The convergence and divergence of impulsivity facets in daily life

By: Sarah H. Sperry, Donald R. Lynam, Thomas R. Kwapil

Abstract:

Objective

Impulsivity appears to be best conceptualized as a multidimensional construct. For example, the UPPS-P model posits that there are five underlying facets of impulsivity. The present study examined the expression of the UPPS-P facets in daily life using experience sampling methodology. A specific goal of the study was to examine positive urgency, a facet added to the original UPPS model, and its convergence and divergence from the negative urgency facet.

Method

A large nonclinical sample of young adults (n = 294) completed the UPPS-P scale and was signaled to complete questionnaires assessing daily affect, cognitions, sense of self, and impulsive behaviors eight times a day for 7 days.

Results

Results indicated that the UPPS-P facets are associated with disruptions in affect, cognitions, and behavior in daily life. Furthermore, all of the UPPS-P facets were associated with impulsivity in daily life. Contrary to expectation, positive urgency was associated with negative affect rather than positive affect and had a profile indistinguishable from negative urgency.

Conclusions

These results generally support a four-factor model of multidimensional impulsivity with a general overall urgency factor instead of separate positive and negative urgency facets.

Keywords: experience sampling methodology | hierarchical linear modeling | impulsivity | UPPS-P | urgency

Article:

1 Introduction

Impulsivity is a key construct in the study of both personality and clinical psychology, as it is associated with a variety of maladaptive outcomes and multiple forms of psychopathology. Increasing evidence supports a multidimensional view of impulsivity that includes personality dimensions characterized by distinct cognitive, affective, and behavioral patterns of risk taking (Cloninger, Svrakic, & Przybeck, 1993; Eysenck & Eysenck, 1985; Tellegen, 1985; Whiteside & Lynam, 2001; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). Nevertheless, research on impulsivity is limited by the fact that there is not a consensus model of its multidimensional structure, and many studies still conceptualize impulsivity as a unidimensional construct.

Whiteside and Lynam (2001) developed the UPPS model of impulsivity based on the Five-Factor Model of personality (McCrae & Costa, 1990). The original model proposed that there are four distinct personality-based facets of impulsivity: negative urgency, lack of premeditation, lack of perseverance, and sensation seeking. Negative urgency is a reactive and mood-based facet of impulsivity characterized by impulsive behaviors in response to stress or distress and is largely characterized by Neuroticism (Whiteside & Lynam, 2001). Specifically, individuals who are reactive to negative affect or stress are especially likely to act rashly to alleviate those emotions. 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 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). 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).

A recent meta-analysis examined the unique associations of the UPPS facets with various measures of psychopathology (Berg, Latzman, Bliwise, & Lilienfeld, 2015). They reported that, in general, negative urgency was the most pathological of the UPPS facets, as it was strongly associated with all forms of psychopathology that were examined in the meta-analysis (suicidality, anxiety, aggression, borderline personality traits, eating disorders, depression, and substance use). Lack of perseverance showed a profile similar to negative urgency in that it was associated with alcohol and substance use, borderline personality traits, depression, suicidality, and disordered eating. In addition, Miller, Flory, Lynam, and Leukefeld (2003) reported that lack of perseverance was associated with lack of attention. Lack of premeditation was associated with substance use, borderline personality traits, and depression (Berg et al., 2015), as well as hyperactivity and antisocial personality (Miller et al., 2003). Sensation seeking was associated with alcohol and substance use, aggression, and suicidality (Berg et al., 2015).

Although the UPPS model captures emotion-based impulsivity in response to negative affect, Cyders et al. (2007) proposed that impulsivity may also occur in reaction to heightened positive affect. Based on this conceptualization, they proposed a fifth facet, positive urgency, that was subsequently added to form the UPPS-P model (Cyders & Smith, 2007; Cyders et al., 2007; Lynam, Smith, Whiteside, & Cyders, 2006). Positive urgency is defined as the tendency to act rashly in response to positive, rather than negative, affect and is characterized by low Conscientiousness and Agreeableness and high Neuroticism (Cyders & Smith 2007, 2008).

Initial studies indicated that positive and negative urgency were distinct facets of the broader trait of urgency and were only moderately correlated (r = .37; Cyders & Smith, 2007, 2008). Cyders and Smith (2007) demonstrated that positive urgency accounted for significant variance in risky behaviors such as substance use, breaking the law, or risky sexual behaviors during positive mood, whereas negative urgency did not; likewise, negative urgency accounted for significant variance in risky behaviors during negative mood, whereas positive urgency did not. This was additionally supported by evidence that negative urgency mediated the relationship between activation (induced by negative images) of the lateral orbitofrontal cortex and left amygdala with risk taking, whereas positive urgency did not (Cyders et al., 2015). Furthermore, several correlational studies have shown that positive urgency predicts problematic behaviors over and above negative urgency. Specifically, positive urgency has been associated with problematic alcohol use, (especially when people are motivated to increase positive mood or expect that alcohol will increase their positive mood), increases in pathological gambling (Cyders et al., 2007), risky sexual behavior, and illegal drug use (Zapolski, Cyders, & Smith, 2009).

Despite initial evidence that positive and negative urgency represent unique constructs (or two moderately related constructs), increasing evidence suggests that these facets may not be particularly distinct. First, negative and positive urgency appear to be more highly correlated than reported in initial studies, with recent reports of large correlations (r = .50 to r = .72; Grimaldi, Napper, & LaBrie, 2014; Neal & Gable, 2016; Rose & Segrist, 2014; Stautz, Dinc, & Cooper, 2017; Weiss, Tull, Sullivan, Dixon-Gordon, & Gratz, 2015). Using confirmatory factor analyses, Cyders and Smith (2008) found that negative and positive urgency could be conceived of as indicators of an overarching higher-order factor of urgency. Second, recent studies indicate that negative and positive urgency often have overlapping, rather than distinct, patterns of associations with psychopathology and maladaptive outcomes. For example, both positive and negative urgency were comparably associated with aggression and alcohol use consequences among college students (Grimaldi et al., 2014), posttraumatic stress disorder symptoms (Weiss et al., 2015), and compulsive buying (Rose & Segrist, 2014). A recent study found that both positive and negative urgency similarly predict behavioral distress tolerance indirectly through changes in negative affect (Borges, Dahne, Lim, & MacPherson, 2017). In addition, although previous studies suggested that positive urgency was associated with alcohol and substance use over and above negative urgency, Berg et al. (2015) found in a meta-analysis that the strength of the association between alcohol and substance use with both positive and negative urgency was not significantly different. Thus, the issue of whether positive and negative urgency represent distinct constructs appears unresolved and, for the most part, is understudied, as there have been relatively few explicit examinations of this issue.

One way to further examine the validity and discriminability of the UPPS-P facets, including negative and positive urgency, is through the use of experience sampling methodology (ESM). ESM is a daily diary method that has several advantages over traditional laboratory-based measures and single-assessment studies. ESM assesses participants in their normal daily environment, thereby increasing ecological validity; repeatedly assesses participants in the moment, thereby decreasing retrospective bias; and allows for the examination of context of experience. Several studies have employed ESM to examine associations of impulsivity with psychopathology in daily life, including nonsuicidal self-injury (Bresin, Carter, & Gordon, 2013), disordered eating (Engel et al., 2007; Myers et al., 2006; Steiger, Lehoux, & Gauvin,

1999), alcohol use (Simons, Dvorak, Batien, & Wray, 2010; Simons, Gaher, Oliver, Bush, & Palmer, 2005), bipolar disorder (Depp et al., 2016), attention-deficit/hyperactivity disorder (Rosen & Factor, 2015), and borderline personality disorder (Tomko et al., 2015). Sperry, Lynam, Walsh, Brown, and Kwapil (2016) examined the original UPPS model and found that, in general, facets were differentially expressed in daily life. Negative urgency was associated with negative affect, poor self-concept, and thought disruption. Lack of perseverance was associated with a failure to complete and enjoy daily activities and less motivation to put in effort in those activities. Surprisingly, lack of perseverance and negative urgency had strikingly similar profiles in daily life in terms of being associated with negative affect. Lack of premeditation was associated with irritable and energetic affect and feeling uncertain about one's circumstances. Sensation seeking had the least overlap with the other UPPS facets and was associated with increased energetic-enthusiasm, happiness, confidence, and enjoyment. Negative urgency, lack of premeditation, and lack of perseverance, but not sensation seeking, were associated with troublesome behavior in daily life. Although this study provided preliminary evidence of the convergent and discriminant validity of the UPPS model in daily life, it did not assess positive urgency; thus, a direct comparison of negative and positive urgency could not be conducted. Additionally, impulsivity in daily life was assessed via only one item, "My behavior can get me in trouble right now." Consistent with the conceptualization of impulsivity as multidimensional, it would be important for studies to assess multiple presentations of impulsive behavior in daily life.

1.1 Goals and hypotheses

The UPPS-P model provides a useful, multidimensional framework for conceptualizing impulsivity and examining associations with psychopathology and impairment. The aim of the present study was to build upon the initial work of Sperry et al. (2016) to provide a more thorough examination of impulsivity by assessing a broader array of impulsive behaviors in daily life and by specifically examining the convergence and divergence of the two urgency facets in a new sample of participants. We expected to replicate the findings from Sperry et al. (2016) regarding negative urgency, lack of premeditation, lack of perseverance, and sensation seeking.

In order to more specifically understand the convergence and divergence between positive and negative urgency, we examined the correlation between the Negative Urgency and Positive Urgency subscales, their factor structure, the reliability of the two subscales individually and together, and their associations with affect, cognitions, and behaviors in daily life. We hypothesized that positive urgency would have a profile similar to negative urgency; however, we expected it to be associated with positive rather than negative affect. In addition, we hypothesized that negative and positive urgency would differentially moderate the association between affect and impulsivity in daily life. Specifically, we expected that negative urgency would moderate the association of negative affect and impulsivity, whereas positive urgency would moderate the association of positive affect and impulsivity in daily life.

2 Method

2.1 Participants

This study was approved by the UNC-Greensboro institutional review board, and all participants provided informed consent. Participants taking general psychology courses were able to enroll in the study via two different methods. Unselected students were able to volunteer through an online sign-up portal. In addition, participants who completed departmental mass screening sessions and scored at least 1.5 standard deviations above the mean on any of the five UPPS-P subscales were recruited to ensure adequate representation of elevated scorers on the impulsivity facets. Usable ESM data were available for 294 of the 382 participants who initially enrolled in the study (73% female; Mage = 18.9 years, SD = 2.8). The final sample was 50% Caucasian, 34% African American, 7% Asian, 5% Hispanic, 1% Native American, and 2% other. Participants were dropped due to invalid questionnaires (n = 16), missing self-report measures (n = 4), or problematic ESM protocols (n = 68). Participants received course credit for serving in the study. In addition, participants who completed at least 70% of the ESM questionnaires were entered into a drawing for one of two $100 gift cards. Note that this was a different sample than that in Sperry et al. (2016), and none of the participants were overlapping in the samples.

2.2 Materials and procedure

The present study followed procedures similar to those in other ESM studies conducted in our laboratory (e.g., Kwapil, Brown, Silvia, Myin-Germeys, & Barrantes-Vidal, 2012; Sperry et al., 2016). Participants attended an information session during which they completed self-report questionnaires and were trained on ESM procedures. Participants completed a brief demographic questionnaire, the UPPS-P Impulsive Behavior Scale (Lynam et al., 2006), an infrequency scale, and measures not used in the present study. The UPPS-P Impulsive Behavior Scale 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 et al. (2007). Responses are based on a 4-point scale ranging from 1 (agree strongly) to 4 (disagree 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, Lynam, Miller, & Reynolds, 2005). Participants completed a 13-item infrequency scale (Chapman & Chapman, 1983) as part of the questionnaire measures to detect invalid responding. Following Chapman and Chapman, participants who endorsed three or more items were dropped from data analyses.

Participants completed ESM protocols on their personal smartphones using either the Qualtrics system or the smartphone application MetricWire (Trafford, 2015). Participants were signaled eight times a day for 7.5 days at random times between the hours of noon and midnight. Participants had 5 minutes to respond to the signal, and the questionnaires required approximately 2 minutes to complete. ESM items are presented in supplementary materials (Table S1). In order to assess a broader array of impulsive thoughts and behaviors in daily life than in previous studies, the present study included six impulsivity ESM items that aimed to characterize the heterogeneity of impulsive thoughts and behaviors conceptualized by the UPPS-P model. For example, the item "Right now there is something I should be doing that I'm not"

was created to tap lack of perseverance, whereas the item "Since the last beep, I acted without thinking" was created to tap experiences more consistent with lack of premeditation.

2.3 Analyses

ESM data have a hierarchical structure in which ratings in daily life (Level 1 data) are nested within participants (Level 2 data). Note that each subject has a distribution of scores at Level 1 for each ESM item and index. Hierarchical linear modeling is recommended for analyzing ESM data, as it handles nested data more appropriately than conventional unilevel analyses (Nezlek, 2012). Specifically, it allows modeling of error terms at multiple levels, unlike ordinary least squares regression, which cannot simultaneously take into account error variance at multiple levels. Initial analyses examined whether Level 2 predictors (UPPS-P facets) predicted Level 1 criteria (ESM daily life ratings). Note that following Sperry et al. (2016), the five UPPS-P facets were examined independently, not simultaneously, given the high level of multicolinearity between the subscales. Lynam, Hoyle, and Newman (2006) argue that when subscales or independent variables that are highly correlated are entered simultaneously into a regression model, the variance left over after partialing the shared variance is difficult to interpret and potentially represents a completely different construct. In addition, we examined whether the UPPS-P facets moderated the association between affect in daily life and impulsive behavior. Specifically, cross-level interactions examined whether Level 1 associations (e.g., the association between negative affect and impulsivity) were predicted by specific UPPS-P facets (Level 2 variable). Level 1 predictors (ESM ratings) were group mean centered, and the Level 2 predictors (UPPS facet scores) were grand mean centered. Analyses were computed with Mplus 7 (Muthén & Muthén, 1998–2010).

In order to examine the convergence and divergence between positive and negative urgency, three analyses were run. First, we computed the expected reliability for an overall urgency scale that included both the items from the Negative Urgency and Positive Urgency subscales and compared that to the expected reliability based on the Spearman-Brown prophecy formula. Second, intraclass Q-correlations (or similarity indices) were computed to assess the similarity of the daily life profiles of the UPPS-P facets (Miller & Lynam, 2006). These statistics provide an index of similarity of patterns of associations that UPPS-P scales bear to outcomes in the study. Third, we computed a principal components analysis with promax rotation using the 26 positive and negative urgency items from the UPPS-P to assess whether the individual urgency facets were better accounted for by a unitary "urgency" factor.

3 Results

Participants completed on average 37.0 ESM protocols (SD = 11.9). The 62% completion rate was within the typical range reported in more than one dozen ESM studies in our lab. Note that scores on the UPPS-P subscales were not significantly associated with the number of ESM surveys completed (–.05 ≤ r ≤ .05, all ps > .05) or with rates of attrition (participants dropped from the study; –.03 ≤ r ≤ .04, all ps > .05). Means, reliability estimates, and intercorrelations of the UPPS-P subscales are presented in Table 1 and are consistent with those reported by Sperry et al. (2016). The range of scores and means for each impulsivity ESM item and the impulsivity index are presented in supplemental Table S2. Note that positive (coefficient α = .86) and

negative (coefficient α = .88) urgency were highly correlated (r = .77); if one disattenuates this correlation, it rises to .88. When combining all the items from the Negative Urgency (n = 12) and Positive Urgency (n = 14) subscales, the coefficient alpha rose to .93, consistent with values based on the Spearman-Brown prophecy. The expected reliability for negative urgency when adding 14 comparable items would be .95, whereas the expected reliability for positive urgency when adding 12 comparable items would be .92. Men had significantly higher levels of positive urgency, $t(292) = 2.65$, $p < .01$, and sensation seeking, $t(292) = 3.55$, $p < .001$.

Table 1. Means, reliability, and correlations of the UPPS-P facets

	Mean (SD)[a]	Alpha	1	2	3	4
1. Negative urgency	2.45 (.62)	.88				
2. Positive urgency	2.21 (.54)	.86	0.77***			
3. Lack of premeditation	1.92 (.45)	.80	0.42***	0.49***		
4. Lack of perseverance	2.02 (.48)	.81	0.39***	0.24***	0.44***	
5. Sensation seeking	2.79 (.54)	.83	0.33***	0.48***	0.11	−0.13*

Note. [a]The mean is the average response across items in each subscale
*p < .05. **p < .01. ***p < .001.

3.1 Associations with daily affect, cognitions, sense of self, and social interactions

Associations between the UPPS-P facets and daily affect and cognitions are presented in Table 2. Note that for all analyses, we present standardized multilevel regression coefficients for ease of comparison. In terms of negative urgency and lack of perseverance, the present study replicated findings from Sperry et al. (2016), which suggested that both facets were associated with aspects of negative affect and thought disruption. As expected, positive and negative urgency had comparable patterns of associations. However, contrary to our hypotheses, positive urgency was associated with elevated negative affect and decreased positive affect. Lack of premeditation was associated with dysphoria and irritability but not thought disruption. Sensation seeking was associated with increased positive affect (happiness and energy) but also with dysphoria, irritability, and thought disruption. In contrast to Sperry et al. (2016), the present study included the ESM item "Right now my emotions are out of control." All UPPS-P facets were associated with elevated scores on this item. In addition, all UPPS-P facets except sensation seeking were negatively associated with feeling as if one's situation were positive, and negative and positive urgency and lack of perseverance were associated with feeling as if one's situation were stressful.

Table 2. Associations of affect and cognitions assessed in daily life with UPPS-P facets

Level 1 criterion	Level 2 predictors (df = 292)				
	Negative urgency	Positive urgency	Lack of premeditation	Lack of perseverance	Sensation seeking
Affect					
Happy	−0.138 (.061)*	−0.122 (.059)*	−0.084 (.066)	−0.271 (.058)***	0.091 (.063)
Energetic	0.044 (.062)	0.159 (.062)**	0.063 (.062)	−0.155 (.064)*	0.278 (.059)***
Dysphoria index	0.365 (.051)***	0.328 (.051)***	0.152 (.056)**	0.286 (.052)***	0.129 (.055)*
Irritability index	0.337 (.052)***	0.283 (.056)***	0.167 (.071)*	0.196 (.054)***	0.150 (.057)**
Emotions out of control	0.421 (.047)***	0.426 (.049)***	0.246 (.060)***	0.239 (.054)***	0.203 (.049)***
Current situation is positive	−0.188 (.056)***	−0.165 (.057)**	−0.154 (.060)*	−0.298 (.054)***	0.055 (.059)
Current situation is stressful	0.227 (.058)***	0.193 (.057)***	0.084 (.066)	0.139 (.058)*	0.082 (.056)
Thoughts					
Trouble concentrating	0.324 (.055)***	0.326 (.057)***	0.145 (.067)*	0.291 (.051)***	0.167 (.060)**
Thoughts racing	0.306 (.058)***	0.291 (.061)***	0.125 (.071)	0.182 (.057)***	0.185 (.056)***

Note. Standardized multilevel regression coefficients indicating the relation of the Level 2 predictors (UPPS-P) and the Level 1 (daily life experience) criteria and standard errors are shown.
*p < .05. **p < .01. ***p < .001.

Associations of the UPPS-P facets with sense of self and social functioning are presented in Table 3. Consistent with Sperry et al. (2016), negative urgency and lack of perseverance were associated with poor sense of self and feeling as though others did not want them. Additionally, lack of perseverance was uniquely associated with being alone more often, not feeling close when with others, and not feeling cared for by others. Inconsistent with previous findings, lack of premeditation was also associated with feeling as if others did not want to be with them yet

feeling like the center of attention. Consistent with previous findings, sensation seeking was associated with positive sense of self. Novel to this study, we found that all UPPS-P facets were associated with feeling criticized by others in daily life and that negative and positive urgency, lack of premeditation, and lack of perseverance were associated with feeling lonely. In general, positive and negative urgency exhibited comparable patterns of associations with daily life measures of sense of self and social functioning.

Table 3. Associations of sense of self and social functioning assessed in daily life with UPPS-P facets

Level 1 criterion	Level 2 predictors ($df = 292$)				
	Negative urgency	Positive urgency	Lack of premeditation	Lack of perseverance	Sensation seeking
Sense of self in the world and activities					
Confident	−0.087 (.059)	0.017 (.059)	−0.043 (.062)	−0.312 (.056)***	0.232 (.062)***
Center of attention	0.217 (.056)***	0.300 (.059)***	0.254 (.054)***	0.056 (.056)	0.243 (.053)***
Uncertain	0.345 (.052)***	0.291 (.054)***	0.134 (.056)*	0.265 (.055)***	0.120 (.055)*
Bored	0.178 (.058)**	0.144 (.062)*	0.042 (.062)	0.296 (.058)***	0.062 (.062)
Lonely	0.337 (.054)***	0.275 (.053)***	0.177 (.057)**	0.323 (.052)***	0.100 (.060)
Successful in current activity	−0.169 (.058)**	−0.099 (.063)	−0.085 (.064)	−0.237 (.060)***	0.140 (.063)*
Doing something exciting	0.147 (.058)*	0.234 (.065)***	0.168 (.060)**	−0.042 (.059)	0.198 (.063)**
Doing many things	0.157 (.057)**	0.220 (.058)***	0.127 (.067)	−0.006 (.056)	0.163 (.068)*
Social interactions					
Alone at signal	0.017 (.060)	−0.035 (.058)	−0.105 (.056)	0.119 (.058)*	−0.042 (.064)
When alone: Alone b/c not wanted	0.247 (.065)***	0.203 (.056)***	0.149 (.047)***	0.164 (.056)**	0.060 (.053)
When with others: Close to other(s)	0.020 (.068)	−0.013 (.065)	0.073 (.064)	−0.153 (.060)*	0.106 (.063)
Cared for by others	−0.094 (.061)	−0.061 (.061)	−0.078 (.062)	−0.216 (.055)***	0.118 (.064)
Criticized by others	0.326 (.051)***	0.320 (.050)***	0.164 (.052)**	0.182(.052)***	0.176(.050)***

Note. Standardized multilevel regression coefficients indicating the relation of the Level 2 predictors (UPPS-P) and the Level 1 (daily life experience) criteria and standard errors are shown.
*p < .05. **p < .01. ***p < .001.

3.2 Associations with impulsivity in daily life

Associations between UPPS-P facets and daily impulsivity items are presented in Table 4. An overall impulsivity index based on the mean of the six items was computed for each participant at each beep. All UPPS-P facets were associated with the impulsivity index. In addition, all UPPS-P facets were associated with each impulsivity item, with the exception of lack of premeditation and sensation seeking, which were unassociated with the item "Right now there is something I should be doing that I'm not."

Table 4. Associations of impulsivity assessed in daily life with UPPS-P facets

Level 1 criterion	Level 2 predictors (df = 292)				
	Negative urgency	Positive urgency	Lack of premeditation	Lack of perseverance	Sensation seeking
Impulsivity Index	0.367 (.049)***	0.408 (.050)***	0.245 (.047)***	0.179 (.053)***	0.221 (.052)***
Doing something that could get me into trouble	0.344 (.048)***	0.374 (.051)***	0.224 (.052)***	0.208 (.056)***	0.161 (.057)**
Doing something that I may regret later	0.299 (.050)***	0.325 (.050)***	0.190 (.047)***	0.205 (.051)***	0.149 (.054)**
There is something I should be doing that I'm not	0.234 (.056)***	0.186 (.061)**	0.123 (.064)	0.294 (.055)***	0.056 (.061)
Since last beep, said or did things I wish I hadn't	0.338 (.050)***	0.390 (.053)***	0.216 (.049)***	0.142 (.055)**	0.229 (.055)***
Since the last beep, did something risky	0.369 (.049)***	0.408 (.052)***	0.232 (.049)***	0.178 (.055)***	0.218 (.053)***
Since the last beep, acted without thinking	0.385 (.049)***	0.425 (.052)***	0.277 (.057)***	0.141 (.053)**	0.282 (.052)***

Note. Standardized multilevel regression coefficients indicating the relation of the Level 2 predictors (UPPS-P) and the Level 1 (daily life experience) criteria and standard errors are shown.
*p < .05. **p < .01. ***p < .001.

3.3 Moderation of daily life experiences

Cross-level interactions examined whether the slope of affective states and impulsivity in the moment varied across levels of positive and negative urgency. The cross-level interactions computed separately for negative urgency and positive urgency are presented in Table 5.1 Note

that the Level 2 predictor coefficients represent the cross-level interaction or prediction of the slope of the Level 1 predictor and criterion. Negative and positive urgency moderated the association of stress (Figure 1), dysphoria, and irritability (Figure 2) with impulsivity in daily life in the same pattern. In other words, in general, stress, dysphoria, and irritability were associated with increased impulsivity in daily life, but these relations were especially pronounced for those high in negative or positive urgency.
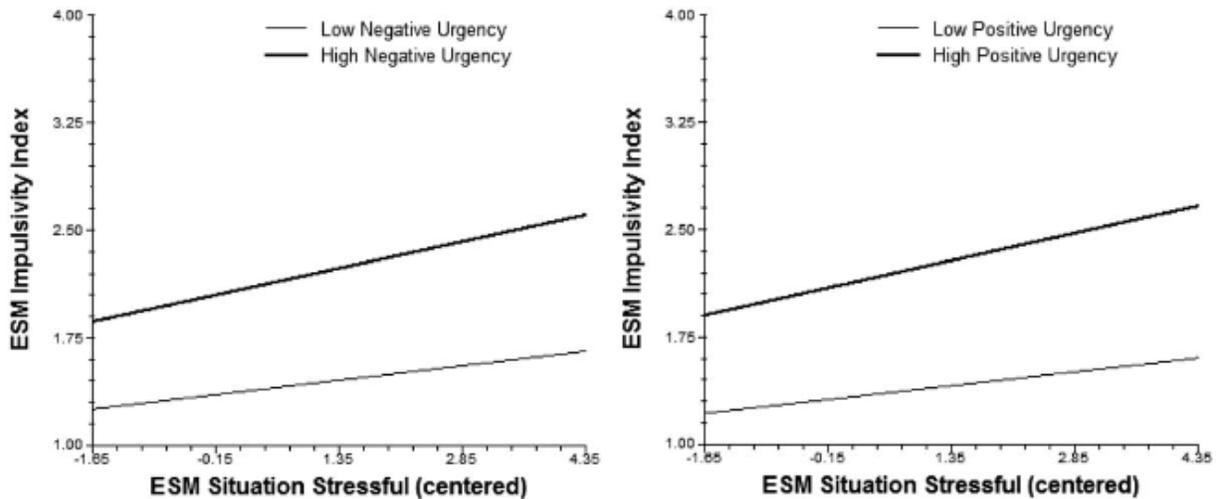

Figure 1. Negative and positive urgency moderate the association of stress and impulsivity
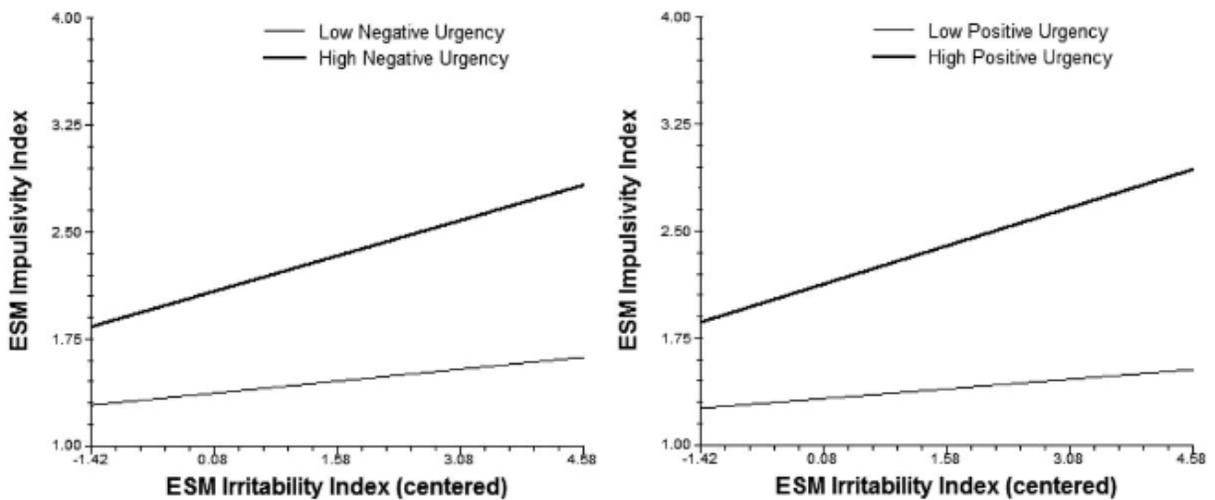

Figure 2. Negative and positive urgency moderate the association of irritability and impulsivity

Table 5. Cross-level interactions of negative and positive urgency with experiences in daily life

| Level 1 criterion | Level 1 predictor | | Level 2 predictor | |
	γ_{10} (df = 292)		Negative urgency γ_{12} (df = 291)	Positive urgency γ_{12} (df = 291)
Impulsivity index	Situation positive	−0.045 (.009)***	0.006 (.010)	−0.010 (.009)
Impulsivity index	Happy	−0.031 (.009)**	−0.006 (.009)	−0.012 (.010)
Impulsivity index	Energy	0.024 (.007)**	0.002 (.007)	0.001 (.007)
Impulsivity index	Situation stressful	0.098 (.009)***	0.019 (.008)*	0.022 (.009)**
Impulsivity index	Dysphoria index	0.169 (.015)***	0.039 (.014)**	0.052 (.015)**
Impulsivity index	Irritability index	0.114 (.012)***	0.038 (.011)**	0.049 (.012)***
Impulsivity index	Emotions out of control	0.176 (.014)***	0.006 (.013)	0.020 (.012)

Note. Note that positive and negative urgency were entered in separate analyses. The results for the Level 1 predictors were comparable across the two sets of analyses; therefore, we only list the Level 1 results for the negative urgency analyses for the sake of space. The Level 2 predictor coefficients represent the cross-level interaction or prediction of the slope of the Level 1 variables by the Level 2 urgency measures.

As hypothesized, negative urgency moderated the association of negative affect/stress with impulsivity in the moment; however, positive urgency did not moderate the association of positive affect/situations with impulsivity. In order to investigate this further, we reran three exploratory cross-level interactions, examining whether the cross-level interaction of emotions out of control in the moment moderating positive affect (happy, energetic, situation positive) and impulsivity would be further moderated by positive urgency. In the first analysis, we entered the ESM items "feeling happy," "emotions out of control," and the Happy × Emotions Out of Control interaction as Level 1 predictors and positive urgency as the Level 2 predictor. Specifically, we wanted to examine whether positive urgency moderated the association of the Level 1 interaction with impulsive behavior (which would suggest that positive urgency impacts the association of positive affect with impulsivity, but specifically under conditions of intense emotion). However, this cross-level interaction was not significant, nor were comparable

analyses including the Level 1 interaction of emotions out of control with feeling energetic or situation positive.

3.4 Similarity indices

Similarity indices were computed for each UPPS-P facet across all ESM items. For example, the columns under negative urgency from Tables 2 through 4 were stacked and compared with the double-entry correlation to the columns under positive urgency similarly stacked across Tables 2 through 4. Intraclass Q-correlations can be interpreted in the same way as traditional correlations on a scale ranging from -1 to $+1$. The daily life profile of negative urgency was essentially identical with the profile for positive urgency ($Q = .97$). Likewise, the profile for negative urgency was comparable to lack of premeditation ($Q = .67$) and lack of perseverance ($Q = .79$). The similarity between negative urgency and sensation seeking was close to zero ($Q = .05$). Positive urgency had a profile similar to that of lack of premeditation ($Q = .68$) and lack of perseverance ($r = .66$), but not sensation seeking ($Q = .20$). Lack of premeditation's profile was similar to that of lack of perseverance ($r = .63$), but not sensation seeking ($Q = .17$). Lack of perseverance and sensation seeking had distinct profiles ($Q = -.14$).

3.5 Principal components analysis

We computed a principal components analysis with a promax rotation using the 26 positive and negative urgency items from the UPPS-P. Five factors had eigenvalues greater than 1 (9.81, 1.90, 1.24, 1.22, and 1.06). However, the ratio of the first to second eigenvalue was greater than 4, whereas the ratio of the subsequent pairs was less than 2. Following Slocum-Gori, Zumbo, Michalos, & Diener (2009), the findings support that the urgency items load on a unitary factor. However, it should be noted that the factor only accounted for 38% of the variance. All of the items loaded positively on the first factor; however, two of the positive urgency items had very small loadings ($< .05$) on this factor.

4 Discussion

The UPPS-P model of impulsivity provides a multidimensional framework that takes into account that impulsivity is a normal personality characteristic. However, the discriminability of the five UPPS-P facets in nonclinical samples, especially negative and positive urgency, has not yet been thoroughly examined. The present study was the first to our knowledge to use ESM to examine the affective, cognitive, and behavioral correlates of the UPPS-P model in daily life and to specifically examine the convergence and divergence of positive and negative urgency.

We replicated findings from Sperry et al. (2016) that suggested negative urgency and lack of perseverance shared similar profiles and were generally associated with negative affect, difficulty concentrating, and poor sense of self. In Sperry et al. (2016), lack of premeditation was associated with energetic-enthusiasm and negative affect; however, in the present study, it was no longer associated with this measure of positive affect. This may be due in part because the present study only examined energy rather than the combined index of energetic-enthusiasm presented in Sperry et al. (2016). Thus, one potential interpretation is that lack of premeditation may be more associated with enthusiasm rather than energy. Additionally, sensation seeking was

associated with more negative aspects of daily life in the present study, but it remained most distinct from the other facets, consistent with previous findings (Cyder & Smith, 2007). In Sperry et al. (2016), sensation seeking was overwhelmingly associated with increased positive affect and with a positive self-image. Although still associated with positive affect and sense of self, sensation seeking was associated with dysphoria (combined sadness and anxiety), thoughts racing, and trouble concentrating. This was not accounted for by having increased levels of sensation seeking in the present sample (the mean level of sensation seeking in both studies was 2.79).

All UPPS-P impulsivity facets were associated with impulsive behaviors in daily life. Overall, there was very little differentiation of the UPPS-P facets with each ESM impulsivity item despite attempts to develop unique items that tapped the conceptual nature of each of the UPPS-P facets. The item "Right now there is something I should be doing that I am not," developed to tap lack of perseverance, was associated only with urgency and lack of perseverance. This may not be surprising given the high similarity indices of negative and positive urgency and lack of perseverance. Note that in Sperry et al. (2016), sensation seeking was unassociated with impulsive behaviors in daily life, whereas in the present study, it was robustly so. This may be in part due to the fact that sensation seeking was associated with slightly more negative aspects of daily life in the present study. However, these findings are consistent with previous literature that suggests sensation seeking is associated with problematic impulsive behaviors such as substance use and gambling (Berg et al., 2015).

Our findings that men had higher levels of positive urgency and sensation seeking is consistent with Cyders (2013), who reported higher levels of these facets in a large sample of college students. Note that Cyders (2013) examined the measurement and structural invariance of the UPPS-P Impulsive Behavior Scale with sex differences and found that, despite higher means on these subscales, the UPPS-P subscales are invariant across sex, suggesting that sex should not significantly predict outcomes related to the UPPS-P facets.[2]

The present study found that positive and negative urgency were highly correlated ($r = .77$), and the items appeared to load onto a single underlying factor. This correlation is significantly higher than the original correlation reported in validation studies (Cyder & Smith, 2007, 2008); however, other studies have reported correlations of .70 (Borges, Dahne, Lim, & MacPherson, 2017), .71 (Neal & Gable, 2016), and .72 (Stautz, Dinc, & Cooper, 2017). Most consistently, studies report correlations between .55 and .65 (Grimaldi, Napper, & LaBrie, 2014; Rose & Segrist, 2014; Weiss, Tull, Sullivan, Dixon-Gordon, & Gratz, 2015). It is important to note that the high correlation between these two subscales makes it unlikely that we would see differential patterns of expression in daily life. Thus, it is not surprising that we found positive and negative urgency were largely undifferentiated, contrary to our a priori hypothesis. In fact, positive urgency was associated with increased negative and decreased positive affect in daily life, and it moderated the association between negative affect and impulsivity in the moment (just like negative urgency). This is consistent with Borges and colleagues' (2017) findings that both positive and negative urgency indirectly predicted distress tolerance, and that this was mediated by change in negative, not positive, affect. Although we expected some overlap between negative and positive urgency, the two facets showed almost identical correlates across affective, cognitive, and behavioral measures in daily life. The only items for which the two facets showed

divergence were energy and success in activities, with positive urgency being associated with increased energy and negative urgency being associated with decreased success in activity. Thus, these findings point to negative and positive urgency as being more convergent than divergent facets; however, it is unclear whether this is due to a conceptual or methodological problem with the constructs and their subscales. Note that the present study did not examine the unique effects of positive and negative urgency entered simultaneously in the prediction of daily life experiences. Based on the high correlation between positive and negative urgency, the unique variance left over after accounting for their shared variance would be difficult to interpret and may not represent the initial theoretical descriptions of positive or negative urgency.

Conceptually, positive urgency was proposed as a distinct facet for two potential reasons. First, Cyders and colleagues (2007) highlighted evidence that people engage in impulsive or risk-taking behaviors in response to positive mood (e.g., people drink more on days of celebration; Del Boca, Darkes, Greenbaum, & Goldman, 2004). Second, they proposed that people may engage in impulsivity to enhance existing positive mood (e.g., drinking for mood enhancement leads to increased drinking; Cooper, Agocha, & Sheldon, 2000). Both of these arguments suggested that impulsive behavior is used to match or enhance positive, not negative, affect. Furthermore, studies report differential behaviors associated with positive and negative urgency. For example, negative urgency uniquely predicts bulimic behaviors (Cyders et al., 2007), whereas positive urgency predicts increases in positive mood–based rash action (Cyders & Smith, 2010) and negative outcomes on risk-taking tasks following positive mood induction (Cyders et al., 2010). A recent study found that negative urgency uniquely predicted negative consequences of alcohol use, whereas positive urgency uniquely predicted negative consequences of cannabis use (Stautz et al., 2017). Bold and colleagues (2017) found that those high in negative urgency were more likely to drink to intoxication on days when reporting negative affect, whereas those high in positive urgency were more likely to drink to intoxication on days when reporting positive affect. Despite this, the present findings and those suggesting that negative and positive urgency may be best accounted for by an overall urgency factor (Cyders & Smith, 2008) suggest that there is contradictory evidence regarding whether parsing urgency into positive and negative facets provides useful explanatory power in impulsive behavior.

Cyders et al. (2007) suggested that rash action in the face of positive mood mimics that of impulsivity in the face of negative mood, and that both positive and negative urgency represent poor regulation and gating in response to extreme changes in affect. However, to what extent do the patterns of impulsive behaviors differ between positive and negative urgency? Negative urgency has been specifically linked to rash actions including problematic alcohol and substance use, suicidality and nonsuicidal self-injury, and binging and purging with moderate effect sizes (Berg et al., 2015), as well as dependence on cell phones, compulsive shopping, and tobacco cravings (see Cyders & Smith, 2008, for review). In contrast, positive urgency has been specifically linked to rash actions including problematic drinking, pathological gambling, and risky sexual behavior (Cyders & Smith, 2008). Given that positive and negative urgency may result in both similar and different rash actions, this may be important for examining the overlap and differentiation between the facets themselves. Thus, one potential explanation for the present findings is that specific rash actions were not examined via the ESM questionnaire. Perhaps there might have been more differentiation between the facets if the ESM questionnaire had tapped

specific behaviors linked to each facet. However, it is unknown whether participants would respond differentially to questions assessing broad impulsive behaviors (e.g., "Since the last beep, I said or did things that I wish I hadn't," "Since the last beep, I did something risky," and "Since the last beep, I acted without thinking") versus specific behaviors (e.g., "Since the last beep, I engaged in risky sex" and "Since the last beep, I engaged in binge eating") and the extent to which ESM methods would capture these specific behaviors. Thus, in future studies, it would be beneficial to assess whether positive and negative urgency are differentially associated with broad endorsements of rash action versus specific impulsive behaviors and the extent to which specific impulsive behaviors can be adequately captured by ESM.

Another potential explanation may be that positive urgency best captures rash action in the face of intense positive mood (e.g., euphoria) and that participants in this sample were simply not experiencing extreme enough positive mood to see the expected results. However, if this were true, we would have expected that the combination of experiencing positive affect and feeling as if one's emotions were out of control would have been moderated by positive urgency in our exploratory analyses. Additionally, participants reported a range of responses (1 = not at all to 7 = very much) and endorsed relatively high means for items assessing positive affect (happy = 4.63; energetic = 3.26; situation positive = 4.76). Furthermore, it is unlikely that participants in laboratory-based studies experience significantly higher levels of positive affect via mood manipulation than they do in their normal daily environments. Thus, it would be surprising that lab-based studies have found relations between positive urgency and self-reported risky behaviors if positive urgency is only expressed in the face of intense positive affect.

An alternative perspective is that positive urgency may in fact be a distinct facet from negative urgency, but that the Positive Urgency Measure (PUM), or the Negative Urgency subscale, may lack sufficient construct validity. The present findings suggest that the PUM and Negative Urgency subscale are correlated .77 and that when the items from each scale are added together, internal consistency is consistent with expected values based on the Spearman-Brown prophecy formula. This means that the items from the PUM hang together with the Negative Urgency subscale as if they are measuring the same construct. This is surprising given that all 14 items on the PUM specifically have an anchor about positive mood, whereas the Negative Urgency subscale has items that ask about behaviors without the anchor of negative mood. However, this is consistent with the notion that there is significant shared variance between positive and negative urgency that accounts for an overall urgency "mechanism" (Cyders & Smith, 2007).

Future research needs to explicitly examine the convergence and divergence of positive and negative urgency across multiple levels of analysis. For example, studies should incorporate laboratory-based and self-report measures of urgency with genetic or brain imaging methods to understand potential neurobiological differences in positive and negative urgency. Previous research suggests that genetic polymorphisms in serotonergic and dopaminergic systems (e.g., HTR2B and MAOA stop codons) may be implicated in impulsivity (Bevilacqua & Goldman, 2013). Given these neurotransmitters' role in emotion regulation, they may provide a potential starting point for examining differences between rash action expressed in response to, to match, or to enhance positive or negative affect. By doing so, we may begin to understand the mechanisms behind an overall urgency factor that is differentially expressed based on individual differences in emotional reactivity.

5 Conclusions

In a nonclinical sample, the five facets of the UPPS-P model of impulsivity had both shared and divergent affective, cognitive, and behavioral profiles, yet they were all associated with impulsivity in the moment. Findings were consistent with views that the five facets may fall into three broad factors: urgency, sensation seeking, and conscientiousness (lack of premeditation and lack of perseverance together). Lab-based measures and daily life measures suggested that positive and negative urgency are more convergent than divergent facets and may be better represented by a unitary urgency factor.

Conflict of interests

The author(s) declared the following potential conflict of interest with respect to the research, authorship, and/or publication of this article: Donald R. Lynam is a co-creator of the UPPS-P model and scale but receives no financial compensation for its use.

Notes

1. Note that the slopes of the Level 1 predictors (e.g., stress) and the Level 1 criterion (impulsivity index) were comparable in the separate cross-level interaction analyses computed for positive and negative urgency. Therefore, we only reported the value from the negative urgency analyses in Table 5. Note also that the cross-level interaction analyses recompute the direct effects of the Level 2 predictors with the Level 1 criterion. However, given that these values are closely comparable to the coefficients reported in Table 4, they are not reproduced in Table 5. Please note that the data and output of all of the analyses are available upon request from the first author.

2. Given that there were significant sex differences in positive and negative urgency, we reanalyzed the association of these UPPS-P facets with ESM items of affect, cognitions, and behaviors partialing sex, as requested by a reviewer. Results remained substantively unchanged and thus were not included.

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Supporting information

Additional Supporting Information may be found online in the supporting information tab for this article.

Table S1
Table S2