). The mood spectrum: Improving the diagnosis of bipolar disorder. *Bipolar Disorders*, *7*(4), 4-12.
- Angst, J., Gamma, A., Benazzi, F., Ajdacic, V., Eich, D., & Rössler, W. (2003). Toward a re-definition of subthreshold bipolarity: epidemiology and proposed criteria for bipolar-II, minor bipolar disorders and hypomania. *Journal of Affective Disorders*, *73*(1-2), 133-146. doi: [http://dx.doi.org/10.1016/S0165-0327\(02\)00322-1](http://dx.doi.org/10.1016/S0165-0327(02)00322-1)
- Berg, J.M., Litzman, R.D., Bliwise, N.G., & Lilienfeld, S.O. (2015). Parsing the heterogeneity of impulsivity: A meta-analytic review of the behavioral implications of the UPPS for psychopathology. *Psychological Assessment*, *27*(4), 1129-1146. doi: [10.1037/pas0000111](https://doi.org/10.1037/pas0000111)
- Bøen, E., Hummelen, B., Elvsåshagen, T., Boye, B., Andersson, S., Karterud, S., & Malt, U. F. (2015). Different impulsivity profiles in borderline personality disorder and bipolar II disorder. *Journal of Affective Disorders*, *170*, 104-111.
- Bresin, K., Carter, D. L., & Gordon, K. H. (2013). The relationship between trait impulsivity, negative affective states, and urge for nonsuicidal self-injury: A daily diary study. *Psychiatry Research*, *205*(3), 227-231.

- Chapman, L. J., & Chapman, J. P. (1983). Infrequency scale for personality measures. Unpublished scale available from T. R. Kwapil, UNCG Department of Psychology, Greensboro, NC.
- Chapman, L. J., Chapman, J. P., Numbers, J. S., Edell, W. S., Carpenter, B. N., & Beckfield, D. (1984). Impulsive nonconformity as a trait contributing to the prediction of psychotic-like and schizotypal symptoms. *Journal of Nervous and Mental Disease*, *172*, 681-691.
- Cloninger, C. R., Przybeck, T. R., & Svrakic, D. M. (1991). The Tridimensional Personality Questionnaire: US normative data. *Psychological Reports*, *69*, 1047-1057.
- Costa, P. T., & McCrae, R. R. (2010). *NEO personality inventory and five-factor-3 professional manual*. Odessa: Psychological Assessment Resources, Inc.
- Cyders, M. A., & Smith, G. T. (2007). Mood-based rash action and its components: Positive and negative urgency. *Personality and Individual Differences*, *43*(4), 839-850. doi: 10.1016/j.paid.2007.02.008
- Cyders, M. A., & Smith, G. T. (2008). Emotion-based dispositions to rash action: Positive and negative urgency. *Psychological Bulletin*, *134*(6), 807-828. doi: 10.1037/a0013341
- Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior: Development and validation of a measure of positive urgency. *Psychological Assessment*, *19*(1), 107-118. doi: 10.1037/1040-3590.19.1.107
- Dawson, E. L., Shear, P. K., Howe, S. R., Adler, C. M., DelBello, M. P., Fleck, D. E., & Strakowski, S. M. (2014). Impulsivity predicts time to reach euthymia in adults with bipolar disorder. *Bipolar Disorders*, *16*(8), 846-856. doi: 10.1111/bdi.12232

- Dinc, L. & Cooper, A.J. (2015) Positive affective states and alcohol consumption: The moderating role of trait positive urgency. *Addictive Behaviors*, 47, 17-21. doi: 10.1016/j.addbeh.2015.03.014 0306-4603.
- Eckblad, M., & Chapman, L. J. (1986). Development and Validation of a Scale for Hypomanic Personality. *Journal of Abnormal Psychology*, 95(3), 214-222. doi: <http://dx.doi.org/10.1037/0021-843X.95.3.214>
- Ekinci, O., Albayrak, Y., Ekinci, A. E., & Caykoylu, A. (2011). Relationship of trait impulsivity with clinical presentation in euthymic bipolar disorder patients. *Psychiatry Research*, 190(2-3), 259-264. doi: 10.1016/j.psychres.2011.06.010
- Engel, S. G., Boseck, J. J., Crosby, R. D., Wonderlich, S. A., Mitchell, J. E., Smyth, J., . . . Steiger, H. (2007). The relationship of momentary anger and impulsivity to bulimic behavior. *Behaviour Research and Therapy*, 45(3), 437-447.
- Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences: a natural science approach*. New York: Plenum Press.
- Fulford, D., Eisner, L. R., & Johnson, J. L. (2015). Differentiating risk for mania and borderline personality disorder: The nature of goal regulation and impulsivity. *Psychiatry Research*. doi: <http://dx.doi.org/10.1016/j.psychres.2015.02.001>
- Giovanelli, A., Hoerger, M., Johnson, S. L., & Gruber, J. (2013). Impulsive responses to positive mood and reward are related to mania risk. *Cognition and Emotion*, 27(6), 1091-1104. doi: 10.1080/02699931.2013.772048
- Grimaldi, E.M., Napper, L.E., & LaBrie, J.W. (2014). Relational aggression, positive urgency and negative urgency: Predicting alcohol use and consequences among college students. *Psychology of Addictive Behaviors*, 28(3), 893-898. doi: 10.1037/a0037354.

- Gruber, J., Oveis, C., Keltner, D., & Johnson, S. L. (2008). Risk for mania and positive emotional responding: Too much of a good thing? *Emotion*, 8(1), 23-33. doi: <http://dx.doi.org/10.1037/1528-3542.8.1.23>
- Heffner, J. L., Fleck, D. E., DelBello, M. P., Adler, C. M., & Strakowski, S. M. (2012). Cigarette smoking and impulsivity in bipolar disorder. *Bipolar Disorders*, 14, 735-742.
- Hox, J. (2002). *Multilevel analysis techniques and applications*. New Jersey: Lawrence Erlbaum Associates, Inc., Publishers.
- Jiménez, E., Arias, B., Castellví, P., Goikolea, J. M., Rosa, A. R., Fañanás, L., . . . Benabarre, A. (2012). Impulsivity and functional impairment in bipolar disorder. *Journal of Affective Disorders*, 136(3), 491-497. doi: 10.1016/j.jad.2011.10.044
- Johnson, S. L., Carver, C. S., Mulé, S., & Joorman, J. (2013). Impulsivity and risk for mania: Towards great specificity. *Psychology and Psychotherapy: Theory, Research and Practice*, 86, 401-412. doi: <http://dx.doi.org/10.1111/j.2044-8341.2012.02078.x>
- Judd, L. L., & Akiskal, H. S. (2003). The prevalence and disability of bipolar spectrum disorders in the US population: Re-analysis of the ECA database taking into account subthreshold cases. *Journal of Affective Disorders*, 73, 123-131.
- Kwapil, T. R., Barrantes-Vidal, N., Armistead, M. S., Hope, G. A., Brown, L. H., Silvia, P. J., & Myin-Germeys, I. (2011). The expression of bipolar spectrum psychopathology in daily life. *Journal of Affective Disorders*, 130(1-2), 166-170. doi: <http://dx.doi.org.libproxy.uncg.edu/10.1016/j.jad.2010.10.025>
- Kwapil, T. R., Miller, M. B., Zinser, M. C., Chapman, L. J., Chapman, J., & Eckblad, M. (2000). A longitudinal study of high scorers on the Hypomanic Personality Scale. *Journal of Abnormal Psychology*, 109(2), 222-226. doi: <http://dx.doi.org.libproxy.uncg.edu/10.1037/0021-843X.109.2.222>

- Lakens, D., & Evers, E. R. K. (2014). Sailing from the seas of chaos into the corridor of stability: Practical recommendations to increase the informational value of studies. *Perspectives on Psychological Science, 9*(3), 278-292.
- Lynam, D. R., Smith, G. T., Whiteside, S. P., & Cyders, M. A. (2006). The UPPS-P: Assessing five personality pathways to impulsive behaviors (Tech. Rep.). West Lafayette, IN: Purdue University.
- Meade, C. S., Graff, F. S., Griffin, M. L., & Weiss, R. D. (2008). HIV risk behavior among patients with co-occurring bipolar and substance use disorders: Associations with mania and drug abuse. *Drug and Alcohol Dependence, 92*(1-3), 296-300.
- Merikangas, K. R., Akiskal, H. S., Angst, J., Greenberg, P., Hirschfeld, R. M. A., Petukhova, M., & Kessler, R. C. (2007). Lifetime and 12-month prevalence of bipolar spectrum disorder in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 64*, 543-552.
- Miller, D. J., Flory, K., Lynam, D. R., Leukefeld, C. (2003). A test of the four-factor model of impulsivity-related traits. *Personality and Individual Differences, 34*(8), 1403-1418. doi: 10.1016/S0191-8869(02)00122-8
- Miller, D. J., Vachon, D. D., & Lynam, D. R. (2009). Neuroticism, negative affect, and negative affect instability: Establishing convergent and discriminant validity using ecological momentary assessment. *Personality and Individual Differences, 47*(8), 873-877. doi: 10.1016/j.paid.2009.07.007
- Molz, A. R., Black, C. L., Shapero, B. G., Bender, R. E., Alloy, L. B., & Abramson, L. Y. (2013). Aggression and impulsivity as predictors of stress generation in bipolar spectrum disorders. *Journal of Affective Disorders, 146*(2), 272-280. doi: 10.1016/j.jad.2012.07.022

- Muhtadie, L., Johnson, S. L., Carver, C. S., Gotlib, I. H., & Ketter, T. A. (2014). A profile approach to impulsivity in bipolar disorder: The key role of strong emotions. *Acta Psychiatrica Scandinavica*, *129*(2), 100-108. doi: 10.1111/acps.12136
- Muthén, L. K., & Muthén, B. O. (1998-2010). *Mplus user's guide*. Los Angeles, CA: Muthén & Muthén.
- Myers, T. C., Wonderlich, S. A., Crosby, R., Mitchell, J. E., Steffen, K. J., Smyth, J., & Miltenberger, R. (2006). Is Multi-Impulsive Bulimia a Distinct Type of Bulimia Nervosa: Psychopathology and EMA Findings. *International Journal of Eating Disorders*, *39*(8), 655-661.
- Nezlek, J. B. (2012). Multilevel modeling analyses of diary-style data. In M.R. Mehl, & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 357-383). New York, NY: The Guilford Press.
- Nusslock, R., Alloy, L. B., Abramson, L. Y., Harmon-Jones, E., & Hogan, M. (2008). Impairment in the achievement domain in bipolar spectrum disorders: Role of Behavioral Approach System (BAS) hypersensitivity and impulsivity. *Minerva Pediatrica*, *60*, 41-50.
- Patton, J.H., Stanford, M.S., & Barratt, E.S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clinical Psychology*, *51*(6), 768-774.
- Peluso, M. A. M., Hatch, J. P., Glahn, D. C., Monkul, E. S., Sanches, M., Najt, P., . . . Soares, J. C. (2007). Trait impulsivity in patients with mood disorders. *Journal of Affective Disorders*, *100*(1-3), 227-231. doi: 10.1016/j.jad.2006.09.037

- Simons, J. S., Dvorak, R. D., Batien, B. D., & Wray, T. B. (2010). Event-level associations between affect, alcohol intoxication, and acute dependence symptoms: Effects of urgency, self-control, and drinking experience. *Addictive Behaviors, 35*(12), 1045-1053. doi: 10.1016/j.addbeh.2010.07.001
- Simons, J. S., Gaher, R., Oliver, M., Bush, J., & Palmer, M. (2005). An experience sampling study of associations between affect and alcohol use and problems among college students. *Journal of Studies on Alcohol, 66*(459-469).
- Snijders, T.A.B. & Bosker, R.J. (1999). *Multilevel Analysis: An introduction to basic and advanced multilevel modeling*. London: SAGE Publications Inc.
- Sperry, S.H., Lynam, D.R., Walsh, M.A., Brown, L.H., & Kwapil, T.R. (2016). Examining the multidimensional structure of impulsivity in daily life. *Personality and Individual Differences, 94*, 153-158. doi: 10.1016/j.paid.2016.01.018.
- Steiger, H., Lehoux, P. M., & Gauvin, L. (1999). Impulsivity, dietary control and the urge to binge in bulimic syndromes. *International Journal of Eating Disorders, 26*(3), 261-274.
- Strakowski, S. M., Fleck, D. E., DelBello, M. P., Adler, C. M., Shear, P. K., McElroy, S. L., . . . Arndt, S. (2009). Characterizing impulsivity in mania. *Bipolar Disorders, 11*(1), 41-51. doi: 10.1111/j.1399-5618.2008.00658.x
- Swann, A. C., Dougherty, D. M., Pazzaglia, P. J., Pham, M., Steinberg, J. L., & Moeller, F. G. (2005). Increased impulsivity associated with severity of suicide attempt history in patients with bipolar disorder. *The American Journal of Psychiatry, 162*(9), 1680-1687. doi: 10.1176/appi.ajp.162.9.1680
- Swann, A. C., Moeller, F. G., Steinberg, J. L., Schneider, L., Barratt, E. S., & Dougherty, D. M. (2007). Manic symptoms and impulsivity during bipolar depressive episodes. *Bipolar Disorders, 9*, 206-212.

- Swann, A., Pazzaglia, P., Nicholls, A., Dougherty, D. M., & Moeller, F. G. (2003). Impulsivity and phase illness in bipolar disorder. *Journal of Affective Disorders, 73*, 105-111.
- Tellegen, A. (1985). Structure of mood and personality and their relevance to assessing anxiety, with an emphasis on self-report. In A. H. Tuma & J. D. Maser (Eds.), *Anxiety and anxiety disorders* (pp. 681-706). Minneapolis, MN: University of Minnesota Press.
- Trafford, E. (2015). MetricWire (Version 2.2.1) [Mobile application software]. Retrieved from <http://research.metricwire.com>
- Trevisani, D. P., Johnson, S. L., & Carver, C. S. (2008). Positive mood induction and facial affect recognition among students at risk for mania *Cognitive Therapy and Research, 32*, 639-650. doi: <http://dx.doi.org/10.1007/s10608-007-9140-3>
- Victor, S. E., Johnson, S. L., & Gotlib, I. H. (2011). Quality of life and impulsivity in bipolar disorder. *Bipolar Disorders, 13*(3), 303-309. doi: 10.1111/j.1399-5618.2011.00919.x
- Walsh, M. A., DeGeorge, D. P., Barrantes-Vidal, N., & Kwapil, T. R. (2015). A 3-year longitudinal study of risk for bipolar spectrum psychopathology. *Journal of Abnormal Psychology, 124*(3), 486-497.
- Walsh, M. A., Royal, A., Brown, L. H., Barrantes-Vidal, N., & Kwapil, T. R. (2012). Looking for bipolar spectrum psychopathology: Identification and expression in daily life. *Comprehensive Psychiatry, 53*(5), 409-421. doi: <http://dx.doi.org.libproxy.uncg.edu/10.1016/j.comppsy.2011.06.006>
- Whiteside, S. P., & Lynam, D. R. (2001). The Five Factor Model of impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences, 30*(4), 669-689. doi: 10.1016/S0191-8869(00)00064-7

Whiteside, S. P., Lynam, D. R., Miller, J. D., & Reynolds, S. K. (2005). Validation of the UPPS impulsive behavior scale: a four-factor model of impulsivity. *European Journal of Personality, 19*, 559-574. doi: <http://dx.doi.org/10.1002/per.556>

Zapolski, T. C. B., Cyders, M. A., & Smith, G. T. (2009). Positive urgency predicts illegal drug use and risky sexual behavior. *Psychology of Addictive Behaviors, 23*(2), 348-354. doi: 10.1037/a0014684

Zuckerman, M., Kuhlman, D. M., Joireman, J., Teta, P., & Kraft, M. (1993). A comparison of three structural models of personality: the big three, the big five, and the alternative five. *Journal of Personality and Social Psychology, 65*, 757-768.

APPENDIX A

TABLES

Table 1. Means and Intercorrelations of the HPS and UPPS-P Subscales (n=780)

	Mean (SD)	Alpha	1	2	3	4	5
1. Hypomanic Personality Scale	19.2 (7.9)	0.85	--	--	--	--	--
2. Negative Urgency	28.4 (7.3)	0.84	.35*	--	--	--	--
3. Lack of Premeditation	20.4 (5.0)	0.81	<i>.23*</i>	.32*	--	--	--
4. Lack of Perseverance	19.5 (4.6)	0.81	<i>.02</i>	.40*	.48*	--	--
5. Sensation Seeking	33.0 (6.7)	0.82	.33*	<i>.08</i>	<i>.16*</i>	<i>-.13*</i>	--
6. Positive Urgency	27.2 (8.4)	0.89	.48*	.66*	.39*	.32*	<i>.29*</i>

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Medium effect sizes in bold, large effect sizes in bold & italics.

* $p < .001$

Table 2. Multiple Regression of UPPS-P Subscales Predicting HPS (n=780)

	β	B	SE	99.9% CI	Change in R^2	f^2
Negative Urgency	0.141	0.154	0.046	.003, .305	0.010*	0.014
Lack of Premeditation	0.106	0.170	0.058	-.021, .361	0.008	0.011
Lack of Perseverance	-0.175	-0.299	0.063	-.508, -.089	0.020*	0.028
Sensation Seeking	0.179	0.210	0.039	.082, .339	0.026*	0.037
Positive Urgency	0.480	0.328	0.041	.193, .464	0.058*	0.082

Total $R^2 = 29.7\%$, $p < .001$

Each UPPS-P subscale was entered at step 2 after all other subscales were entered at Step 1. $df = [1,774]$

* $p < .001$

Table 3. Experience Sampling Protocol Items and Indices

Affect in the moment

- Item 01 Right now I feel happy
- Item 05 Right now I feel energetic
- Item 07 Right now my emotions feel out of control
- Irritability index (alpha = .99)
 - Item 04 Right now I feel irritable
 - Item 06 Right now I feel frustrated
- Dysphoria index (alpha = .99)
 - Item 02 Right now I feel sad
 - Item 03 Right now I feel anxious

Thought disruption in the moment

- Item 09 Right now my thoughts are racing
- Item 10 Right now I am having trouble concentrating

Sense of self in the moment

- Item 08 Right now I feel confident
- Item 12 I feel uncertain right now
- Item 16 Right now I am the center of attention
- Item 17 Right now I feel criticized by others
- Item 18 Right now I feel cared for by others

Current Activity

- Item 13 Right now I feel bored
- Item 14 Right now I feel lonely
- Item 19 Right now I am doing something exciting
- Item 21 I am successful in my current activity
- Item 22 I am doing many things right now
- Item 29 My current situation is positive
- Item 30 My current situation is stressful

Social Functioning

- Item 26 I am alone right now
- Item 27 I feel close to this person (these people)
- Item 28 I am alone right now because people do not want to be with me

Impulsivity

- Impulsivity Index (alpha = .99)
 - Item 11 Right now I am doing something that could get me into trouble
 - Item 15 I am doing something right now that I may regret later
 - Item 20 Right now there is something I should be doing that I am not
 - Item 23 Since the last beep I said or did things that I wish I hadn't
 - Item 24 Since the last beep I did something risky
 - Item 25 Since the last beep I acted without thinking
-

Note: all items rated from 1 (not at all) to 7 (very much) except Item 26 (yes/no).

Table 4. Means and Intercorrelations of the HPS and UPPS-P Subscales (n=222)

Questionnaires	Mean (SD)	Alpha	1	2	3	4	5	6
1. HPS	22.1 (8.5)	.86	--	--	--	--	--	--
2. Negative Urgency	29.9 (7.6)	.89	.50***	--	--	--	--	--
3. Lack of Premeditation	21.2 (4.9)	.79	.30***	.43***	--	--	--	--
4. Lack of Perseverance	20.1 (4.9)	.82	.04	.41***	.49***	--	--	--
5. Sensation Seeking	33.6 (6.9)	.84	.47***	.32***	.08	-.15*	--	--
6. Positive Urgency	31.2 (7.4)	.86	.57***	.76***	.49***	.26***	.45***	--
7. ESM surveys completed	37.3 (11.5)	--	-.09	-.07	.02	.03	-.02	-.08

Medium effect sizes in bold, large effect sizes in bold & italics.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 5. Relationship of HPS and UPPS-P Subscales with Affect and Cognitions in Daily Life

Level 1 criterion	HPS	Level 2 Predictors (<i>df</i> = 220)				
		Negative Urgency	Lack of Premeditation	Lack of Perseverance	Sensation Seeking	Positive Urgency
<i>Affect</i>						
Happy	0.009 (.009)	-0.016 (.010)	-0.019 (.016)	-0.037 (.015)*	0.015 (.012)	-0.018 (.010)
Energetic	0.034(.007)***	0.006 (.009)	0.004 (.013)	-0.019 (.015)	0.042 (.009)***	0.021 (.009)*
Dysphoria index	0.026 (.007)***	0.044 (.008)***	0.035 (.012)**	0.055 (.012) ***	0.012 (.009)	0.044 (.008)***
Irritability index	0.034 (.008)***	0.046 (.008)***	0.042 (.018)*	0.040 (.012)**	0.022 (.010)*	0.042 (.009)***
Emotion out of control	0.038 (.007)***	0.053 (.008)***	0.053 (.015)***	0.040 (.013)**	0.027 (.009)**	0.057 (.009)***
<i>Cognitions</i>						
Difficulty concentrating	0.034 (.008)***	0.042 (.009)***	0.031 (.017)	0.059 (.014)***	0.024 (.011)*	0.045 (.010)***
Thoughts racing	0.044 (.009)***	0.043 (.010)***	0.037 (.019)	0.041 (.015)**	0.033 (.011)**	0.046 (.011)***

Note that these analyses reflect zero-order relationship of each predictor with the criterion (not simultaneous entry into the analyses)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors (UPPS Subscales) and the level 1 (daily life experience) criteria and standard error.

p* < .05 *p* < .01 ****p* < .001

Table 6. Relationship of HPS and UPPS-P Subscales with Sense of Self and Social Functioning

Level 1 criterion	Level 2 Predictors (<i>df</i> =220)					
	HPS	Negative Urgency	Lack of Premeditation	Lack of Perseverance	Sensation Seeking	Positive Urgency
<i>Sense of Self</i>						
Confident	0.034 (.009)***	-0.008 (.011)	-0.015 (.016)	-0.056 (.016)**	0.044 (.012)***	0.008 (.011)
Uncertain	0.035 (.007)***	0.045 (.008)***	0.032 (.012)**	0.054 (.013)***	0.020 (.009)*	0.042 (.009)***
Center of Attention	0.037 (.006)***	0.024 (.007)**	0.027 (.009)**	0.015 (.011)	0.029 (.007)***	0.032 (.007)***
Criticized by others	0.030 (.006)***	0.036 (.006)***	0.030 (.010)**	0.030 (.010)**	0.019 (.007)**	0.038 (.007)***
Cared for by others	0.016 (.009)	-0.013 (.010)	-0.017 (.017)	-0.042 (.015)**	0.030 (.012)*	-0.007 (.010)
<i>Social Functioning</i>						
Alone	0.003 (.001)	-0.001 (.002)	0.004 (.002)	-0.003 (.002)	0.001 (.002)	0.000 (.002)
Feel close	0.002 (.010)	-0.001 (.011)	0.008 (.016)	-0.015 (.016)	0.012 (.011)	-0.010 (.010)
Alone b/c not wanted	0.024 (.008)**	0.033 (.011)**	0.033 (.012)**	0.018 (.014)	0.007 (.009)	0.031 (.010)**

Note that these analyses reflect zero-order relationship of each predictor with the criterion (not simultaneous entry into the analyses)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors (UPPS Subscales) and the level 1 (daily life experience) criteria and standard error.

p* < .05 *p* < .01 ****p* < .001

Table 7. Relationship of HPS and UPPS-P Subscales with Current Activities

Level 1 criterion	Level 2 Predictors (df =220)					
	HPS	Negative Urgency	Lack of Premeditation	Lack of Perseverance	Sensation Seeking	Positive Urgency
Current Activities						
Bored	0.013 (.007)	0.028 (.009)**	0.015 (.014)	0.055 (.014)***	0.012 (.009)	0.027 (.010)**
Lonely	0.027 (.008)**	0.051 (.009)***	0.052 (.015)***	0.071 (.014)***	0.015 (.011)	0.050 (.009)***
Something exciting	0.031 (.007)***	0.010 (.008)	0.023 (.011)*	-0.006 (.012)	0.026 (.009)**	0.020 (.009)*
Successful	0.005 (.008)	-0.016 (.009)	-0.019 (.015)	-0.036 (.015)*	0.033 (.011)**	-0.004 (.010)
Doing many things	0.041 (.008)***	0.020 (.009)*	0.028 (.016)	-0.005 (.013)	0.025 (.011)*	0.031 (.009)***
Situation Positive	-0.004 (.008)	-0.023 (.009)*	-0.037 (.014)**	-0.050 (.014)***	0.014 (.010)	-0.021 (.009)*
Situation Stressful	0.025 (.010)*	0.034 (.011)**	0.028 (.018)	0.033 (.015)*	0.013 (.011)	0.033 (.011)**

Note that these analyses reflect zero-order relationship of each predictor with the criterion (not simultaneous entry into the analyses)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors (UPPS Subscales) and the level 1 (daily life experience) criteria and standard error.

*p < .05 **p < .01 ***p < .001

Table 8. Relationship of HPS and UPPS-P Subscales with Impulsivity in Daily Life

Level 1 criterion	Level 2 Predictors (df = 220)					
	HPS	Negative Urgency	Lack of Premeditation	Lack of Perseverance	Sensation Seeking	Positive Urgency
Impulsivity Index	0.034 (.005)***	0.036 (.006)***	0.034 (.008)***	0.023 (.009)*	0.023 (.007)**	0.042 (.007)***
Doing something that could get me into trouble	0.030 (.006)***	0.033 (.006)***	0.033 (.009)***	0.028 (.009)**	0.014 (.007)	0.039 (.006)***
Doing something that I may regret later	0.026 (.006)***	0.029 (.006)***	0.026 (.008)**	0.024 (.009)**	0.017 (.007)*	0.034 (.006)***
There is something I should be doing that I'm not	0.028 (.009)**	0.039 (.010)***	.026 (.008)**	.061 (.017)***	0.018 (.012)	0.036 (.010)***
Since last beep, said or did things I wish I hadn't	0.036 (.006)***	0.033 (.007)***	0.030 (.010)**	0.015 (.011)	0.025 (.008)**	0.040 (.007)***
Since the last beep, did something risky	0.035 (.006)***	0.040 (.007)***	0.035 (.010)***	0.026 (.010)*	0.023 (.008)**	0.046 (.008)***
Since the last beep, acted without thinking	0.042 (.007)***	0.044 (.008)***	0.046 (.013)**	0.021 (.011)	0.035 (.009)***	0.050 (.009)***

Note that these analyses reflect zero-order relationship of each predictor with the criterion (not simultaneous entry into the analyses)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors (UPPS Subscales) and the level 1 (daily life experience) criteria and standard error.

*p < .05 **p < .01 ***p < .001

Table 9. Moderating Role of Negative Urgency with the HPS and Impulsivity in Daily Life

Level 1 criterion	Step 1: HPS Υ_{01} (df = 220)	Step 1: NU Υ_{02} (df = 220)	Step 2: HPS x NU Υ_{03} (df = 219)
Impulsivity Index	0.023 (.006)***	0.023 (.007)**	-0.009 (.038)
Doing something that could get me into trouble	0.020 (.007)**	0.022 (.007)**	-0.030 (.036)
Doing something that I may regret later	0.017 (.006)**	0.020 (.007)**	-0.019 (.033)
There is something I should be doing that I'm not	0.014 (.012)	0.031 (.013)*	-0.142 (.073)
Since last beep, said or did things I wish I hadn't	0.028 (.007)***	0.017 (.008)*	-0.030 (.042)
Since the last beep, did something risky	0.022 (.007)**	0.028 (.008)**	0.026 (.046)
Since the last beep, acted without thinking	0.029 (.008)***	0.028 (.009)**	0.002 (.056)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors and

the level 1 (daily life experience) criteria and standard error. NU = Negative Urgency

*p < .05 **p < .01 ***p < .001

Table 10. Moderating Role of Positive Urgency with the HPS and Impulsivity in Daily Life

Level 1 criterion	Step 1: HPS γ_{01} (df = 220)	Step 1: PU γ_{02} (df = 220)	Step 2: HPS x PU γ_{03} (df = 219)
Impulsivity Index	0.019 (.006)**	0.029 (.008)***	0.014 (.043)
Doing something that could get me into trouble	0.015 (.007)*	0.029 (.007)***	0.006 (.040)
Doing something that I may regret later	0.013 (.006)*	0.025 (.008)**	0.015 (.039)
There is something I should be doing that I'm not	0.014 (.012)	0.027 (.014)*	-0.039 (.069)
Since last beep, said or did things I wish I hadn't	0.023 (.007)**	0.025 (.009)**	-0.003 (.045)
Since the last beep, did something risky	0.017 (.007)**	0.034 (.009)***	0.049 (.054)
Since the last beep, acted without thinking	0.025 (.008)**	0.034 (.010)**	0.004 (.062)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors and

the level 1 (daily life experience) criteria and standard error. PU = Positive Urgency

*p < .05

**p < .01

***p < .001

Table 11. Moderating Role of Lack of Premeditation with the HPS and Impulsivity in Daily Life

Level 1 criterion	Step 1: HPS Υ_{01} (df = 220)	Step 1: Prem Υ_{02} (df = 220)	Step 2: HPS x Prem Υ_{03} (df = 219)
Impulsivity Index	0.030 (.005)***	0.018 (.009)*	-0.018 (.034)
Doing something that could get me into trouble	0.026 (.006)***	0.019 (.010)*	-0.045 (.040)
Doing something that I may regret later	0.024 (.006)***	0.014 (.009)	-0.013 (.036)
There is something I should be doing that I'm not	0.024 (.010)*	0.019 (.019)	0.020 (.078)
Since last beep, said or did things I wish I hadn't	0.034 (.006)***	0.012 (.010)	-0.027 (.038)
Since the last beep, did something risky	0.031 (.006)***	0.018 (.010)	-0.026 (.039)
Since the last beep, acted without thinking	0.037 (.007)***	0.026 (.013)*	0.013 (.062)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors and the level 1 (daily life experience) criteria and standard error. Prem = Lack of Premeditation

*p < .05 **p < .01 ***p < .001

Table 12. Moderating Role of Lack of Perseverance with the HPS and Impulsivity in Daily Life

Level 1 criterion	Step 1: HPS γ_{01} (df = 220)	Step 1: Pers γ_{02} (df = 220)	Step 2: HPS x Pers γ_{03} (df = 219)
Impulsivity Index	0.033 (.005)***	0.020 (.009)*	0.000 (.042)
Doing something that could get me into trouble	0.029 (.005)***	0.026 (.009)**	0.026 (.040)
Doing something that I may regret later	0.025 (.005)***	0.022 (.009)*	-0.007 (.040)
There is something I should be doing that I'm not	0.026 (.010)**	0.059 (.017)**	-0.180 (.079)*
Since last beep, said or did things I wish I hadn't	0.035 (.006)***	0.013 (.010)	0.000 (.051)
Since the last beep, did something risky	0.034 (.006)***	0.024 (.010)*	0.006 (.044)
Since the last beep, acted without thinking	0.042 (.007)***	0.017 (.011)	-0.020 (.051)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors and

the level 1 (daily life experience) criteria and standard error. Pers = Lack of Perseverance

*p < .05 **p < .01 ***p < .001

Table 13. Moderating Role of Sensation Seeking with the HPS and Impulsivity in Daily Life

Level 1 criterion	Step 1: HPS γ_{01} (df = 220)	Step 1: SS γ_{02} (df = 220)	Step 2: HPS x SS γ_{03} (df = 219)
Impulsivity Index	0.032 (.006)***	0.004 (.008)	-0.004 (.040)
Doing something that could get me into trouble	0.031 (.006)***	-0.004 (.008)	-0.008 (.041)
Doing something that I may regret later	0.025 (.006)***	0.002 (.008)	-0.001 (.041)
There is something I should be doing that I'm not	0.027 (.010)**	0.002 (.013)	0.009 (.075)
Since last beep, said or did things I wish I hadn't	0.034 (.006)***	0.006 (.008)	-0.007 (.044)
Since the last beep, did something risky	0.033 (.007)***	0.004 (.009)	-0.015 (.043)
Since the last beep, acted without thinking	0.037 (.007)***	0.013 (.009)	0.002 (.056)

Raw multilevel regression coefficients indicating the relation of the level 2 predictors and

the level 1 (daily life experience) criteria and standard error. SS = Sensation Seeking

*p < .05

**p < .01

***p < .001

Table 14. Prediction of the Association of Positive Affect and Impulsivity in Daily Life by HPS and Positive Urgency

Level 1 criterion	Level 1 predictor		Level 2 predictors@		
		Y ₁₀ (df = 220)	Step 1: HPS Y ₁₁ (df =220)	Step 2: PU Y ₁₂ (df =219)	Step 3: HPS x PU Y ₁₃ (df =218)
Impulsivity Index	Energetic	0.104 (.011)***	0.001 (.001)	-0.001 (.001)	-0.004 (.007)
Impulsivity Index	Happy	-0.034 (.011)**	-0.001 (.001)	0.000 (.002)	0.002 (.010)
Impulsivity Index	Situation Positive	-0.040 (.011)***	0.000 (.001)	-0.001 (.002)	0.005 (.009)
Emotions out of control	Energetic	-0.015 (.014)	0.001 (.002)	-0.002 (.002)	-0.007 (.014)
Emotions out of control	Happy	-0.182 (.015)***	-0.002 (.002)	0.000 (.003)	-0.005 (.013)
Emotions out of control	Situation Positive	-0.150 (.015)***	0.001 (.002)	-0.003 (.002)	0.004 (.013)

@ Cross-level interaction of the association of the Level-2 variable with the slope of the Level-1 predictor and criterion.

PU = positive urgency

*p < .05

**p < .01

***p < .001

Table 15. Prediction of the Association of Negative Affect and Impulsivity in Daily Life by HPS and Negative Urgency

Level 1 criterion	Level 1 predictor	Y ₁₀ (df =220)	Level 2 predictors@		
			Step 1: HPS Y ₁₁ (df = 220)	Step 2: NU Y ₁₂ (df = 219)	Step 3: HPS x NU Y ₁₃ (df = 218)
Impulsivity Index	Dysphoria	0.182 (.016)***	0.003 (.002)	0.004 (.002)	0.009 (.016)
Impulsivity Index	Irritability	0.131 (.015)***	0.004 (.002)*	0.004 (.002)	0.009 (.014)
Impulsivity Index	Stress	0.104 (.011)***	0.001 (.001)	0.002 (.001)	-0.011 (.008)
Emotions out of control	Dysphoria	0.423 (.022)***	0.004 (.002)	0.007 (.003)	-0.001 (.018)
Emotions out of control	Irritability	0.352 (.019)***	0.004 (.002)	0.007 (.003)*	-0.003 (.017)
Emotions out of control	Stress	0.195 (.016)***	0.003 (.002)	0.006 (.002)**	-0.014 (.015)

@ Cross-level interaction of the association of the Level-2 variable with the slope of the Level-1 predictor and criterion

NU= Negative Urgency

*p < .05

**p < .01

***p < .001

APPENDIX B

FIGURES

Figure 1. Additive Effects of Negative Urgency and HPS on Impulsivity in Daily Life

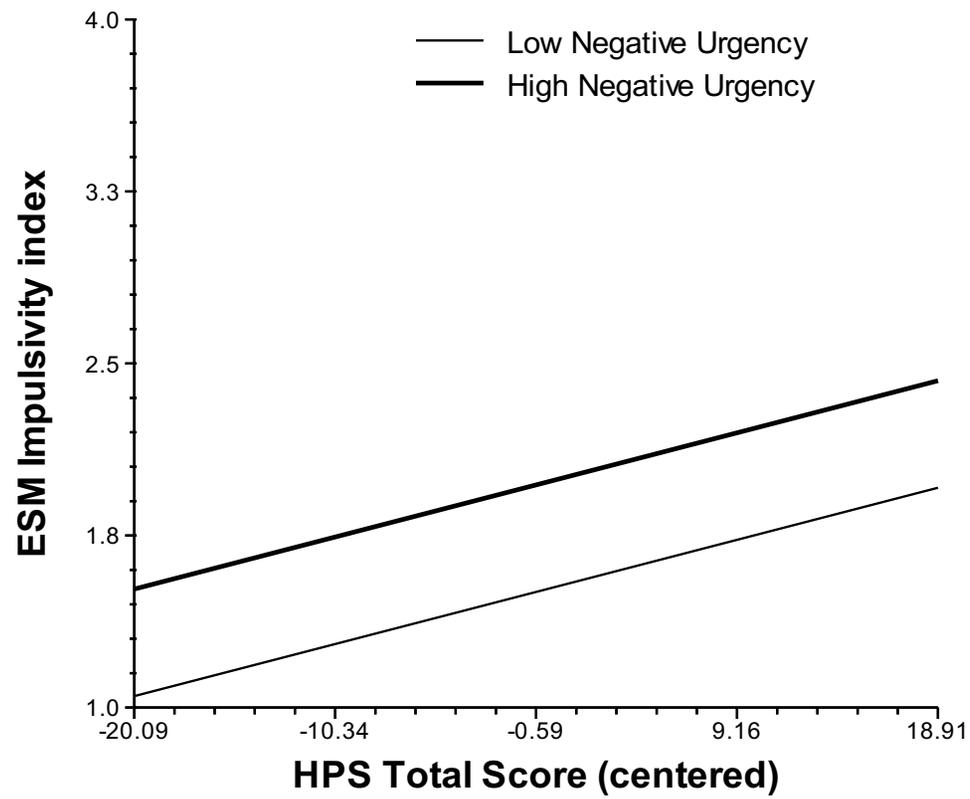


Figure 2. Additive Effects of Positive Urgency and HPS on Impulsivity in Daily Life

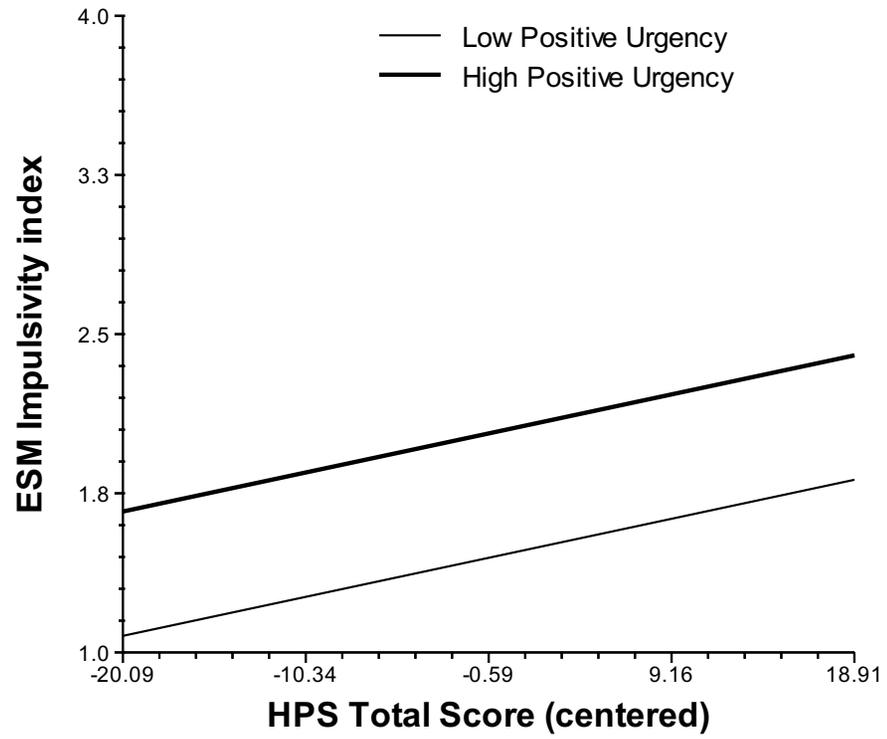


Figure 3. Interaction of Lack of Perseverance and the HPS in Predicting Impulsivity in Daily Life

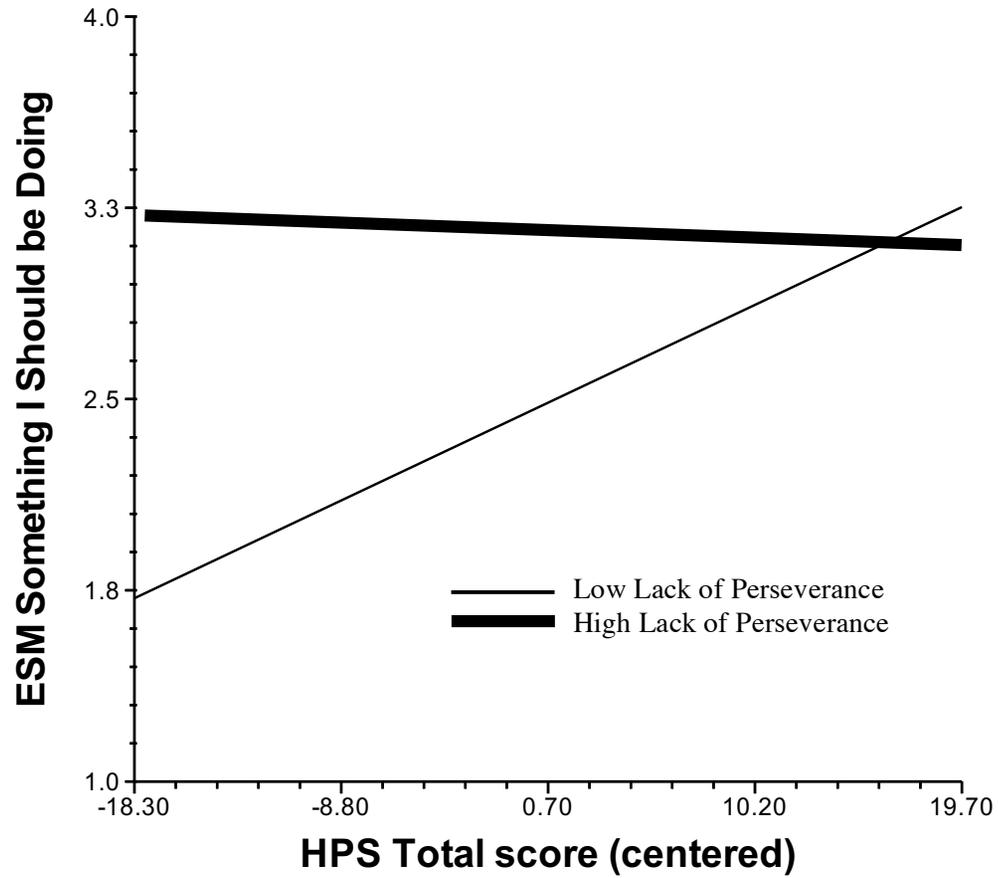


Figure 4. Interaction of HPS and Irritability in Predicting Impulsivity in Daily Life

