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Examination of the heterogeneity in PTSD and impulsivity facets: A latent profile analysis

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Abstract

The experience of traumatizing events and resulting posttraumatic stress disorder (PTSD) symptomology relates to a range of impulsive behaviors. While both PTSD and impulsivity are heterogeneous and multidimensional constructs, no research has used person-centered approaches to examine subgroups of individuals based on these response endorsements. Hence, our study examined PTSD-impulsivity typologies and their construct validity in two samples: university students ($n = 412$) and community participants recruited through Amazon's MTurk ($n = 346$). Measures included the Stressful Life Events Screening Questionnaire (PTEs), PTSD Checklist for DSM-5 (PTSD severity), UPPS Impulsive Behavior Scale (negative urgency, lack of premeditation, lack of perseverance, sensation seeking), Dimensions of Anger Reaction Scale (anger), and the Patient Health Questionnaire-9 (depression). For both samples, results of latent profile analyses indicated a best-fitting 3-class solution: High, Moderate, and Low PTSD-Negative Urgency. Negative urgency was the most distinguishing impulsivity facet. Anger and depression severity significantly predicted membership in the more severe symptomatology classes. Thus, individuals can be meaningfully categorized into three subgroups based on PTSD and impulsivity item endorsements. We provide some preliminary evidence for a *negative urgency* subtype of PTSD characterized by greater depression and anger regulation difficulties; and underscore addressing emotional regulation skills for these subgroup members.

Keywords

PTSD; impulsivity; latent profile analysis; depression; anger

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1. Introduction

The experience of potentially traumatizing events (PTEs) is associated with several health and behavioral problems including Posttraumatic Stress Disorder (PTSD) and pathological impulsive behaviors including substance use (Breslau, 2009; 2010), suicidal attempts (Belik, Stein, Asmundson, & Sareen, 2009), sexual risk taking behavior (Cavanaugh, Hansen, & Sullivan, 2010), and aggressive acts (Orth & Wieland, 2006). PTSD and impulsivity are both heterogeneous and multidimensional constructs (Armour, Mullerova, & Elhai, 2016; Berg, Latzman, Bliwise, & Lilienfeld, 2015). While extensive evidence has linked PTSD severity to impulsivity (Jakšić, Brajković, Ivezić, Topić, & Jakovljević, 2012), no study to our knowledge has used person-centered approaches to examine subgroups of people based on their endorsement of PTSD and impulsivity items. Thus, our study examined PTSD-impulsivity typologies (latent subgroups of individuals based on endorsement patterns), and their construct validity in two distinct samples: university students' and a community sample.

PTSD is a multidimensional constellation of four symptom clusters: intrusions, avoidance of internal and external trauma reminders, negative alternations in cognitions and mood (NACM), and alternations in arousal and reactivity (AAR) following the experience of a PTE (American Psychiatric Association, 2013). This is not surprising given the heterogeneous nature of PTSD (Galatzer-Levy & Bryant, 2013), and its high comorbidity with psychopathology (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Examples of PTSD subtypes include subgroups of individuals characterized by predominant dissociative symptoms (dissociative subtype; Mullerová, Hansen, Contractor, Elhai, & Armour, 2016; Wolf, Miller, Reardon, et al., 2012), and predominant depression symptoms (depression subtype; Armour, et al., 2015; Contractor, Roley-Roberts, Langdon, & Armour, 2017). Such subgroupings have construct validity and are distinct in terms of psychopathology covariates (Contractor, et al., 2017; M.W. Miller & Resick, 2007).

We were most interested in the interaction of the personality trait of impulsivity and PTSD symptoms in defining PTSD subgroupings (possibly an impulsive subtype of PTSD). We consider impulsivity as multidimensional, most widely assessed by the UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001). The assessed four facets of impulsivity include lack of premeditation (tendency to act without careful thought), negative urgency (tendency to engage in impulsive behaviors in the context of intense negative emotions), sensation seeking (tendency to seek excitement), and lack of perseverance (difficulty completing tasks and a tendency for boredom). The UPPS conceptualization of impulsivity offers a pragmatic lens to understanding impulsivity as it relates to different symptoms (e.g., of PTSD) in forming heterogeneous subgroups. From a UPPS perspective, while the overt behavior of impulsivity may appear the same, the underlying mechanisms for this behavior may be different (Whiteside & Lynam, 2001); possibly depending on PTSD symptoms. Our study, thus, examined how impulsivity and PTSD facets might group together among people who have experienced PTEs for the following reasons.

First, substantial evidence supports an externalizing subtype of PTSD characterized by high negative emotionality and low constraint (impulsivity), as distinct from the internalizing

subtype of PTSD characterized by low positive emotionality and high negative emotionality (Carleton, Mulvogue, & Duranceau, 2015; M. W. Miller, 2003; Wolf, Miller, & Harrington, 2012). Externalizing class members are more likely to demonstrate aggression and substance use, while internalizing class members are more likely to experience depression, and anxiety (Castillo, et al., 2014; Forbes, Elhai, Miller, & Creamer, 2010; M. W. Miller, 2003). Thus, evidence indicates that impulsivity plays a role in defining PTSD subtypes, specifically the externalizing subtype of PTSD.

Second, there is a strong empirical and theoretical relation between PTSD severity and impulsivity (Contractor, Armour, Forbes, & Elhai, 2016; Jakšić, et al., 2012). According to a disinhibition perspective, PTSD severity may interfere with one's ability to inhibit behaviors when perceiving rewarding situations (Casada & Roache, 2005). This perspective aligns with UPPS's lack of premeditation facet, which strongly relates to PTSD's NACM severity (Roley, Contractor, Weiss, Armour, & Elhai, 2017). From an emotional regulation perspective, engagement in impulsive behaviors may functionally help to reduce PTSD's negative affect (Marshall-Berenz, Vujanovic, & MacPherson, 2011; Weiss, Tull, Sullivan, Dixon-Gordon, & Gratz, 2015). This perspective aligns with UPPS's negative urgency facet, which strongly relates to PTSD severity (mainly NACM and AAR; Contractor, Armour, Forbes, et al., 2016; Roley, et al., 2017). Further, the compulsive re-exposure theory posits that people with PTSD severity engage in sensation-seeking activities (UPPS's sensation seeking facet) to mimic the biological arousal experienced during a PTE (Joseph, Dalgleish, Thrasher, & Yule, 1997). Research indicates that sensation seeking predicts all PTSD clusters' severity (mainly NACM and AAR; Contractor, Armour, Forbes, et al., 2016; Roley, et al., 2017). Lastly, a cognitive explanation (Ben-Zur & Zeidner, 2009) highlights attentional difficulties (attributed to intrusive thoughts), and a restriction in information processing capacity following trauma. Consequently, one may behave impulsively to redirect attention, or distract from intrusive thoughts (UPPS lack of perseverance; Billieux, 2012; Roberts, Pullig, & Manolis, 2015; Wu, Cheung, Ku, & Hung, 2013). Lack of perseverance predicts PTSD's intrusion severity (Roley, et al., 2017).

Despite the aforementioned, there is little understanding of how the different PTSD and impulsivity facets interact in creating subgroups. Person-centered approaches of latent class (LCA) and latent profile (LPA) analyses can extend this line of research on PTSD subtypes by identifying latent subgroupings of people based on endorsed response patterns. LCA assesses categorical symptom indicators while LPA assesses continuous indicators; the obtained subgroups are compared qualitatively and quantitatively (Kline, 2011; McCutcheon, 1987). Using two different samples, our current study examined the best-fitting latent class solution in categorizing participants based on PTSD and impulsivity endorsements, and the construct validity of the optimal class-solution. Drawing from prior research on latent subgroups based on posttraumatic responses (PTSD and other co-occurring symptoms), we hypothesized finding an optimal three- or four-class solution (Armour, et al., 2015; Contractor, Armour, Shea, Mota, & Pietrzak, 2016; Contractor, et al., 2017).

We examined the covariates of gender and age in predicting latent class membership in both samples. Consistently, evidence indicates that females have greater PTSD severity (Tolin &

Foa, 2006); however, there are mixed findings regarding the relation between age and PTSD severity (Green, et al., 1991; Norris, Kaniasty, Conrad, Inman, & Murphy, 2002). Regarding impulsivity's multidimensional construct, Cross et al. (2011) concluded through a meta-analysis that gender differences were contingent on the type of measure used to assess impulsivity and the theory underlying the impulsivity construct. This meta-analysis reflected more sensation seeking in males, more negative urgency in females, and no gender differences in lack of perseverance and lack of premeditation facets. While some evidence indicates a decline in impulsivity with age (Steinberg, 2010; Steinberg, et al., 2008), sensation seeking has a curvilinear relation with age (strongest relation between ages 10 and 15; Steinberg, et al., 2008). Thus, we hypothesized that being female would increase the chance of being in a subgroup characterized by higher PTSD severity, but did not hypothesize how gender would relate to impulsivity facets. Further, we explored the relationship between age and latent class membership.

We further examined the covariates of anger and depression (each variable available in one sample) in establishing the construct validity of the optimal class solution. Evidence indicates PTSD's co-occurrence with depression (Rytwinski, Scur, Feeny, & Youngstrom, 2013) and difficulties in regulating anger (Orth & Wieland, 2006). Further, impulsivity is highly related to depression (Swann, Steinberg, Lijffijt, & Moeller, 2008) and difficulties in regulating anger (Contractor, Armour, Wang, Forbes, & Elhai, 2015). Thus, we hypothesized that a subgroup characterized by higher impulsivity and PTSD severity would have greater depression and anger severity compared to other subgroups.

2. Methods

2.1. Participants and Procedure

2.1.1. University Sample—A university's Institutional Review Board approved all procedures. The sample included 911 undergraduates recruited from 2011 through 2013. Self-report measures were administered on [Psychdata.com](https://psychdata.com) following informed consent. Participants were provided course credit for study participation. Of 911 participants, we excluded participants not endorsing at least one PTE. Of the remaining 427 participants, we further excluded 15 participants missing more than 30% of items on the PTSD Checklist for *DSM-5* (PCL-5; ≥ 6 ; Weathers, et al., 2013), the UPPS Impulsive Behavior Scale (UPPS; ≥ 13 items; Whiteside & Lynam, 2001), or the Dimensions of Anger Reaction Scale-5 (DARS-5; > 2 items; Forbes, et al., 2004). In the final sample of 412 participants, 27 participants were missing between 1–2 PCL-5 items; 79 participants were missing between 1–4 UPPS items; and 12 participants were missing one DARS-5 item. The sample of 412 participants had a mean age of 20.06 years ($SD = 4.42$), with the majority being female ($n = 278$, 74.50%). Table 1 has detailed descriptive information.

2.1.2. MTurk sample—A university's Institutional Review Board approved all procedures. The original sample included 499 participants recruited through Amazon's Mechanical Turk (MTurk) platform (Buhrmester, Kwang, & Gosling, 2011). Participants 18 years and older were screened on four inclusionary criteria, including experiencing a PTE. Participants completed the survey hosted on [Psychdata.com](https://psychdata.com) following informed consent, and were

compensated 75 cents for study participation. Among the 499 respondents who completed the survey, 19 participants attempted the questionnaire twice/thrice and were excluded ($n = 480$). We further excluded participants who (1) did not meet one or more of the inclusionary criteria ($n = 120$); (2) were missing data on all measures ($n = 11$); and (3) were missing more than 30% item-level data ($n = 3$) on the PCL-5 (≥ 6 items; Weathers, et al., 2013), the UPPS scale (≥ 13 items; Whiteside & Lynam, 2001), or the Patient Health Questionnaire-9 (PHQ-9; ≥ 3 items; Kroenke & Spitzer, 2002). In the final sample of 346 participants, 45 participants were missing between 1–3 PCL-5 items; 73 participants were missing between 1–4 UPPS items; and 19 participants were missing one PHQ-9 item. The average age in this sample was 33.60 years ($SD = 9.52$), and approximately half were female ($n = 199$, 57.70%). Table 1 has detailed descriptive information.

2.2. Assessments

2.2.1. Demographic information—Information on gender, age, years of schooling, employment status, ethnic and racial background, relationship status, and socio-economic status was obtained in both samples.

2.2.2. Potentially traumatic experiences—Information on exposure to 13 PTEs was obtained using the Stressful Life Events Screening Questionnaire (SLESQ; Goodman, Corcoran, Turner, Yuan, & Green, 1998) in both samples. The SLESQ uses dichotomous response options (yes/no). We added three additional items to address changes in *DSM-5* criteria for a Criterion A PTE (Elhai, et al., 2012). The SLESQ has a good test-retest reliability, and concurrent and convergent validity (Goodman, et al., 1998). For participants who endorsed more than one PTE, we wished to ensure that they referenced their index PTE while endorsing questions on PTSD severity; hence, they specified their most distressing PTE.

2.2.3. PTSD symptoms—Severity of *DSM-5* PTSD symptoms experienced in the past month was assessed using the PTSD Checklist for *DSM-5* (PCL-5; Weathers, et al., 2013) in both samples. The PCL-5, a 20-item self-report measure, uses response options ranging from 0 (Not at all) to 4 (Extremely). Participants completed the PCL-5 in reference to their most distressing event endorsed on the SLESQ. The PCL-5 has excellent psychometric properties (Blevins, Weathers, Davis, Witte, & Domino, 2015; Bovin, et al., 2016; Wortmann, et al., 2016). The item-level responses were summed to create four subscale scores: intrusions, avoidance, NAMC, and AAR. The Cronbach's α for the intrusions, avoidance, NACM, and AAR subscales were .86, .87, .88, and .87 respectively in the university sample, and .90, .89, .92, .87 respectively in the MTurk sample.

2.2.4. Impulsivity Facets—The UPPS Impulsive Behavior Scale (UPPS; Whiteside & Lynam, 2001), a 45-item self-report measure, was used to assesses four impulsivity facets in both samples. The four facets were lack of premeditation (11 items), negative urgency (12 items), sensation seeking (12 items), and lack of perseverance (10 items). Response options range from 1 (Agree Strongly) to 4 (Disagree Strongly). The subscales have good internal consistency, and convergent and divergent validity (Smith, et al., 2007; Whiteside & Lynam, 2001; Whiteside, Lynam, Miller, & Reynolds, 2005). Cronbach's α for the lack of

premeditation, negative urgency, sensation seeking, and lack of perseverance subscales were .85, .88, .82, and .83 respectively in the university sample; and .88, .90, .90, and .87 respectively in the MTurk sample. For both samples, we used a past-month timeline of inquiry, for consistency with PTSD ratings.

2.2.5. Anger reactions—In the university sample, the Dimensions of Anger Reaction Scale – 5 (DARS-5; Forbes, et al., 2004), a 5-item self-report questionnaire, assessed one's disposition towards anger in response to stressful situations (Forbes, et al., 2004). Responses are given on a 5-point Likert rating scale ranging from 1 (none of the time) to 4 (all of the time) referencing the past month. This measure has good convergent validity (Forbes, et al., 2004), and an internal consistency coefficient of .85 in the university sample.

2.2.6. Depression—In the MTurk sample, the Patient Health Questionnaire-9 (PHQ-9; Kroenke & Spitzer, 2002), a 9-item self-report measure, assessed the severity of depression symptoms within the past two weeks. Response options range from 0 (“Not at all”) to 3 (“Nearly every day”). The PHQ-9 has excellent psychometric properties (Kroenke & Spitzer, 2002; Kroenke, Spitzer, & Williams, 2001). Internal consistency in the MTurk sample was .91.

2.3. Data Analyses

We conducted a latent profile analysis (LPA) with Mplus 7 using PCL-5 subscales (intrusions, avoidance, NACM, AAR), and UPPS subscales (lack of premeditation, negative urgency, sensation seeking, lack of perseverance) as indicators. We used Maximum Likelihood estimation with robust standard errors (ML) for the LPA, analyzing one through four-class models based on prior studies with PTSD symptoms (e.g., Armour, et al., 2015; Ayer, et al., 2011; Contractor, et al., 2017). The optimal class solution had the lowest Bayesian Information Criterion (BIC) and sample-size adjusted BIC values (SSABIC), a significant Lo–Mendell–Rubin Adjusted Likelihood Ratio Test value (LMR), a significant Bootstrapped Likelihood Ratio Test (BLRT) *p* value, good entropy values (quality of classification), parsimony, and interpretative meaning (DiStefano & Kamphaus, 2006; Nylund, Asparouhov, & Muthén, 2007; Nylund, Bellmore, Nishina, & Graham, 2007). A model with a 10-point lower BIC value has a 150:1 likelihood to be the better fitting model (Raftery, 1995). In comparing a K-class with a K-1 class model, a significant LRT test indicates the optimal model as the one with K-1 classes (Nylund, Asparouhov, et al., 2007). We estimated missing values with ML.

After identifying the best-fitting class solution, we tested differences across classes on the PTSD and impulsivity subscales with one-way ANOVA tests (effect sizes of partial eta square). Posterior class probabilities were imported into SPSS for these analyses. Next, we tested the effect of covariates (anger for the university sample; depression for the MTurk sample; gender and age for both samples) on latent class membership. We used the Mplus three-step approach (multinomial logistic regression) by estimating class membership in relation to auxiliary variables of interest (covariates) while accounting for misspecification bias (Asparouhov & Muthén, 2014; Vermunt, 2010). For the 3-step analysis, Mplus uses list-

wise deletion to deal with missing data; thus, reducing our sample to 361 participants in the university sample, and 326 participants in the MTurk sample.

3. Results

3.1. University Sample

Table 2 indicates the LPA results. Based on recommended guidelines, a 3-class solution was found to be the optimal class solution (DiStefano & Kamphaus, 2006; Nylund, Asparouhov, et al., 2007). According to LMR value guidelines, the 3-class solution would be the best-fitting model. Despite a continuous decrease in BIC and SSABIC values, the difference between the 3- and 4-class solutions is minimal compared to the difference across the other class solutions. We additionally considered parsimony and interpretative meaning. Further, entropy values were quite similar for all the models tested.

See Figure 1 for a graphical depiction of the 3-class solution. The class descriptors reference the negative urgency facet rather than the impulsivity construct based on the predominant between-class comparative differences in negative urgency rather than most other impulsivity facets. Class 3 was characterized by relatively higher PTSD subscale severity (particularly NACM and AAR) and negative urgency scores (*High PTSD-Negative Urgency*). In comparison, Class 2 was characterized by lower PTSD subscale severity and negative urgency scores (*Low PTSD-Negative Urgency*). Class 1 was characterised by relatively moderate PTSD subscale severity and negative urgency scores (*Moderate PTSD-Negative Urgency*). Table 3 indicates ANOVA test results for class differences in the PTSD and UPPS subscale severity. All classes differed significantly on all PTSD subscale severity. However, among the UPPS subscales, all classes differed significantly only on the negative urgency subscale score; and some classes differed significantly (excluding Class 1-Class 3 comparison) on the lack of perseverance subscale score. Where there were significant differences, Class 3 had the highest scores followed by Class 1, and then Class 2.

Table 4 indicates results of the multinomial logistic regression analyses ($n = 361$). Anger was a significant predictor for all class comparisons. Anger significantly predicted the Low versus the Moderate PTSD-Negative Urgency class memberships ($B = -.15$, $p < .001$, OR = .86), the High versus the Moderate PTSD-Negative Urgency class memberships ($B = .13$, $p = .001$, OR = 1.14), and the High versus the Low PTSD-Negative Urgency class memberships ($B = .28$, $p = .001$, OR = 1.32). Gender was a significant predictor when comparing the Low versus the Moderate PTSD-Negative Urgency class memberships ($B = -.65$, $p = .04$, OR = .52).

3.2. MTurk sample

Consistent with the results of the university sample (see Table 2), the 3-class solution was deemed optimal based on the recommended guidelines (DiStefano & Kamphaus, 2006; Nylund, Asparouhov, et al., 2007). Figure 2 provides a graphical depiction of the 3-class solution. Again, class descriptors referenced the negative urgency facet based on that being the most distinguishing of all classes among the UPPS subscales. Class 3 was characterized by relatively higher PTSD subscale severity (particularly NACM and AAR), and negative

urgency scores (*High PTSD-Negative Urgency*). In comparison, Class 1 was characterized by relatively lower PTSD and negative urgency scores (*Low PTSD-Negative Urgency*). Class 2 was characterized by moderate PTSD and negative urgency scores (*Moderate PTSD-Negative Urgency*). Results of the ANOVA tests (see Table 3) indicated that all classes differed significantly on PTSD subscale severity. Further, all classes differed significantly on the negative urgency score, and while some classes differed significantly on the lack of predmeditation (Class 1 vs. Class 3) and lack of perseverance (excluding Class 2 vs. Class 3) subscale scores. Where there were significant differences, Class 3 had the highest scores followed by Class 2, and then Class 1.

Results of the multinomial logistic regression analyses (see Table 4; $n = 326$) indicated that depression was a significant predictor for all class comparisons. Depression severity was significant in predicting the Moderate versus the Low PTSD-Negative Urgency class memberships ($B = .32, p < .001, OR = 1.37$), the High versus the Low PTSD-Negative Urgency class memberships ($B = .73, p < .001, OR = 2.08$), and the High versus the Moderate PTSD-Negative Urgency class memberships ($B = .41, p < .001, OR = 1.51$). Age and gender were not significant covariates.

4. Discussion

Using two distinct samples (university students and community), we examined the nature and construct validity of latent subgroups of participants based on their responses to PTSD and impulsivity items. Results indicated an optimal 3-class solution, with classes differing mainly in severity of the indicators of PTSD subscales and negative urgency predominantly, and with construct validity. Negative urgency was the predominant impulsivity facet that helped differentiate subgroups of people.

Both samples differed on some demographic characteristics. Comparatively, the MTurk sample had an older and more diverse age sample, and included a larger percentage of employed participants. While in both samples the most prevalent PTE was the unexpected death of a family member/close friend, the samples differed in the prevalence of other PTEs experienced. The second most prevalent PTE for the student sample was childhood sexual molestation, compared to the experience of a life-threatening accident in the MTurk sample. Despite differences in the samples, we found evidence for three latent subgroupings of participants based on their responses to PTSD and impulsivity items. We labelled them High PTSD-High negative urgency, Moderate PTSD-Moderate negative urgency, and Low PTSD-Low negative urgency.

While all latent classes differed in all PTSD subscale severity, the negative urgency facet of impulsivity was the most distinguishing for all classes. Negative urgency references a tendency to act impulsively under conditions of intense negative affect (Whiteside & Lynam, 2001), with the possible function of alleviating the distressing negative emotions. Theoretical and empirical evidence indicates that people with greater PTSD symptom severity may engage in impulsive behaviors to regulate their mood, mainly to reduce negative affect (Marshall-Berenz, et al., 2011; Weiss, et al., 2015). Berg, et al. (2015) found that negative urgency (compared to other UPPS facets) consistently had the largest effect

size in relation to several categories of psychopathology. Our findings suggest that their results might generalize to PTSD as well.

In both samples, the UPPS lack of perseverance facet (related to distractibility) differentiated the Low from both the Moderate and High PTSD-Negative Urgency classes. Our findings also suggested that the UPPS lack of premeditation facet (difficulty in reflecting on consequences before engaging in an act), though often considered the prototypical definition of impulsivity, did not differentiate classes beyond the Low vs. High PTSD-Negative Urgency class comparisons (only MTurk sample). Further, the UPPS sensation-seeking facet did not differentiate latent classes in either sample. Our findings align with prior empirical research linking lack of perseverance to PTSD intrusion severity (Roley, et al., 2017), and with the cognitive explanation of the relation between PTSD symptoms and impulsivity (Ben-Zur & Zeidner, 2009). While our findings support the role of lack of perseverance in subtyping diagnostic patterns, this facet did not consistently differentiate all subgroups of people (especially those at higher levels of post-trauma severity). Thus, while there is evidence for the usefulness of the UPPS model of impulsivity, our results suggest that in regards to PTSD subtypes, the most relevant facet is negative urgency, followed by lack of perseverance, and lack of premeditation.

The class solution had construct validity. Depression (university sample) significantly predicted membership in the more severe class. Our results align with empirical evidence indicating PTSD's co-occurrence with depression (Rytwinski, et al., 2013). The causality explanation of PTSD-depression comorbidity indicates that PTSD may be a causal risk factor for depression, or depression may be a causal risk factor for PTE, and subsequent PTSD (Breslau, 2009; Strander, Thomsen, & Highfill-McRoy, 2014). Alternatively, the common factors explanation highlights shared environmental and genetic risk/buffering factors underlying these disorders (Breslau, 2009; Strander, et al., 2014). Further, our results align with empirical evidence relating impulsivity to depression (d'Acremont & Van der Linden, 2007; Swann, et al., 2008). Impulsive individuals may use ineffective emotion regulation strategies when experiencing stressful life events, which may lead to increased depression and emotional stress (d'Acremont & Van der Linden, 2007). Such an explanation highlights the role of the negative urgency facet in relation to depression. Indeed, suicide attempts among people who are depressed are linked to impulsivity (Corruble, Benyamina, Bayle, Falissard, & Hardy, 2003; McGirr & Turecki, 2007; Simon, et al., 2001).

Further, anger regulation difficulties (MTurk sample) significantly predicted membership in the more severe class. PTSD relates to difficulties in suppressing, regulating, inhibiting, and appropriately expressing anger (Olatunji, Ciesielski, & Tolin, 2010; Orth & Wieland, 2006). The survival mode theory indicates that anger has survival value in threatening situations; however becomes maladaptive when threat schemas are activated in non-threatening situations (which occurs in individuals with PTSD). Consequently, people react with hostile appraisal, arousal, and antagonistic behavior, failing to regulate anger (Chemtob, Novaco, Hamada, Gross, & Smith, 1997; Novaco & Chemtob, 2002). Alternatively, the fear avoidance theory states that anger represents an avoidant coping mechanism to deal with trauma-related fear (Foa, Riggs, Massie, & Yarczower, 1995). Further, our results align with evidence linking impulsivity to anger regulation difficulties (Ahmed, Kingston, DiGiuseppe,

Bradford, & Seto, 2012; Contractor, Armour, et al., 2015; Milligan & Waller, 2001). The experience of negative affect such as anger could trigger impulsive behaviors including self-mutilation (Herpertz, Sass, & Favazza, 1997) and overt aggression (Shorey, Brasfield, Febres, & Stuart, 2011). Indeed, negative urgency has been shown to explain the relation between PTSD and physical aggression (Weiss, Connolly, Gratz, & Tull, 2017).

Age was not a significant covariate in the models. Further research should investigate whether our results would hold true in samples with predominantly younger or older participants. Gender was not a consistent predictor of class membership across samples. The only significant result was that being female decreased the chances of being in the Low vs. Moderate PTSD-Negative Urgency classes by 48% (university sample). While research strongly portrays that females have greater PTSD severity compared to males (Tolin & Foa, 2006), it is possible that mixed findings regarding gender differences in impulsivity (Cross, et al., 2011) could be driving our obtained pattern of relationships.

4.1. Implications, Limitations, and Future Research

Our study results have several implications. When assessing PTSD and impulsivity, we find three meaningful subgroups of people with intra-group homogeneity and inter-group heterogeneity. Although no study has examined this research question, the results of an optimal three-class solution has been found in other studies of posttraumatic responses, such as PTSD and depression (Contractor, et al., 2017), and PTSD, depression, and anxiety (Contractor, Elhai, et al., 2015). Thus, we could conceptualize an *impulsive (negative urgency) subtype of PTSD* characterized by high PTSD severity and the negative urgency facet of impulsivity. It would be helpful to reference negative urgency in lieu of the general construct of impulsivity when examining the relation between PTSD and impulsivity.

Further, our findings align with studies indicating a strong relation between negative urgency and PTSD cluster severity (Contractor, Armour, Forbes, et al., 2016; Roley, et al., 2017); and the mediating role of negative urgency in the relation between PTSD severity and risky behaviors (Weiss, et al., 2015). In the clinical realm, targeting emotion regulation skills needs to be an important component of treatment for those experiencing greater PTSD severity and negative urgency (Cloitre, Koenen, Cohen, & Han, 2002; Ford, Courtois, Steele, Hart, & Nijenhuis, 2005).

NACM and arousal cluster severity mainly paralleled negative urgency severity. NACM symptoms in particular are quite representative of PTSD's inherent emotional distress (Contractor, et al., 2014; Elhai, et al., 2015), and engaging in impulsive behaviors (e.g., substance use, suicidal behaviors) may reduce this emotional distress (McLean, et al., 2017; Weiss, Tull, Viana, Anestis, & Gratz, 2012). Further, it is possible that a tendency to act impulsively when experiencing intense negative emotions associated with NACM and AAR symptoms may exacerbate PTSD symptom severity in the long-run (Mirhashem, et al., 2017). Clinically, it may be beneficial to assess for and target impulsive tendencies among individuals with increased NACM and AAR severity to prevent the development of negative behavior cycles.

Lastly, we found a pattern of increasing depression severity and anger regulation difficulties with increasing PTSD severity and impulsivity. In addition to supporting pre-existing theoretical models of these constructs and alignment with empirical research, our results support a clinical focus on depression and anger management for clients who report PTSD severity and impulsivity. Future efforts should focus on developing and evaluating the efficacy of integrated PTSD treatment approaches, including investigating the role of depression, anger, and impulsivity as underlying mechanisms of PTSD symptoms.

Like any study based solely on self-report for data collection, there may have been response biases and social desirability effects. Further, we did not use item-level data as LPA indicators because of model convergence problems. We recommend such an approach in future research with a larger sample to capture more heterogeneity and identify item-level data patterns contributing to diagnostic subgrouping. Additionally, future research needs to examine the generalizability of results to more culturally diverse samples with higher levels of clinical severity. Despite these limitations, using two different samples, we have indicated some preliminary evidence for a *negative urgency* subtype of PTSD (mainly impulsivity when experiencing negative affect) categorized by greater depression and difficulties regulating anger. This may be a more refined manner of categorizing the externalizing subtype of PTSD (M. W. Miller, 2003).

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Highlights

- We examined PTSD-impulsivity typologies and their construct validity.
- We used latent profile analyses on data from a student and a community sample.
- Results indicated an optimal 3-class solution, with classes differing in severity.
- Negative urgency was the predominant impulsivity facet differentiating classes.
- Anger and depression predicted membership in the high severity subgroup.

Figure 1. Latent profiles of participants based on responses to PTSD and impulsivity indicators (university sample)

Note. Class 1 is Moderate PTSD-Negative Urgency, Class 2 is Low PTSD-Negative Urgency, Class 3 is High PTSD-Negative Urgency, NACM is PTSD's negative alterations in mood and cognitions subscale; AAR is PTSD' alterations in arousal and reactivity subscale.

Figure 2. Latent profiles of participants based on responses to PTSD and impulsivity indicators (MTurk sample)

Note. Class 1 is Low PTSD-Negative Urgency, Class 2 is Moderate PTSD-Negative Urgency, and Class 3 is High PTSD-Negative Urgency, NACM is PTSD's negative alterations in mood and cognitions subscale; AAR is PTSD' alterations in arousal and reactivity subscale.

Table 1

Descriptive information on demographics.

	University sample (<i>n</i> = 412)	MTurk Sample (<i>n</i> = 346)
M (<i>SD</i>)		
Age	20.06 (4.42)	33.60 (9.52)
Years of Schooling	12.70 (1.30)	15.31 (2.43)
<i>n</i> (%)[*]		
Female	278 (74.50%)	199 (57.70%)
Employment Status		
Part time	198 (48.20%)	59 (17.10%)
Full time	27 (6.60%)	227 (65.80%)
Unemployed	20 (4.90%)	44 (12.80%)
Unemployed Student	166 (40.40%)	8 (2.30%)
Retired	N/A	7 (2%)
Relationship Status		
Single	331 (80.30%)	123 (35.50%)
Living with significant other	58 (14.10%)	51 (14.70%)
Married	18 (4.40%)	149 (43.10%)
Divorced, separated, or widowed	5 (1.20%)	23 (6.60%)
Racial Status		
White	297 (72.10%)	288 (83.20%)
Asian	17 (4.10%)	36 (10.40%)
African American	106 (25.70%)	22 (6.40%)
American Indian or Alaskan Native	15 (3.60%)	16 (4.60%)
Native Hawaiian/other Pacific Islander	3 (.70%)	5 (1.40%)
Ethnicity		
Hispanic or Latino	19 (4.70%)	39 (11.30%)
Not Hispanic or Latino	368 (90.40%)	296 (86%)
Income		
Less than \$15,000	141 (34.90%)	40 (11.60%)
\$15,000 – \$24,999	44 (10.90%)	47 (13.60%)
\$25,000 – \$34,999	39 (9.70%)	55 (15.90%)
\$35,000 – \$49,999	34 (8.40%)	53 (15.30%)
\$50,000 – \$64,999	48 (11.90%)	53 (15.30%)
\$65,000 – \$79,999	29 (7.20%)	34 (9.80%)
\$80,000 and higher	69 (17.10%)	64 (18.50%)

Note.

* All reported percentages are *valid percentages* to account for missing data.

Table 2

Fit indices of the latent-class models.

Model	AIC	BIC	SSABIC	Entropy	LMR (<i>p</i>)	BLRT (<i>p</i>)
University sample						
1 class	19510.638	19574.975	19524.203	–	–	–
2 class	18652.214	18752.739	18673.409	.89	860.544 (<i>p</i> < .001)	<i>p</i> < .001
3 class	18421.960	18558.675	18450.786	.90	243.755 (<i>p</i> = .0007)	<i>p</i> < .001
4 class	18325.815	18498.719	18362.271	.88	112.077 (<i>p</i> = .35)	<i>p</i> < .001
MTurk sample						
1 class	16756.938	16818.481	16767.724	–	–	–
2 class	15972.645	16068.806	15989.499	.90	787.330 (<i>p</i> < .001)	<i>p</i> < .001
3 class	15738.681	15869.460	15761.602	.89	247.265 (<i>p</i> = .0005)	<i>p</i> < .001
4 class	15646.992	15812.389	15675.981	.86	107.643 (<i>p</i> = .09)	<i>p</i> < .001

Note. AIC is Akaike Information Criterion, BIC is Bayesian Information Criterion, SSABIC is sample-size adjusted BIC, LMR is Lo–Mendell–Rubin Adjusted Likelihood Ratio Test value, BLRT is Bootstrapped Likelihood Ratio Test.

Table 3

Results of ANOVA tests comparing classes on PTSD and UPPS subscale scores.

Variables	University Sample			Class 2 M (SD)	Class 3 M (SD)	F	Partial η^2
	Full Sample M (SD)	Class 1 M (SD)					
Lack of Premeditation	21.44 (5.28)	21.89 (5.39)		21.16 (5.10)	21.27 (5.66)	.82	.004
Negative Urgency	30.29 (7.36)	31.77 (6.92) ^{>2} **, Cohen's d = .58; <3 **, Cohen's d = .64		27.82 (6.59) ^{<3} **, Cohen's d = 1.23	36.26 (7.11)	36.11 ^{**}	.16
Sensation Seeking	32.04 (6.88)	31.78 (7.07)		32.06 (6.51)	32.76 (7.78)	.36	.002
Lack of Perseverance	19.66 (4.99)	20.28 (4.97) ^{>2} *, Cohen's d = .35		18.59 (4.80) ^{<3} **, Cohen's d = .73	22.06 (4.71)	11.87 ^{**}	.06
Intrusions	5.67 (4.62)	7.66 (3.18) ^{>2} **, Cohen's d = 1.83; <3 **, Cohen's d = 1.38		2.49 (2.41) ^{<3} **, Cohen's d = 3.11	12.57 (3.90)	302.22 ^{**}	.60
Avoidance	2.80 (2.42)	4.21 (1.90) ^{>2} **, Cohen's d = 2.02; <3 **, Cohen's d = .84		1.00 (1.21) ^{<3} **, Cohen's d = 3.25	5.70 (1.65)	290.58 ^{**}	.59
NACM	7.26 (6.44)	10.02 (3.67) ^{>2} **, Cohen's d = 2.43; <3 **, Cohen's d = 2.14		2.27 (2.63) ^{<3} **, Cohen's d = 4.78	18.09 (3.87)	596.30 ^{**}	.75
AAR	5.95 (5.73)	8.42 (3.88) ^{>2} **, Cohen's d = 2.16; <3 **, Cohen's d = 1.96		1.66 (2.11) ^{<3} **, Cohen's d = 4.90	15.60 (5.73)	509.85 ^{**}	.72
MTurk sample							
Lack of Premeditation	21.22 (5.73)	20.25 (5.08) ^{<3} *, Cohen's d = .36		21.15 (5.15)	22.75 (7.59)	3.42 [*]	.02
Negative Urgency	29.56 (7.68)	25.95 (7.73) ^{<2} **, Cohen's d = .53; <3 **, Cohen's d = 1.13		29.68 (6.21) ^{<3} **, Cohen's d = .71	34.63 (7.57)	31.19 ^{**}	.16
Sensation Seeking	28.63 (8.28)	28.75 (7.70)		28.39 (8.04)	28.98 (9.83)	.13	.001
Lack of Perseverance	20.37 (5.66)	18.24 (4.95) ^{<2} **, Cohen's d = .55; <3 **, Cohen's d = .74		21.11 (5.47)	22.35 (6.16)	14.22 ^{**}	.08
Intrusions	8.84 (5.43)	3.35 (2.77) ^{<2} **, Cohen's d = 2.28; <3 **, Cohen's d = 4.44		10.09 (3.13) ^{<3} **, Cohen's d = 1.88	15.64 (2.77)	407.19 ^{**}	.71
Avoidance	3.80 (2.50)	1.34 (1.58) ^{<2} **, Cohen's d = 1.94; <3 **, Cohen's d = 3.42		4.52 (1.69) ^{<3} **, Cohen's d = 1.22	6.41 (1.38)	247.99 ^{**}	.60
NACM	10.89 (7.60)	3.07 (2.89) ^{<2} **, Cohen's d = 2.64; <3 **, Cohen's d = 5.35		12.50 (4.15) ^{<3} **, Cohen's d = 2.18	21.20 (3.82)	537.66 ^{**}	.77
AAR	9.27 (6.47)	2.55 (2.59) ^{<2} **, Cohen's d = 2.66; <3 **, Cohen's d = 4.78		10.81 (3.55) ^{<3} **, Cohen's d = 1.93	17.77 (3.68)	475.12 ^{**}	.75

Note. University Sample: Class 1 is Moderate PTSD-Negative Urgency, Class 2 is Low PTSD-Negative Urgency, Class 3 is High PTSD-Negative Urgency; MTurk sample: Class 1 is Low PTSD-Negative Urgency, Class 2 is Moderate PTSD-Negative Urgency, and Class 3 is High PTSD-Negative Urgency; NACM is PTSD's negative alterations in mood and cognitions subscale; AAR is PTSD's alterations in arousal and reactivity subscale;

* $p < .05$;

$p < .001$
**

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Table 4

Results of multinomial logistic regression analyses.

OR (95% CI)			
University Sample			
	Class 2 (Low) vs. 1 (Moderate) [#]	Class 3 (High) vs. 1 (Moderate) [#]	Class 3 (High) vs. 2 (Low) [#]
Age	1.03 (.97 – 1.11)	1.05 (.97 – 1.14)	1.02 (.96 – 1.08)
Gender	.52 (.28 – .97) *	.98 (.41 – 2.35)	1.87 (1.01 – 3.45)
Anger	.86 (.80 – .92) **	1.14 (1.05 – 1.23) <i>p</i> = .001	1.32 (1.23 – 1.43) <i>p</i> = .001
MTurk sample			
	Class 2 (Moderate) vs. 1 (Low) [#]	Class 3 (High) vs. 1 (Low) [#]	Class 3 (High) vs. 2 (Moderate) [#]
Age	.98 (.94 – 1.01)	1.02 (.95 – 1.09)	1.00 (.95 – 1.06)
Gender	.54 (.27 – 1.09)	.52 (.16 – 1.68)	.98 (.38 – 2.55)
Depression	1.37 (1.26 – 1.50) **	2.08 (1.63 – 2.66) **	1.51 (1.21 – 1.89) **

Note. University Sample: Class 1 is Moderate PTSD-Negative Urgency, Class 2 is Low PTSD-Negative Urgency, Class 3 is High PTSD-Negative Urgency; MTurk sample: Class 1 is Low PTSD-Negative Urgency, Class 2 is Moderate PTSD-Negative Urgency, and Class 3 is High PTSD-Negative urgency;

* *p* < .05;

** *p* < .001;

[#] indicates the reference class.