Quantitative and Qualitative Subgroup Differences in PTSD Symptom Presentations:

A Latent Class Analysis

by

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Abstract

Posttraumatic stress disorder (PTSD) is a highly heterogeneous disorder (Galatzer-Levy & Bryant, 2013). Latent class analysis (LCA) and latent profile analysis (LPA) have been used to identify homogeneous subgroups of individuals with PTSD symptoms. However, most of these studies are based on *DSM-IV* rather than *DSM-5* PTSD criteria. In addition, these studies employ different indicators of class membership, which contributes to variability in the number and nature of latent classes identified. Specifically, studies have identified (a) quantitatively different classes (i.e., low, moderate, and high PTSD symptoms; e.g., Contractor et al., 2018); (b) quantitatively and qualitatively different classes (e.g., moderate PTSD symptoms with high reexperiencing symptoms; Sripada et al., 2020); and (c) primarily qualitatively different classes (e.g., dysphoric, anxious/reexperiencing, high symptoms; Pietrzak et al., 2014). Further, there is relatively limited validation of latent classes with respect to differential relationships with external correlates, such as various forms of comorbid psychopathology. Accordingly, to address these limitations, an LCA of *DSM-5* PTSD symptoms was conducted in a sample of undergraduate students (N = 322) who met criteria for a subthreshold diagnosis of PTSD. The current study aimed to replicate and extend findings from the limited number of LCAs of *DSM-5* PTSD criteria, and to examine quantitative and qualitative class differences in PTSD symptoms and other forms of psychopathology. Findings revealed a three-class solution: Low Anhedonia/Externalizing Behaviors, Moderate Symptoms, and High Symptoms of PTSD. Class differences were validated with the Personality Assessment Inventory (PAI; Morey, 1991). Implications and future directions are discussed.

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List of Abbreviations

ADHD	Attention-deficit/hyperactivity disorder
AGG	Aggression
AGG-A	Aggressive Attitude
AGG-P	Physical Aggression
AGG-V	Verbal Aggression
ALC	Alcohol Problems
ANOVA	Analysis of variance
ANT	Antisocial Features
ANT-A	Antisocial Behaviors
ANT-E	Egocentricity
ANT-S	Stimulus-Seeking
ANX	Anxiety
ANX-A	Affective (Anxiety)
ANX-C	Cognitive (Anxiety)
ANX-P	Physiological (Anxiety)
ARD	Anxiety Related Disorders
ARD-O	Obsessive Compulsive
ARD-P	Phobias
ARD-T	Traumatic Stress
AvePP	Average posterior class probability

AWE	Approximate weight of evidence criterion
BF	Bayes Factor
BIC	Bayesian information criteria
BOR	Borderline Features
BOR-A	Affect Instability
BOR-I	Identity Problems
BOR-N	Negative Relationships
BOR-S	Self-Harm
CAIC	Consistent Akaike's information criterion
cmP	Approximate correct model probability
DEP	Depression
DEP-A	Affective (Depression)
DEP-C	Cognitive (Depression)
DEP-P	Physiological (Depression)
DRG	Drug Problems
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders (4th Ed.)
DSM-5	Diagnostic and Statistical Manual of Mental Disorders (5th Ed.)
FIML	Full information maximum likelihood
FMM	Factor Mixture Modeling
GAD	Generalized anxiety disorder
HSD	Honestly significant difference
INC	Inconsistency
INF	Infrequency

LEC-5	Life Events Checklist for DSM-5
LCA	Latent class analysis
LL	Loglikelihood
LMR	Lo-Mendell-Rubin Likelihood ratio test
LPA	Latent profile analysis
LRT	Vuong-Lo-Mendell-Rubin likelihood ratio test
LTA	Latent transition analysis
MAN	Mania
MAN-A	Activity Level
MAN-G	Grandiosity
MAN-I	Irritability
MCAR	Missing completely at random
MDD	Major depressive disorder
M	Mean
MLR	Maximum Likelihood Robust
N	Sample size
OCC	Odds of correct classification ratio
OR	Odds ratio
PAI	Personality Assessment Inventory
PAR	Paranoia
PAR-H	Hypervigilance
PAR-P	Persecution
PAR-R	Resentment

PCL-5	PTSD Checklist for DSM-5
PTSD	Posttraumatic stress disorder
SCZ	Schizophrenia
SCZ-P	Psychotic Experiences
SCZ-S	Social Detachment
SCZ-T	Thought Disorder
SD	Standard deviation
SOM	Somatic Complaints
SOM-C	Conversion
SOM-H	Health Concerns
SOM-S	Somatization
SPSS	Statistical Package for the Social Sciences
SUI	Suicide

Quantitative and Qualitative Subgroup Differences in PTSD Symptom Presentations: A Latent Class Analysis

Posttraumatic stress disorder (PTSD) is a highly heterogeneous disorder. The *Diagnostic and Statistical Manual of Mental Disorders (DSM)* criteria for PTSD were expanded from *DSM-IV* (American Psychiatric Association [APA], 1994) to *DSM-5* (APA, 2013), resulting in an increase in the number of ways to meet criteria for a PTSD diagnosis by a factor of eight from 79,794 in *DSM-IV* to 636,120 in *DSM-5* (Galatzer-Levy & Bryant, 2013; Olbert et al., 2014). Further, the number of disjoint combinations (i.e., combinations of symptoms that meet the diagnostic criteria but have no symptoms in common) also increased from 42,000 in *DSM-IV* to 336,000 in *DSM-5* (Olbert et al., 2014). Although the conceptual heterogeneity is likely much greater than the empirical heterogeneity, this is still problematic because any two individuals meeting the criteria for a PTSD diagnosis are unlikely to present with the same symptomatology (Olbert et al., 2014). While there is evidence that PTSD is a dimensional construct (e.g., Kramer et al., 2016; Ruscio et al., 2002), PTSD is also a multifaceted construct, with as many as seven distinct factors (e.g., Armour, Tsai et al., 2015). This means that individuals can differ both quantitatively, i.e., exhibit higher or lower total PTSD severity, and qualitatively, i.e., exhibit different symptom profiles. Accordingly, researchers have tried to reduce this heterogeneity by creating distinct, clinically meaningful subgroups of individuals with PTSD symptoms. Such subgroups may differ in their latent structure, etiology, risk factors, course of the disorder, and comorbidities (Dalenberg et al., 2012). Therefore, accurately deriving and utilizing subgroups can allow for accurate investigation into the development, course, presentation, and treatment of these specific symptom profiles (Wolf et al., 2017). Subsequently, assessment, prevention, and

intervention efforts can be tailored based on individual needs (Galatzer-Levy & Bryant, 2013; Pietrzak et al., 2014).

In an attempt to address heterogeneity in PTSD, researchers have identified unique subgroups of PTSD. Early investigations used cluster analysis, a group of techniques that identifies homogeneous groups of individuals within a larger sample (see Ruscio & Ruscio, 2004b for review). Cluster analytic findings consistently identified three qualitatively different subgroups of PTSD: low pathology, internalizing, and externalizing (Flood et al., 2010; McDevitt-Murphy et al., 2012; Miller et al., 2003, 2004; Miller & Resick, 2007; Rielage et al., 2010). The low pathology subgroup was typically described as a "normally functioning" group because individuals in this group met PTSD criteria but had relatively intact emotional and social functioning (e.g., Flood et al., 2010; Miller et al., 2003). In contrast, individuals classified as internalizers or externalizers were described as having clinically significant pathology other than a PTSD diagnosis (e.g., Flood et al., 2010; Miller et al., 2003). Specifically, individuals classified as externalizers had higher levels of aggression, hostility, substance use, overactivity, impulsivity, fearlessness, intimidation, and decreased constraint (e.g., Flood et al., 2010; Miller et al., 2003). Alternatively, individuals classified as internalizers had higher levels of negative affect, PTSD, depression, hypochondriasis, and low positive affect (e.g., Flood et al., 2010; Miller et al., 2003).

Although cluster analysis provided preliminary evidence of subgroups of PTSD, this approach has been heavily criticized (see Blashfield, 1984 and Ruscio & Ruscio, 2004b for reviews). The most important criticisms of cluster analysis are that it lacks specific rules for determining the superiority of one model over another, relies on subjective judgment to identify final models (e.g., Ruscio & Ruscio 2004b), does not produce maximum likelihood estimates of

parameters, does not allow for significance testing, and does not test model fit (Dalenberg et al., 2012; Meyers et al., 2013). Given these concerns, it has been suggested that cluster analysis should only be utilized as an exploratory technique (e.g., Pastor et al., 2007). Consequently, the field has mostly abandoned this approach in favor of statistically superior ways to investigate subgroups of PTSD. These techniques, latent class analysis (LCA) and latent profile analysis (LPA), are more sophisticated ways to statistically derive, explicate, and validate subgroups.

What is LCA/LPA?

LCA and LPA are types of latent variable mixture modeling (Collins & Lanza, 2010). Mixture modeling is used when a sample of interest cannot be described by one population distribution because it consists of a mixture of more than one population, with each being modeled by its own distribution and set of parameters (Pastor et al., 2007). Thus, these approaches are used when theory suggests that a population is composed of two or more mutually exclusive latent subgroups (see Lanza & Rhodes, 2013 for review). LCA and LPA focus on individuals and their patterns of characteristics, known as person-oriented approaches (Muthén & Muthén, 2000). Person-oriented approaches differ from traditional variable-oriented approaches (e.g., factor analysis), which aim to identify relationships between variables and apply these patterns across all individuals (see Collins & Lanza, 2010 for review, 2010).

LCA and LPA differ in the nature of their indicators. Strictly speaking, LCA treats indicators as only categorical, whereas LPA treats indicators as only continuous (Collins & Lanza, 2010). Both LCA and LPA have been used within the PTSD literature because PTSD symptoms are sometimes treated as continuous (e.g., Hebenstreit et al., 2015) and sometimes treated as categorical (e.g., Campbell et al., 2020). However, the distinction between LCA and LPA may be unnecessary because both LCA and LPA are based on the same type of model

(latent variable mixture modeling), and both continuous and categorical indicators can be used together in the same analysis (Pastor et al., 2007).

In a typical LCA/LPA, variables of interest are selected as indicators of latent class membership. Statistical algorithms then systematically categorize individuals into homogeneous subgroups based on underlying characteristics or response patterns. The use of statistical algorithms to classify individuals is a distinct advantage of LCA/LPA because such classifications are based on statistics instead of inherently subjective investigator judgment (Ginley & Bagge, 2017). Though the main goal of an LCA/LPA is to categorize individuals into homogeneous subgroups, these analyses can also be used to describe within-class similarities and between-group differences. Two types of parameters, both of which are probabilities, are produced: latent class prevalence and item-response probabilities (Collins & Lanza, 2010). The latent class prevalence parameter is the overall likelihood of being assigned to a particular class, and item response probabilities are the probability of a particular response conditional on class membership (Collins & Lanza, 2010; Muthén & Muthén, 2000).

In psychopathology, LCA/LPA has been used widely for a variety of different purposes. For example, LCA/LPA has been used to create meaningful subgroups of individuals at risk for suicidal thoughts or behavior (Dhingra et al., 2016), describe individuals who have attempted suicide (Ginley & Bagge, 2017), and categorize traumatic event exposure (McCutcheon et al., 2010). In addition, LCA/LPA has been used to statistically derive and validate subgroups of various psychological disorders, including attention deficit-hyperactivity disorder (ADHD; Hudziak et al., 1998), alcohol use (Casey et al., 2013), and depression (Carragher et al., 2009), among others. These findings are examples of LCA/LPAs utility in psychopathology. Statistically derived subgroups can be used to describe distinct clinical presentations of a

disorder or phenomenon. Subsequently, these clinical presentations can be used to inform the development of appropriate assessment, prevention, and intervention efforts based on individual needs.

LCA/LPA in the Context of PTSD: Previous LCA/LPAs

DSM-IV Findings

Numerous LCA/LPAs have been conducted in samples of individuals with PTSD symptoms, the majority of which have utilized the *DSM-IV* criteria for PTSD. A comprehensive review of these findings reveals inconsistent methods and results. In particular, methods vary in the number and type of indicators used to estimate latent class membership. While most used only PTSD symptoms as indicators, others used both PTSD symptoms and depression as indicators or PTSD symptoms, depression, and another measure of psychopathology as indicators. As a result of these different methods, findings differ in the number and types of latent classes identified.

PTSD Symptoms as Latent Class Indicators

Within the *DSM-IV* literature, most LCA/LPAs have been performed using only PTSD symptoms as indicators of latent class membership, aimed at understanding the nature of PTSD symptoms in isolation. Though one might expect the use of similar latent class indicators to provide a cohesive set of results, an examination of these findings reveals a wide range of findings, including various numbers and types of latent classes. Specifically, studies have revealed three distinct patterns of results: (a) solutions suggesting mainly quantitative symptom differences (i.e., classes differing in symptom severity only), (b) solutions suggesting both quantitative and qualitative symptom differences (i.e., classes differing in symptom severity and specific symptom presentations), and (c) solutions suggesting mainly qualitative symptom

differences. In addition, further analyses have suggested differential relationships between class membership and other areas of psychopathology.

Solutions Suggesting Quantitative Symptom Differences. LPA/LCAs that have utilized only PTSD symptoms as indicators have identified solutions suggesting quantitative symptom differences. In an early study, Breslau and colleagues (2005) described a three-class solution with classes labeled as no, intermediate, or pervasive disturbance. Subsequently, the same three-class solution was replicated in a sample of veterans (Steenkamp et al., 2012). Similarly, another LCA also identified three-class symptom severity driven solution, identifying similar classes: low, moderate, and high symptoms (Hellmuth et al., 2014). Moreover, findings from LCA/LPAs conducted in survivors of natural disasters have similarly identified symptom severity driven solutions, albeit identifying four-class solutions. Specifically, findings revealed classes with negligible/minimal, low/mild, moderate, and high symptoms (Bondjers et al., 2018; Rosellini et al., 2014). Finally, results of a set of LCAs conducted in two samples of adults exposed to rocket shelling identified a different pattern of results, with findings in both samples identifying a resilient class. Two patterns of results emerged. In the first sample, the LCA revealed a four-class solution: resilient, low/moderate symptoms, moderate/high symptoms, and high symptoms. In the second sample, the LCA revealed a three-class solution: resilient, low/moderate, moderate/high symptoms (Itzhaky et al., 2017).

Solutions Suggesting Quantitative and Qualitative Symptom Differences. LCA/LPAs have also identified solutions suggesting that classes differ both quantitatively and qualitatively (i.e., exhibit differential symptom profiles). However, these findings are again inconsistent in the number and type of latent classes identified. On the one hand, a three-class solution has been identified: intermediate disturbance, pervasive disturbance with low avoidance, and pervasive

disturbance with high avoidance (Böttche et al., 2015). On the other hand, LCAs conducted in samples of veterans consistently identified a four-class solution: one low, two intermediate/moderate, and one high symptom class (Hebenstreit et al., 2014; Maguen et al., 2013; Sripada et al., 2020). However, these findings differ in the nature of the moderately symptomatic classes. Specifically, Maguen and colleagues (2013) identified one intermediate symptom class and one intermediate symptom class with low emotional numbing. In contrast, Hebenstreit and colleagues (2014) identified one intermediate symptom class and one intermediate symptom class with high emotional numbing. As a third pattern of results, Sripada and colleagues (2020) identified one moderate symptom class with high reexperiencing symptoms and one moderate symptom class with high emotional numbing.

Although studies have generally identified three-class or four-class solutions, others have identified additional classes. For example, Hebenstreit and colleagues (2015) found the best fit for a five-class solution: low symptoms, low symptoms with high hyperarousal, intermediate symptoms, intermediate symptoms with high hyperarousal, and high symptoms. In addition, Nugent and colleagues (2012) found six latent classes: resilient, moderate with amnesia, moderate with diminished interest, moderate without diminished interest and amnesia, severe without amnesia, and severe overall.

Additional follow-up analyses have suggested qualitative differences in PTSD symptom patterns, such that a specific symptom cluster differentiates the latent classes, although findings are mixed. Findings have essentially implicated each symptom cluster as important in differentiating latent classes. First, results revealed that avoidance and hypervigilance distinguished the pervasive class (most severe) from other classes (Steenkamp et al., 2012). Second, results revealed that emotional numbing specifically distinguished the pervasive class

(Breslau et al., 2005). Third, results revealed that those with more severe symptoms (severe class) are more likely to have avoidance/numbing symptoms (Rosellini et al., 2014). Lastly, other findings have failed to demonstrate that a particular symptom cluster differentiated between classes (Hellmuth et al., 2014). In sum, while some findings (Rosellini et al., 2014; Steenkamp et al., 2012) have demonstrated both quantitative and qualitative differences in symptom presentations, findings are inconsistent.

Solutions Suggesting Only Qualitative Symptom Differences. While results often identify classes differing in their symptom severity, results from previous LCA/LPAs have also identified qualitatively distinct subgroups of PTSD. For one, Pietrzak and colleagues (2014) identified a three-class solution, with each class representing a distinct subgroup of PTSD: anxious/reexperiencing, dysphoric, and high symptoms. Subsequently, Horn and colleagues (2016) identified three qualitatively distinct subgroups of PTSD: high symptoms, dysphoric (high emotional numbing and dysphoric arousal), and threat (high reexperiencing, avoidance, and anxious arousal).

The Relationship Between Class Membership and Other Psychopathology. Additional analyses have been conducted to investigate the relationship between class membership and other areas of psychopathology. Unsurprisingly, findings have generally indicated that those in the more symptomatic classes are more likely to endorse other psychopathology, such as depression (Böttche et al., 2015; Horn et al., 2016; Nugent et al., 2012; Pietrzak et al., 2014), anxiety (Böttche et al., 2015; Pietrzak et al., 2014), alcohol or substance use problems (Horn et al., 2016; Pietrzak et al., 2014), suicide attempts (Pietrzak et al., 2014), personality disorders (Pietrzak et al., 2014), and somatization symptoms (Böttche et al., 2015).

In addition, findings have demonstrated relationships between specific subgroups of PTSD and other measures of psychopathology, the majority of which have focused on the dysphoric subgroup. Specifically, individuals in the dysphoric class were more likely to endorse depression and alcohol use problems (Horn et al., 2016). In addition, other findings have suggested that individuals in the dysphoric class (compared to an anxious reexperiencing class) were more likely to express symptoms of major depression. Individuals in the anxious reexperiencing class were more likely to express nicotine dependence, borderline personality disorder, and suicide attempts compared to individuals in the dysphoric class (Pietrzak et al., 2014).

PTSD Symptoms and Depression as Latent Class Indicators

Given the high comorbidity of PTSD and depression, LPAs have been conducted to understand the nature of PTSD and depression using symptoms of PTSD and depression as indicators of latent class membership. Findings are generally consistent, with one LPA finding a four-class solution: mild PTSD and depression, low-moderate PTSD and depression, high-moderate PTSD and depression, and severe PTSD and depression (Au et al., 2013), and another finding a similar solution, albeit with three classes: low PTSD and depression, moderate PTSD and depression, and high PTSD and depression (Armour, Contractor, et al., 2015). With the exception of the additional mildly symptomatic class included in Au and colleagues' (2013) solution, these models revealed similar findings, such that both identified solutions based on quantitative symptom differences.

PTSD Symptoms, Depression, and Other Measures as Latent Class Indicators

LCA and LPA have been used to create meaningful subgroups of individuals with PTSD symptoms and other comorbid disorders by including PTSD symptoms and other psychopathology as indicators of latent class membership. To begin, PTSD symptoms, major

depressive disorder (MDD), alcohol and other drug disorders, and trauma history have been used as indicators of latent class membership. Results revealed four classes: asymptomatic, mild PTSD with current MDD, severe PTSD with current MDD and alcohol or substance use disorder, and extreme PTSD with current MDD (Hruska et al., 2014). In addition, a subsequent LPA utilizing symptoms of PTSD, MDD, and generalized anxiety disorder (GAD) as indicators of latent class membership identified three latent classes: mild, moderate, and severe symptomatology (Contractor et al., 2015). Although the number of classes differed (four vs. three), these findings suggest that PTSD symptoms and other comorbid conditions can be categorized based on symptom severity. These results are also consistent with results of studies that used only PTSD symptoms and depression as indicators of latent class membership (Armour, Contractor, et al., 2015; Au et al., 2013), indicating that classes can and should be differentiated based on symptom severity.

In summary, results from LCA/LPAs using the *DSM-IV* criteria for PTSD are confusing and do not provide a consistent set of results. Previous research has employed different methods for estimating latent class membership, with some using only PTSD symptoms (e.g., Pietrzak et al., 2014), some using PTSD symptoms and depression (e.g., Armour, Contractor, et al., 2015), and some using PTSD, depression, and other variables as indicators of latent class membership (e.g., Hruska et al., 2014). It should be noted that the use of different indicators may be due to the differing goals of previous research: some researchers were interested in understanding PTSD by itself, whereas others were interested in understanding PTSD and other comorbid conditions. The majority of previous research has been conducted using only PTSD symptoms as indicators of latent class membership, though these results are also mixed. Specifically, while some previous findings have suggested that individuals with PTSD symptoms vary quantitatively

(i.e., in the severity of their symptoms), others have suggested that there are qualitative differences between individuals with PTSD symptoms (i.e., specific symptom presentations). Moreover, there are conflicting patterns of results with regard to the relationship between class membership and other areas of psychopathology.

DSM-5 Findings

As evidenced by the previous review, while many LCA/LPAs have been conducted utilizing the *DSM-IV* criteria for PTSD, a variety of methods have been used, and there are a variety of findings. As a result, there is a lack of consensus about the number and type of latent classes that should be identified. Additionally, the *DSM-5* literature provides little additional insight. This literature is further complicated by the numerous changes to the PTSD criteria for *DSM-5*. The *DSM-5* criteria are longer and more complex, and thus represent a more heterogeneous diagnosis of PTSD compared to the previous *DSM-IV* criteria (Olbert et al., 2014). Changes to the PTSD criteria for *DSM-5* have been detailed elsewhere (see Weathers et al., 2014 for review). Most important to the discussion of heterogeneity within PTSD are the addition of individual symptoms and symptom clusters. Specifically, the avoidance and numbing cluster was split into two clusters: avoidance and negative alterations in cognitions and mood, and three new symptoms were added. The addition of more symptoms and symptom clusters presents even more challenges than did *DSM-IV*: with more symptoms and symptom clusters, there are now even more combinations of symptoms that meet the criteria for a PTSD diagnosis (Olbert et al., 2014). This leads to more confusion and difficulty in understanding PTSD.

Thus far, only six LCA/LPAs have utilized the *DSM-5* criteria for PTSD. Consistent with the *DSM-IV* literature, methods for estimating latent class membership vary, such that different numbers and types of indicators of latent class membership have been used. As a result, findings

have revealed different numbers and types of latent classes. Also consistent with the *DSM-IV* literature, LCA/LPAs conducted using only the *DSM-5* PTSD symptoms have found both quantitative and qualitative symptom differences. In particular, one LCA revealed a four-class solution: no PTSD, moderate PTSD, high reexperiencing and avoidance symptoms, and high symptoms (Minihan et al., 2018). Another recent LCA indicated a four-class solution, including distinct subgroups of PTSD: threat-reactivity, dysphoric, low symptoms, and high symptoms (Campbell et al., 2020).

Within the *DSM-5* literature, four of the six previous LCA/LPAs were conducted using PTSD and another variable (depression or impulsivity) as indicators of latent class membership, aimed at investigating PTSD and comorbid conditions. Results from two LPAs conducted by Contractor and her colleagues (2017, 2018) were generally consistent, finding a three-class solution with classes differing in their severity of PTSD symptoms and either depression symptoms or impulsivity (negative urgency). Consistent with these findings, a recent LPA also identified three classes differing in PTSD and depressive symptom severity: low PTSD/depression, moderate PTSD/depression, and high PTSD/depression (Eli et al., 2020). In contrast, another LPA utilized both PTSD symptoms and depression as indicators of latent class membership but identified a four-class solution: low symptoms, mostly PTSD, mostly depression, and combined PTSD and depression (Cao et al., 2015). Again, there is a lack of consensus about the number and nature of latent classes to be identified.

The *DSM-5* literature is further limited by the samples used. First and foremost, Campbell and colleagues (2020) did not use the correct *DSM-5* criteria for PTSD. Specifically, they required three symptoms each of Criteria D and E, whereas *DSM-5* only requires two symptoms each. As a result, the conclusions they made about subgroups of PTSD were based on

a more stringent diagnostic rule than that of the actual *DSM-5* criteria. Second, Minihan and colleagues (2018) conducted their analyses in refugees and asylum seekers, and Eli and colleagues (2020) conducted their analyses with parents who lost a child. While both are worthy and informative studies, not all these individuals experienced a Criterion A traumatic event. Therefore, these results may not be generalized to, or representative of, individuals who have experienced a traumatic event, or individuals diagnosed with PTSD. Lastly, the overall symptom severity and most commonly experienced traumatic event are not clear in these samples (Campbell et al., 2020; Eli et al., 2020; Minihan et al., 2018). Thus, it is unclear whether the symptomatology in these samples is similar to a clinical population or to a population that is relatively asymptomatic.

The Dissociative Subtype

The utility of LCA/LPA is exemplified in the incorporation of the dissociative subtype (i.e., an empirically validated subgroup; Dalenberg et al., 2012) of PTSD into the *DSM-5* criteria (APA, 2013). Preliminary investigations of the dissociative subtype incorporated both clinical and neurobiological evidence for the subtype (see Lanius et al., 2012 for review). Subsequent investigations of the dissociative subtype have utilized LCA/LPA to further validate the subtype. Findings from LCA/LPAs conducted with the *DSM-IV* PTSD criteria emphasized the need for a specific dissociative subtype, such that findings consistently demonstrated a categorically distinct group of individuals who exhibited dissociative symptoms (e.g., Steuwe et al., 2012; Wolf, Lunney, et al., 2012; Wolf, Miller, et al., 2012).

Subsequent replications further validate the inclusion of the dissociative subtype in *DSM-5*. Specifically, prior studies (Frewen et al., 2015; Hansen et al., 2016; Wolf et al., 2017) have used PTSD symptoms and measures of dissociation as indicators to conduct LCA/LPAs in a

variety of samples. Findings have identified a variety of latent class solutions, including a two-class solution (dissociative and high PTSD symptoms, non-dissociative and high PTSD symptoms; Hansen et al., 2016), a three-class solution (high PTSD with high dissociation, high PTSD with no dissociation, asymptomatic; Blevins et al., 2014; Wolf et al., 2017), and a five-class solution (moderate symptoms with higher emotional numbing, moderate symptoms with higher hyperarousal, moderate symptoms with dissociation, severe symptoms with dissociation, severe symptoms with no dissociation; Frewen et al., 2015). Although these findings identified different numbers of classes, these results all support the existence of a dissociative subtype of PTSD.

While these findings further validate the inclusion of the dissociative subtype in *DSM-5*, these findings also add to the confusion surrounding latent class models of PTSD. Indeed, these three studies identified somewhat contradictory models of PTSD – with some identifying only moderate and severe levels of PTSD (Frewen et al., 2015; Steuwe et al., 2012; Wolf, Lunney, et al., 2012; Wolf, Miller, et al., 2012), one identifying only high levels of PTSD symptoms (Hansen et al., 2016), and two identifying either high or asymptomatic levels of PTSD symptoms (Blevins et al., 2014; Wolf et al., 2017). These findings contradict studies that have suggested that individuals exhibit low, moderate, or high levels of PTSD symptoms (e.g., Minihan et al., 2018).

Limitations of the Previous Literature

As evidenced by the previous review, there are several limitations to previous LCA/LPAs of PTSD symptoms. First, there is a distinct lack of LCA/LPAs that have been performed using the *DSM-5* criteria for PTSD. As stated previously, given the substantial changes to the criteria for PTSD for *DSM-5*, it is important to conduct LCA/LPAs using the current criteria.

Second, both the *DSM-IV* and *DSM-5* literature are limited by the various samples used to examine latent class models of PTSD. For example, previous studies have been conducted using clinical samples (e.g., Sripada et al., 2020), individuals meeting criteria for a PTSD diagnosis (e.g., Pietrzak et al., 2014), and trauma-exposed samples (e.g., Breslau et al., 2005). Given the different symptom levels in theses samples, it is possible that the conclusions made could be specific to the PTSD symptom level of the sample used.

Third, the previous literature is limited by the various approaches used to investigate latent class models of PTSD. There are few replications of findings using only PTSD symptoms as indicators of latent class membership in the same population. Instead, previous research has focused on changing aspects of the latent class model (including covariates) before replicating previous findings. Specifically, while some have used only PTSD symptoms as indicators of latent class membership (e.g., Campbell et al., 2020), others have included measures of other comorbid disorders to estimate latent class membership (e.g., Contractor et al., 2017).

Including covariates as indicators of latent class membership allows for the investigation of comorbid disorders but limits the interpretation of findings. Specifically, the use of covariates influences the resultant class solution because solutions produced by LCAs are sensitive to the indicators used (Randall, 2018). Including covariates in the estimation of the model may result in the identification of more classes (i.e., class overidentification), since the latent class model is being estimated based on the information from both PTSD symptoms and the covariate(s) (Lanza et al., 2013). As a result, when different indicators are used, different solutions are obtained – the same could be said for any statistical analysis – because the output is influenced by the input. While a different pattern of results may indicate a novel symptom presentation, this may also be

an artifact of the indicators used. Therefore, conclusions about specific subgroups seem premature without replication.

Including covariates as indicators of latent class membership also alters the interpretation of the resultant latent classes. The latent classes have been estimated based on different information, i.e., both PTSD symptoms and covariates, and thus the interpretation of the latent classes differs accordingly (Clark & Muthén, 2009; Lanza et al., 2013). This then raises the question of whether these classes should be interpreted with the covariates included or without (Vermunt, 2010).

Fourth, in both the *DSM-IV* and *DSM-5* literature, there is little agreement on the number of classes that should be identified. More importantly, there is a lack of consensus about whether these classes differ primarily quantitatively (i.e., in symptom severity), both quantitatively and qualitatively (i.e., in symptom severity and symptom profiles), or primarily qualitatively. Consistently identifying the same number of classes may not be essential, as this will likely vary based on the sample, but it is imperative that there is a consensus about the nature of these latent classes.

The importance of understanding comorbid disorders is clear: PTSD does not occur in a vacuum and often co-occurs with other disorders. However, it appears as though the literature may have gotten slightly ahead of itself. While it is useful to understand the disorders that are often comorbid with PTSD, it is important to first understand the disorder itself. Though previous findings have done LCA/LPAs using only the *DSM-IV* symptoms for PTSD as indicators of latent class membership, only two studies have conducted LCA/LPAs using just the *DSM-5* symptoms of PTSD as indicators of latent class membership (i.e., Campbell et al., 2020; Minihan et al., 2018). Therefore, there is not an empirical foundation for describing the

heterogeneity of *DSM-5* PTSD symptoms alone. As a result, further description of comorbid disorders should not be conducted until PTSD symptoms are understood in isolation. When investigating specific symptom presentations of PTSD, only PTSD symptoms should be used as indicators of latent class membership. Such an approach estimates the latent class model without including covariates in the class estimation phase. Subsequently, analyses could be conducted to further analyze the relationship between class membership, specific symptom clusters, and other areas of psychopathology.

Present Study

Based on the previous review, there is conflicting evidence with regard to the number and nature of latent classes identified in individuals with PTSD symptoms. Moreover, there are conflicting findings with regard to the relationship between class membership and other areas of psychopathology. Accordingly, an LCA of *DSM-5* PTSD symptoms was conducted in a sample of undergraduate students who met subthreshold criteria (see below for subthreshold definition) for a diagnosis of PTSD using only *DSM-5* PTSD symptoms as indicators of latent class membership. The current study aimed to replicate and extend findings from the limited number of LCAs of *DSM-5* PTSD criteria, examine quantitative class differences, and examine qualitative differences in PTSD symptoms and other areas of psychopathology. The following hypotheses were evaluated:

Hypothesis 1: LCA will identify classes that differ quantitatively in PTSD symptoms.

Hypothesis 2: LCA will identify classes that differ quantitatively in other areas of psychopathology, such that individuals expressing more severe PTSD symptoms will also show more severe psychopathology.

In addition to these hypotheses, specific qualitative between-class differences were explored. While the current literature and the exploratory nature of LCA do not allow for firm hypotheses about qualitative between-class differences in PTSD symptoms and other psychopathology, it is possible to speculate about these possible differences. Specifically, findings from the subgroup literature (e.g., Flood et al., 2010; Miller et al., 2003) suggest that there will be quantitative differences, such as a relatively low symptom class. Although participants were only included if they met subthreshold PTSD criteria, given the definition of subthreshold PTSD used (see below), participants could be included with a PCL-5 severity score of as low as 8. Classes will also show qualitative differences such that there will be an internalizing class, and an externalizing class. Further, the subgroup literature suggests that these classes will show corresponding differences in other areas of psychopathology, with individuals in the internalizing class showing higher levels of anxiety (ANX), anxiety-related disorders (ARD), and depression (DEP), and individuals in the externalizing class showing higher levels of antisocial features (ANT), alcohol problems (ALC), and drug problems (DRG).

Method

Participants and Procedure

Undergraduate students (N = 322) enrolled in a psychology course at a large southeastern university self-selected to participate. Participants completed a 60-minute online survey for research credit. The University's Institutional Review Board approved this protocol.

Initially, the sample included 1693 participants. After removing individuals deemed "random responders" on the PAI (i.e., scores greater than 75 on the Inconsistency [INC] or Infrequency [INF] scales), the sample included 1303 participants. Next, participants were included only if they reported exposure to a *DSM-5* Criterion A traumatic event (N = 1139; APA,

2013). Traumatic event exposure was determined by reviewing individuals' narrative descriptions of their worst event on the Life Events Checklist for *DSM-5* (LEC-5; Weathers, Blake, et al., 2013). Two graduate students reviewed the trauma narratives and independently rated participants' Criterion A status. Discrepancies in Criterion A status were resolved among the raters with the help of an expert in PTSD assessment as needed. The most commonly experienced traumatic event types were sexual assault (n = 92; 28.60%), transportation accident (n = 60; 18.60%), and suicide (n = 48; 14.90%; see Table A1).

Participants in the final sample (N = 322) all met criteria for subthreshold PTSD as defined by meeting the symptom criteria for Criterion B and at least two other symptom criteria. Recent work in this area has defined subthreshold PTSD as "meeting two or three Criteria B-E" (McLaughlin et al., 2015, p. 9). However, the current study required at least one Criterion B (reexperiencing) symptom to ensure a specific link between subthreshold symptoms and the index traumatic event. As the definition implies, individuals who meet full diagnostic criteria for PTSD generally express higher symptom levels than those with subthreshold PTSD (McLaughlin et al., 2015). However, there is considerable evidence for the debilitating nature of subthreshold PTSD. First, individuals with subthreshold levels of PTSD express functional impairment at levels much greater (four times) than those without PTSD (Cukor et al., 2010). In addition, individuals with subthreshold PTSD report clinically significant impairment (Marshall et al., 2001; Mylle & Maes, 2004; Stein et al., 1997; Zlotnick et al., 2002), which may be comparable to individuals who meet the full criteria for PTSD (Zlotnick et al., 2002). Second, further evidence for the debilitating nature of subthreshold PTSD is exemplified in the connection between subthreshold PTSD and other health problems, such as sleep disorders, respiratory conditions (El-Gabalawy et al., 2018), and physical health problems (e.g., ulcers, tachycardia;

Pietrzak et al., 2011). Lastly, previous studies have found similar duration of symptoms, levels of depression, and rates of other comorbid disorders in individuals with subthreshold PTSD and full PTSD (Jeon et al., 2007). Therefore, it has been suggested that individuals with subthreshold PTSD show significant, and maybe even equal, levels of functional impairment compared to individuals meeting full PTSD criteria. Thus, this was a worthwhile sample to investigate.

The final sample consisted of 322 participants who ranged in age from 18 to 31 (M = 20.08, SD = 1.71). The majority of participants self-identified as female (n = 273; 84.8%) and Caucasian (n = 284; 88.2%), with the rest of the sample self-identifying as Black (n = 21; 6.5%), Asian (n = 10; 3.1%), and other (n = 7; 2.2%). In addition, 4.0% (n = 13) of the sample self-identified as Hispanic or Latinx.

Measures

Demographics. A custom demographics questionnaire was created to obtain information about participants, such as age, race, and ethnicity.

Life Events Checklist for DSM-5 (LEC-5). Traumatic event exposure was measured using the LEC-5, a self-report measure of traumatic event exposure (Weathers, Blake, et al., 2013). The LEC-5 asks participants to indicate their exposure to 17 different types of traumatic events (e.g., natural disasters, physical and sexual assault, combat, etc.) by indicating if they experienced the event directly, witnessed it, learned about it, it was part of their job, they are unsure if they experienced the event, or the event does not apply to them. The current study utilized the extended version of the LEC-5, which asks participants to supply a brief narrative of their worst traumatic event and answer several follow-up questions about this event (e.g., whether the event involved life threat, serious injury, or sexual violence) to aid in determining

Criterion A status. The *DSM-IV* version of the LEC has shown good convergent validity and stability (Gray et al., 2004).

PTSD Checklist for DSM-5 (PCL-5). PTSD symptoms were measured using the PCL-5 (Weathers, Litz, et al., 2013), a self-report measure of *DSM-5* PTSD symptoms. Referring to their worst event, participants indicated how much they were bothered by each of the 20 PTSD symptoms in the past month using a 5-point scale ranging from 0 (*not at all*) to 4 (*extremely*). PCL-5 items rated as 2 (*moderately)* or higher were considered symptoms endorsed and were counted toward a PTSD diagnosis. The PCL-5 has shown strong test-retest reliability, discriminant and convergent validity, and internal consistency (Blevins et al., 2015). Cronbach's alpha for the current sample was 0.89.

Personality Assessment Inventory (PAI). Additional areas of psychopathology were measured using the PAI (Morey, 1991). The PAI is a 344-item self-report measure that includes four validity, 11 clinical, five treatment consideration, and two interpersonal scales. Participants indicated their response to each item on a 4-point scale ranging from 1 (*not true at all*) to 4 (*very true*). The PAI has been shown to possess excellent psychometric properties (Morey, 1991, 2007), including in samples of trauma-exposed undergraduate students (McDevitt-Murphy et al., 2007). The present study utilized the 11 clinical scales: anxiety (ANX), anxiety-related disorders (ARD), depression (DEP), mania (MAN), paranoia (PAR), schizophrenia (SCZ), borderline features (BOR), antisocial features (ANT), somatic complaints (SOM), alcohol problems (ALC), and drug problems (DRG), and two treatment consideration scales: aggression (AGG) and suicide (SUI). The present study also utilized two validity scales to identify and exclude random responders. Individuals who scored above 75 on INC and INF were excluded from the current sample.

Data Analysis

A robust maximum likelihood (MLR) estimator was utilized. A small proportion of the data were missing; covariance coverage for the proportion of pairwise present data ranged from 0.99 to 1.00. Data were missing due to participants accidentally skipping items or choosing not to answer items. Accordingly, missing data was handled using Full Information Maximum Likelihood Estimator (FIML; Enders, 2010). Descriptive statistics for study variables are displayed in Tables A2 and A3.

An LCA was conducted in Mplus Version 8 using PCL-5 items as indicators of latent class membership (Muthén & Muthén, 1998-2017). Multiple solutions were examined by starting with one class and increasing the number of classes until the model was no longer well defined. Prior to conducting analyses, PCL-5 items were dichotomized at 2 (*moderately;* i.e., symptom threshold*)* and above and treated as binary indicators. PCL-5 items were treated as binary indicators based on the recommendations of Kline (2016). Specifically, Kline (2016) has argued that it may be inappropriate to treat Likert-scale items with five or fewer categories as continuous. Numerous previous studies have utilized this approach (e.g., Hansen et al., 2015; Hebenstreit et al., 2014; Horn et al., 2016; Maguen et al., 2013; Minihan et al., 2018; Sripada et al., 2020; Steenkamp et al., 2012). Treating indicators as categorical was considered. However, when treating the indicators as categorical, an examination of the condition numbers and number of degrees of freedom indicated poorly identified models (Masyn, 2013).

Decisions on the best-fitting class solution were determined by collectively examining model fit indices, including Bayesian Information Criteria (BIC), consistent Akaike's information criterion (CAIC; Bozdogan, 1987), the approximate weight of evidence criterion (AWE; Banfield & Raftery, 1993), the approximate Bayes factor (BF), the Lo-Mendell-Rubin

likelihood ratio test (LMR), and the Vuong-Lo-Mendell-Rubin likelihood ratio test (LRT). Superior model fit was identified by lower BIC, CAIC, and AWE values, BF values greater than 3, an LMR with a significant p-value, and an LRT with a significant p-value (Masyn, 2013; Nylund et al., 2007). For both LMR and LRT, when comparing a model with *K* classes and a model with *K*-1 classes, a significant *p*-value indicates that the model with *K* classes has superior fit (Nylund et al., 2007). Models were also compared using the approximate correct model probability (cmP; Kass & Wasserman, 1995) with values greater than 0.1 considered candidate models (Masyn, 2013). Candidate models were then examined for interpretability using the condition numbers and examining class proportions. Specifically, condition numbers less than 10^{-6} may indicate poorly defined models, and small class sizes may indicate class overextraction (Masyn, 2013).

Candidate models were then compared based on classification accuracy using the average posterior class probability (AvePP) and the odds of correct classification ratio (OCC; Nagin, 2005). These statistics can be used to characterize the quality of the selected model. Models with values of AvePP greater than 0.7 and OCC values greater than 5 indicate classification precision (Nagin, 2005). After selecting the best-fitting model, entropy values were examined as a measure of accuracy. Values of the entropy statistic range from 0 to 1, with higher values indicating greater accuracy (e.g., Berlin et al., 2014; Ginley & Bagge, 2017).

After identifying the best-fitting model solution, a series of follow-up analyses were conducted to examine between-class differences in PTSD symptoms and PAI scales/subscales. Following the approach of others (e.g., Horn et al., 2016; Sripada et al., 2020), participants were assigned to their most likely class based on posterior probabilities. This approach, known as the classify-analyze approach, has been criticized (e.g., Nylund-Gibson et al., 2019). Since latent

class membership is a probability and not an exact value, there is some uncertainty involved in the estimation of class membership (Clark & Muthén, 2009; Lanza et al., 2013). By treating class membership as a known entity (i.e., part of the class or not), and not a probability, the possible classification error is not accounted for (Clark & Muthén, 2009; Lanza et al., 2013). However, it has been argued that when classification accuracy is high, the associated error is minimal, and this approach can be used (Clark & Muthén, 2009). In this case, numerous indices of classification accuracy indicate high classification accuracy, suggesting that this is an appropriate approach (see Table 2).

A series of logistic regressions were conducted using Mplus Version 8 to investigate between-class differences in PCL-5 symptoms (Muthén & Muthén, 1998-2017). A series of one-way ANOVAs were conducted using SPSS Version 26 to examine between-class differences in overall PTSD symptom severity and PAI scales and subscales. This procedure for follow-up analyses is similar to those of previous studies (e.g., Cao et al., 2015; Eli et al., 2020; Wolf, Lunney, et al., 2012). Of note, these ANOVAs were subject to listwise deletion. Though usually identified as a poor method for handling missing data, Kline (2016) has suggested that missing data is of little concern when less than 5% of the total dataset is missing. In this case, missing data was minimal, with only 0.71% of the values missing. Data were also missing completely at random (MCAR), a requirement of using listwise deletion to handle missing data (Little's MCAR test: $\chi^2[2409] = 2178.43$, $p = 1.00$; Enders, 2010). To correct for the possibility of Type I error inflation due to multiple comparisons, the Benjamini and Hochberg (1995) False Discovery approach was employed.

Results

LCA Results

Starting with a one-class solution, the number of classes was increased until the solutions became ill-defined. Models with five or more classes suggested under identified solutions. Thus, models with between one to four classes were considered. Examination of the fit indices for these models revealed mixed results (see Table 1). After collectively examining the fit statistics, the three-class solution was selected. This solution was supported by the lowest observed BIC. The BF also indicated extremely strong evidence for the three-class solution compared to the four-class solution. The value of the cmP also indicated that there was a very high probability (91%) that the three-class solution was the best solution. Further reinforcing the selection of the three-class solution, examination of the classification accuracy statistics for the three-class solution (see Table 2) revealed excellent classification accuracy with values of the AvePP and OCC greatly exceeding their cutoffs for classification accuracy and well-separated classes (0.70 and 5, respectively; Nagin, 2005). Entropy was also high (0.84), indicating high accuracy.

The three-class solution includes two classes with moderate PTSD symptom severity and one class with high PTSD symptom severity. Probability of symptom endorsement is displayed in Figure 1. Class 1 ("High Symptoms;" *n* = 102; 32%) consisted of individuals exhibiting high levels of PTSD symptoms with a PCL-5 mean of 54.29. Class 2 ("Moderate Symptoms" *n* = 65; 20%) consisted of individuals exhibiting moderate levels of PTSD symptoms with a PCL-5 mean of 34.11. Lastly, Class 3 ("Low Anhedonia/Externalizing Behaviors;" *n* = 155; 48%) consisted of individuals exhibiting moderate levels of PTSD symptoms with a PCL-5 mean of 26.84. Classes 2 and 3 were differentiated in the presence of anhedonia symptoms and externalizing behaviors. Specifically, odds ratios (ORs) showed that individuals in Class 3 were less likely to

endorse symptoms included in the anhedonia and externalizing behaviors clusters of the hybrid model of PTSD (Armour, Tsai, et al., 2015), including loss of interest, detachment, aggressive behavior, and reckless behavior, compared to individuals in Class 2 (see Table 4).

The prevalence of traumatic event type was somewhat different across classes. The three most commonly experienced traumatic event types were the same across the three classes, although the rank order and specific prevalence varied between classes. The most commonly experienced traumatic event types in the High Symptoms class were sexual assault (*n* = 40; 39.20%), transportation accident (*n* = 14; 13.70%), and suicide (*n* = 12; 11.80%). The most commonly experienced traumatic event types in the Moderate Symptoms class were suicide (*n* = 15; 23.10%), sexual assault (*n* = 12; 18.50%), and transportation accident (*n* = 10; 15.40%). The most commonly experienced traumatic event types in the Low Anhedonia/Externalizing Behaviors class were sexual assault (*n* = 40; 25.80%), transportation accident (*n* = 36; 23.30%), and suicide (*n* = 21; 13.50%; see Table A1).

Of the total sample, 189 (58.7%) met provisional criteria for a PTSD diagnosis based on their PCL-5 scores, including 100/102 (98%) in the High Symptoms class, 41/65 (63%) in the Moderate Symptoms class, and 48/155 (31%) in the Low Anhedonia/Externalizing Behaviors class. Similar prevalence rates were found for a diagnostic rule of 24 or higher on the PCL-5: of the total sample, 184 (57.1%) met this criterion, including 100/102 (98%) in the High Symptoms class, 40/65 (62%) in the Moderate Symptoms class, and 44/155 (28%) in the Low Anhedonia/Externalizing Behaviors class.

Consistent with hypothesis 1, classes differed quantitatively in PTSD symptoms. One-way analysis of variance (ANOVA) revealed overall statistically significant differences between the classes in their PTSD symptom severity. Post-hoc Tukey Honestly Significant Difference

(HSD) tests indicated that all classes significantly differed with respect to PTSD symptom severity (see Table 3).

Differences in PCL-5 Items

Results from logistic regressions revealed that classes differed qualitatively in their PTSD symptom endorsement on the PCL-5. As shown in Table 4, individuals in the High Symptoms class were significantly more likely than individuals in the Moderate Symptoms class to endorse all of the PTSD symptoms, except for four: cued distress, detachment, no positive emotions, and reckless behavior. Individuals in the High Symptoms class were significantly more likely than individuals in the Low Anhedonia/Externalizing Behaviors class to endorse all of the PTSD symptoms, except for no positive emotions. Of note, ORs for the comparison between the High Symptoms class and the Low Anhedonia/Externalizing Behaviors class could not be calculated due to the low level of endorsement of this item in the Low Anhedonia/Externalizing Behaviors class.

Several between-class differences emerged when comparing the Moderate Symptoms class and the Low Anhedonia/Externalizing Behaviors class on the PCL-5 (see Table 4). In particular, individuals in the Moderate Symptoms class were significantly more likely to endorse negative beliefs, loss of interest, detachment, aggressive behavior, reckless behavior, concentration, and sleep compared to individuals in the Low Anhedonia/Externalizing Behaviors class. Individuals in the Low Anhedonia/Externalizing Behaviors class were significantly more likely than individuals in the Moderate Symptoms class to endorse flashbacks, avoidance of reminders, hypervigilance, and startle.

Differences in PAI Scales and Subscales

In order to investigate between-class differences in other areas of psychopathology, a series of one-way ANOVAs were conducted using PAI parent and subscales (see Table 5). With regard to the PAI parent scales, overall F ratios revealed statistically significant differences between classes on all PAI scales, except for MAN and Aggression (AGG). Pairwise comparisons further elucidated between-class differences in PAI scales. Specifically, when comparing the High Symptoms and Moderate Symptoms classes, individuals in the High Symptoms class exhibited significantly higher levels of SOM, ANX, and ARD compared to individuals in the Moderate Symptoms class. Examination of the effect sizes for these comparisons revealed the largest difference between the High Symptoms class and the Moderate Symptoms class for ARD. When comparing the High Symptoms and Low Anhedonia/Externalizing Behaviors classes, individuals in the High Symptoms class exhibited significantly higher levels on all PAI scales, except for MAN, compared to individuals in the Low Anhedonia/Externalizing Behaviors class. Examination of the effect sizes for these comparisons revealed the largest difference between the High Symptoms class and the Low Anhedonia/Externalizing Behaviors class for DEP. Lastly, when comparing the Moderate Symptoms and Low Anhedonia/Externalizing Behaviors classes, individuals in the Moderate Symptoms class exhibited significantly higher levels of DEP, PAR, SCZ, Suicide (SUI), and BOR compared to individuals in the Low Anhedonia/Externalizing Behaviors class. Examination of the effect sizes for these comparisons revealed the largest differences between the Moderate Symptoms class and the Low Anhedonia/Externalizing Behaviors class for DEP and SCZ.

One-way ANOVAs also revealed between-class differences on PAI subscales. Overall F ratios revealed statistically significant between-class differences on all PAI subscales except for

Aggressive Attitude (AGG-A), Verbal Aggression (AGG-V), Obsessive Compulsive (ARD-O), Activity Level (MAN-A), and Grandiosity (MAN-G). Pairwise comparisons were conducted to further explicate between-class differences on PAI subscales. When comparing the High Symptoms and Moderate Symptoms classes, individuals in the High Symptoms class exhibited significantly higher levels of Affective Anxiety (ANX-A), Physiological Anxiety (ANX-P), Conversion (SOM-C), Somatization (SOM-S), Phobias (ARD-P), and Traumatic Stress (ARD-T) compared to individuals in in the Moderate Symptoms class. Examination of the effect sizes for these comparisons revealed the largest difference between the High Symptoms class and the Moderate Symptoms class for ARD-T. When comparing the High Symptoms and Low Anhedonia/Externalizing Behaviors classes, individuals in the High Symptoms class exhibited significantly higher levels on all PAI subscales except for ARD-O, MAN-A, MAN-G, and the ANT subscales, compared to individuals in the Low Anhedonia/Externalizing Behaviors class. Examination of the effect sizes for these comparisons revealed the largest difference between the High Symptoms class and the Low Anhedonia/Externalizing Behaviors class for Affective Depression (DEP-A). Lastly, when comparing the Moderate Symptoms and Low Anhedonia/Externalizing Behaviors classes, individuals in the Moderate Symptoms class exhibited significantly higher levels on Cognitive Depression (DEP-C), DEP-A, Physiological Depression (DEP-P), Hypervigilance (PAR-H), Persecution (PAR-P), Resentment (PAR-R), Social Detachment (SCZ-S), Thought Disorder (SCZ-T), Affective Instability (BOR-A), Identity Problems (BOR-I), and Negative Relationships (BOR-N) compared to individuals in the Low Anhedonia/Externalizing Behaviors class. Examination of the effect sizes for these comparisons revealed the largest difference between the Moderate Symptoms class and the Low Anhedonia/Externalizing Behaviors class for DEP-A.

Discussion

An LCA was conducted using only PCL-5 symptoms as indicators of latent class membership. LCA revealed a three-class solution: High Symptoms, Moderate Symptoms, and Low Anhedonia/Externalizing Behaviors. The High Symptoms and Moderate Symptoms classes consisted of individuals exhibiting high and moderate levels of PTSD symptoms, respectively. The Low Anhedonia/Externalizing Behaviors class consisted of individuals exhibiting moderate levels of PTSD symptoms but with low levels of the anhedonia and externalizing behaviors clusters of the hybrid model of PTSD (Armour, Tsai, et al., 2015), such as loss of interest, detachment, aggressive behavior, and reckless behavior. The most commonly experienced traumatic event in the High Symptoms and Low Anhedonia/Externalizing Behaviors classes was sexual assault, whereas the most commonly experienced traumatic event in the Moderate Symptoms class was suicide. A series of follow-up analyses revealed between-class differences in PCL-5 symptoms and other areas of psychopathology, suggesting both qualitative and quantitative differences in subthreshold PTSD symptom presentations.

With regard to the overall model, the results of the current study are somewhat inconsistent with previous literature on PTSD subgroups. Previous studies have consistently identified three specific subgroups: low symptoms, primarily internalizing symptoms, and primarily externalizing symptoms (Flood et al., 2010; McDevitt-Murphy et al., 2012; Miller et al., 2003, 2004; Miller & Resick, 2007; Rielage et al., 2010). The current findings did not replicate these results. In addition, the current findings add to the confusion of the LCA/LPA literature. As mentioned previously, previous findings have identified three to six latent classes of PTSD symptoms. The current findings identified a three-class solution, though this three-class solution does not resemble any prior three-class solutions. While the current findings indicate

quantitative differences, similar to previous studies (e.g., Bondjers et al., 2018), the qualitative differences found in the current study are somewhat novel findings. Whereas previous studies have found anxious/reexperiencing (e.g., Horn et al., 2016), numbing (e.g., Hebenstreit et al., 2014; Sripada et al., 2020), and threat classes (e.g., Campbell et al., 2020), the current findings suggest a class with low anhedonia symptoms and externalizing behaviors.

The current findings were compared to other studies with similar samples and methodology, with the aim of providing a more cohesive picture of these findings. The current findings were compared to eight studies that were selected because they only used PTSD symptoms as latent class indicators, and because they included Criterion A trauma-exposed samples (Bondjers et al., 2018; Breslau et al., 2005; Nugent et al., 2012), individuals meeting subthreshold or threshold PTSD diagnostic status (Campbell et al., 2020; Maguen et al., 2013), or clinical samples (Böttche et al., 2015; Hebenstreit et al., 2014; Sripada et al., 2020). These eight studies produced eight different patterns of results, with findings varying across the various samples.

Though this literature continues to be confusing and messy, the current study adds a rigorous investigation of subgroups of subthreshold PTSD to the existing literature. Specifically, the current study used *DSM-5* criteria, only used PTSD symptoms as latent class indicators, used a rigorous definition of subthreshold PTSD to ensure accurate investigation of PTSD subgroups, and includes an investigation of a full range of comorbidity. Based on the comprehensive literature review, the current study is the only study so far to use *DSM-5* PTSD criteria, a Criterion A trauma-exposed sample, and only PTSD symptoms as latent class indicators. It should be noted that Campbell and colleagues (2020) conducted a similar study using *DSM-5* PTSD symptoms but did not use the correct *DSM-5* PTSD criteria. In any case, the current

findings are actual quite similar to those of Campbell and colleagues (2020), each finding a high symptom class and a class with low dysphoria symptoms (i.e., Campbell and colleagues' [2020] threat-reactivity class and the current study's Low Anhedonia/Externalizing Behaviors class).

Results revealed several between-class differences on both the PCL-5 and PAI. Specifically, individuals in the High Symptoms class were significantly more likely to endorse most symptoms of PTSD on the PCL-5 compared to individuals in either of the other classes. An examination of the elevations on the PAI further describes this class. Individuals in the High Symptoms class exhibited clinically significant elevations (i.e., T scores > 70) on ANX-A, ANX-P, Cognitive Anxiety (ANX-C), ARD-T, and DEP-C. These findings are somewhat consistent with previous research that has investigated the PAI profiles of individuals with PTSD. Specifically, previous findings have suggested that individuals with PTSD show higher elevations on DEP, BOR, and ARD-T (McDevitt-Murphy et al., 2005). Other additional findings have suggested that individuals with PTSD show clinically significant elevations on ANX, ANX-P, ARD-T, all three DEP subscales, PAR-H, SCZ-S, SCZ-T, and BOR-A (Bellet et al., 2018; McDevitt-Murphy et al., 2005, 2007).

Statistically significant differences emerged on the PCL-5 between individuals in the High Symptoms class and the Moderate Symptoms class. In particular, individuals in the High Symptoms class were significantly more likely to exhibit all but four symptoms of PTSD (i.e., cued distress, detachment, no positive emotions, and reckless behavior) compared to individuals in the Moderate Symptoms class. Individuals in the High Symptoms class also exhibited significantly higher levels of symptomatology on several of the PAI subscales. In particular, individuals in the High Symptoms class exhibited significantly higher levels of ANX-A, ANX-P, SOM-C, SOM-S, ARD-P, and ARD-T. These results are consistent with previous findings that

have documented the likely symptom profile of individuals with PTSD using the PAI (Bellet et al., 2018; McDevitt-Murphy et al., 2005). In addition, examination of the effect sizes for these pairwise comparisons revealed that the largest effect between these classes was for ARD-T. This finding is consistent with previous research that has suggested ARD-T is the most elevated subscale in individuals with PTSD (Mozley et al., 2005).

Individuals in the High Symptoms class were significantly more likely to endorse all but one symptom of PTSD (no positive emotions) on the PCL-5 compared to individuals in the Low Anhedonia/Externalizing Behaviors class. Of note, comparisons could not be made between the High Symptoms class and the Low Anhedonia/Externalizing Behaviors class for no positive emotions due to the low level of endorsement of this item in the Low Anhedonia/Externalizing Behaviors class. In addition, individuals in the High Symptoms class exhibited significantly higher levels of symptomatology on almost all the PAI subscales compared to individuals in the Low Anhedonia/Externalizing Behaviors class. Specifically, individuals in the High Symptoms class exhibited significantly higher levels on all the PAI subscales except for ARD-O, MAN-A, MAN-G, Antisocial Behaviors (ANT-A), Egocentricity (ANT-E), and Stimulus-Seeking (ANT-S). It is possible that the lack of significant differences for these subscales could be because of the restricted range in the current sample. Indeed, individuals in this non-clinical sample exhibited relatively low levels of psychopathology as measured by these subscales.

With regard to the PCL-5, individuals in the Moderate Symptoms class were significantly more likely to endorse negative beliefs, loss of interest, detachment, aggressive behavior, reckless behavior, concentration, and sleep compared to individuals in the Low Anhedonia/Externalizing Behaviors class. With regard to the PAI, individuals in the Moderate Symptoms class exhibited significantly higher elevations on all three DEP subscales, PAR-H,

SCZ-S, SCZ-T, and BOR-A compared to individuals in the Low Anhedonia/Externalizing Behaviors class. These findings are consistent with previous research that has shown that these subscales are elevated in individuals with PTSD (Bellet et al., 2018; McDevitt-Murphy et al., 2005, 2007). Since individuals in the Moderate Symptoms class showed slightly higher levels of PTSD, it is unsurprising that these subscales would be slightly more elevated in the Moderate Symptoms class compared to the Low Anhedonia/Externalizing Behaviors class. However, individuals in the Moderate Symptoms class exhibited significantly higher levels on several other subscales that previous findings would not necessarily predict. Specifically, individuals in the Moderate Symptoms class exhibited significantly higher levels on PAR-P, PAR-R BOR-I, and BOR-N compared to individuals in the Low Anhedonia/Externalizing Behaviors class. Of note, none of the elevations on any of the PAI scales or subscales reached the clinically significant level for either of the moderately symptomatic classes.

Interestingly, the difference between these two classes is consistent with the factor structure of the *DSM-5* hybrid model of PTSD (Armour, Tsai, et al., 2015). This 7-factor model has been shown to have superior fit compared to other models of PTSD (e.g., Armour, Tsai, et al., 2015). This model divides the *DSM-5* negative alterations in cognitions and mood and arousal clusters into multiple parts. Most notably, the anhedonia cluster includes loss of interest, detachment, and no positive emotions. The externalizing behaviors cluster includes aggressive behavior and reckless behavior. This model provides the best explanation of the symptomatology of the Low Anhedonia/Externalizing Behaviors class. Indeed, individuals in the Low Anhedonia/Externalizing Behaviors class were significantly less likely to endorse loss of interest, detachment, aggressive behavior, and reckless behavior compared to individuals in the Moderate Symptoms class. In addition, further examination of the PAI elevations for each of these classes

provides further evidence for the use of the hybrid model to describe these classes. In particular, individuals in the Low Anhedonia/Externalizing Behaviors class expressed significantly lower levels on all three of the depression subscales.

There are several possible explanations for these results. Previous findings have suggested that there are quantitative (e.g., Hellmuth et al., 2014) and qualitative differences in PTSD symptom presentations (e.g., Horn et al., 2016). The current findings are consistent with previous findings suggesting a symptom severity spectrum (e.g., Hellmuth et al., 2014). However, other previous findings have identified subgroups other than low anhedonia/externalizing behaviors, such as threat (high reexperiencing and avoidance; Horn et al., 2016) and anxious/reexperiencing (Pietrzak et al., 2014). It is possible that these different results are due to differences in sample characteristics. For example, Minihan and colleagues (2018) found a high reexperiencing and avoidance symptoms class in their sample of refugees and asylum-seekers. Minihan and colleagues (2018) suggested that different subgroups may emerge in different populations. In particular, they suggested that refugees and asylum-seekers experience more reexperiencing symptoms and avoidance because of the ongoing sense of threat (Minihan et al., 2018).

A review of the literature suggests that this is the first study to specifically investigate subgroups of PTSD in individuals meeting subthreshold criteria for PTSD. Previous studies have investigated a variety of samples with differing levels of PTSD symptom severity, including trauma-exposed (e.g., Blevins et al., 2014; Contractor et al., 2015), clinical samples (e.g., Sripada et al., 2020), individuals diagnosed with PTSD (e.g., Hebenstreit et al., 2014; Pietrzak et al., 2014), and individuals meeting probable PTSD criteria (e.g., Horn et al., 2016). Not only have previous studies focused on individuals with different levels of PTSD, but the variety of

traumatic events and types of samples (e.g., veterans, civilians, refugees) could explain the variety of previous findings. Therefore, one possible explanation for the current study's findings could be the specific sample and associated level of PTSD symptoms found in the sample.

While other studies have often found a low symptom or asymptomatic class (e.g., Cao et al., 2015), the current findings did not reveal such a class. This is likely due to the current study's sample: individuals who met subthreshold PTSD criteria were specifically chosen – therefore eliminating most individuals who would have only been slightly symptomatic. These results are consistent with previous findings. In particular, studies that include trauma-exposed individuals often identify a resilient or asymptomatic class (e.g., Nugent et al., 2012) – these types of classes are specific to samples that include trauma-exposed individuals and do not appear in clinical samples or samples of individuals meeting PTSD diagnosis, since the definition of these samples precludes individuals considered to be asymptomatic.

Limitations and Future Directions

The current study findings should be interpreted within the context of several limitations. First, because this study employed a cross-sectional design, causation cannot be inferred. Future research should utilize longitudinal designs to aid in establishing temporal relationships between PTSD symptoms and other psychopathology. Longitudinal designs would also allow for measurement of the change in these symptoms over time using techniques such as latent trait analysis (LTA).

A second limitation is the relatively homogeneous nature of the study's sample, which was mostly female and Caucasian. Therefore, the current study's findings may not generalize outside of an undergraduate sample that is mostly female and Caucasian. In addition, the current sample consisted of individuals who met the criteria for subthreshold PTSD. While research

suggests similar functional impairment between individuals with subthreshold PTSD (e.g., Zlotnick et al., 2002) and a diagnosis of PTSD, it is possible that these findings may not extend to a clinical sample of individuals meeting full criteria for PTSD. Replication of these results in a clinical sample of individuals meeting full criteria for PTSD is warranted. Should results show specific subgroups of PTSD, further research should be conducted to see if these individuals respond differentially to treatment. The need for tailored treatments should be investigated.

It is important to note that many individuals in the current sample did not meet the criteria for PTSD. As a result, these individuals would normally not receive treatment for PTSD. However, based on the current findings and the findings of others (Marshall et al., 2001; Stein et al., 1997), individuals that do not meet full criteria for PTSD but meet the subthreshold criteria still experience significant distress and impairment. Therefore, it may be important for these individuals to engage in treatment. Careful assessment and treatment planning should be conducted in order to administer proper treatment.

Third, the current study relied on questionnaire measures. Reliance on these types of measures introduces the possibility of method error variance. Future studies should utilize structured interviews.

Fourth, LCA itself has several limitations. Specifically, LCA assumes that the same latent structure applies equally to each class. As a result, LCA cannot model within-class differences in model structure (i.e., heterogeneity in PTSD symptoms; Clark et al., 2013). In addition, LCA assumes a categorical latent structure, which may be an erroneous assumption since the structure could be dimensional (Dalenberg et al., 2012). LCA has also been critiqued for overidentifying the number of classes present (Ruscio & Ruscio, 2004a). Finally, LCA assumes that observed

variables are independent of one another, which is not always the case and can affect model fit (Ruscio & Ruscio, 2004a).

Lastly, as mentioned previously, the classify-analyze approach was used in order to conduct follow-up analyses. Since this approach requires class membership to be treated as a known quantity and not a probability, there is some uncertainty in the estimation of class membership (Clark & Muthén, 2009; Lanza et al., 2013). Therefore, it is possible that there is some classification error that is not accounted for (Clark & Muthén, 2009; Lanza et al., 2013). However, given that classification accuracy is high in this case, it is likely that classification error is minimal (Clark & Muthén, 2009). Therefore, it is unlikely that this approach altered the current findings.

In order to address the critiques of LCA, future research could employ techniques such as factor mixture modeling (FMM). FMM is an extension of LCA that combines both the common factor and latent class models (Lubke & Muthén, 2005). This type of latent variable modeling allows for the identification of a latent class and the structure of each class – meaning that the relationships between observed variables can be measured, unlike in LCA (Lubke & Muthén, 2005; Lubke & Neele, 2006). Within psychopathology, this approach provides the advantage of grouping individuals into a diagnostic category or class but also allowing for differing severity of the disorder within each class (Clark et al., 2013). Therefore, FMM provides the distinct advantage of allowing for the description of within-class heterogeneity (Lubke & Muthén, 2005). However, FMM is not well understood. Little information exists on how these models should be applied and how they should be interpreted (Clark et al., 2013). Three FMM have been conducted within the PTSD literature (Elhai et al., 2011; Frankfurt et al., 2015; Naifeh et al.,

2010). Therefore, while this is promising area for future research, more information is needed in order to implement these approaches appropriately and meaningfully.

In conclusion, these findings highlight the quantitative and qualitative differences in PTSD symptom presentations. These findings suggest that statistically derived classes differ both quantitatively (Moderate vs. High Symptoms classes) and qualitatively (Low Anhedonia/Externalizing Behaviors). Given the inconsistent findings, both within *DSM-IV* and *DSM-5* literature, further research is needed in order to more clearly understand subgroups of PTSD: if they exist and what they might look like. Future research should employ rigorous methodology, including the *DSM-5* criteria for PTSD (including Criterion A) and only PTSD symptoms as latent class indicators. This methodology will be most informative in investigating PTSD subgroups. Future research in this area will continue to describe specific symptom presentations in individuals meeting subthreshold PTSD criteria and should be replicated in individuals who meet full PTSD criteria. In addition, future research will inform the possibility of specifically tailoring treatments for specific symptom presentations.

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Table 1

Fit Statistics and Entropy Values for Tested Models

	LL	BIC	CAIC	AWE	BF	cmP	LMR *p*	LRT *p*	Entropy
1	-3967.19	8049.87	8004.54	8094.70	3.4098^{-137}	2.8907^{-138}	-	-	
2	-3592.33	7421.42	7328.48	7513.30	0.09	0.08	< .001	< .001	0.88
3	-3529.32	7416.66	7276.13	7555.61	859.63	0.91	0.11	0.11	0.84
4	-3475.44	7430.18	7242.04	7616.19	3101821.26	0.001	0.32	0.32	0.85

Note. AWE = approximate weight of evidence criterion; BF = Bayes factor; BIC = Bayes information criterion; CAIC = consistent Akaike's information criterion; cmP = correct model probability; LL = log-likelihood; LMR p = Lo-Mendell-Rubin likelihood ratio test; LRT *p* = Lo-Mendell-Rubin likelihood ratio test.

Table 2

Classification Accuracy Statistics for the Three-Class Solution

Class	AvePP	OCC
1	0.96	52.62
2	0.89	29.83
3	0.93	15.69

Note. AvePP = average posterior class probability; OCC = odds of correct classification ratio.

Table 3

Analysis of Variance and Post Hoc Tukey HSD Results for PCL-5 Total

	High Symptoms		Moderate Symptoms		Low Anhedonia/ Externalizing Behaviors						
	M	*SD*	*M*	*SD*	*M*	*SD*	Overall F Ratio	Partial η^2	$d_{1\text{-}2}$	$d_{1\text{-}3}$	$d_{2\text{-}3}$
PCL-5 Total	54.35_a	9.54	33.94_b	8.58	27.52_c	8.19	$F(2,314) = 293.53$**	0.65	2.25	3.02	0.77

Note. d = Cohen's d; M = mean; PCL-5 = Posttraumatic Disorder Checklist-5; SD = standard deviation; 1 = High Symptom; 2 = Moderate Symptoms; 3 = Low Anhedonia/Externalizing Behaviors; means in the same row that do not have the same subscript differ at $p < .001$.

** Statistically significant at $p < .001$

Table 4

Odds Ratios and Confidence Intervals for PCL-5 Items

PCL-5 Item	Symptom Endorsement			OR_{1-2}	95% CI	OR_{1-3}	95% CI	OR_{2-3}	95% CI
	1	2	3						
Memories	91	34	88	7.54*	[3.41-16.67]	6.30*	[3.12-12.71]	0.84	[0.47-1.49]
Dreams	76	18	49	7.63*	[3.78-15.41]	6.26*	[3.58-10.96]	0.82	[0.43-1.56]
Flashbacks	73	9	45	15.66*	[6.86-35.74]	6.15*	[3.54-10.69]	0.39*	[0.18-0.86]
Cued distress	97	57	132	2.72	[0.85-8.72]	3.38*	[1.24-9.21]	1.24	[0.52-2.94]
Cued physical reactions	98	29	87	30.41*	[9.99-92.56]	18.87*	[6.61-53.88]	0.62	[0.35-1.11]
Avoid thoughts/feelings	99	50	134	9.90*	[2.74-35.80]	5.17*	[1.50-17.82]	0.52	[0.25-1.09]
Avoid reminders	98	34	111	22.34*	[7.35-67.92]	9.71*	[3.37-28.00]	0.44*	[0.24-0.79]
Amnesia	57	22	51	2.48*	[1.30-4.72]	2.58*	[1.54-4.32]	1.04	[0.57-1.93]
Negative beliefs	91	44	56	3.95*	[1.75-8.91]	14.63*	[7.22-29.64]	3.70*	[2.00-6.85]
Blame	83	42	88	2.39*	[1.17-4.88]	3.33*	[1.84-6.01]	1.39	[0.76-2.53]
Negative emotions	101	43	105	51.67*	[6.75-395.64]	48.10*	[6.52-354.75]	0.93	[0.50-1.72]
Loss of interest	73	27	16	3.54*	[1.84-6.82]	21.87*	[11.16-42.86]	6.17*	[3.02-12.62]
Detachment	86	53	27	1.22	[0.53-2.77]	25.28*	[12.86-49.72]	20.78*	[9.80-44.06]
No positive emotions	86	49	0	1.76	[0.81-3.82]	--	--	--	--
Aggressive behavior	71	24	21	3.91*	[2.03-7.55]	14.61*	[7.83-27.28]	3.74*	[1.89-7.39]
Reckless behavior	45	19	8	1.91	[0.99-3.71]	14.51*	[6.44-32.67]	7.59*	[3.12-18.48]
Hypervigilance	88	23	88	11.48*	[5.37-24.53]	4.79*	[2.51-9.14]	0.42*	[0.23-0.76]
Startle	88	10	69	36.55*	[14.99-89.13]	8.44*	[4.35-16.37]	0.23*	[0.11-0.49]
Concentration	95	44	55	7.56*	[2.85-20.04]	28.79*	[11.84-69.98]	3.81*	[2.06-7.05]
Sleep	95	45	64	6.03*	[2.38-15.30]	19.30*	[8.40-44.32]	2.20*	[1.73-5.92]

Note. CI = confidence interval; OR = odds ratio; PCL-5 = Posttraumatic Disorder Checklist-5; 1 = High Symptoms; 2 = Moderate Symptoms; 3 = Low Anhedonia/Externalizing Behaviors; odds ratios less than one indicate a reduced likelihood of a class expressing a symptom; symptom endorsements are presented as frequencies, i.e., the number of participants endorsing the symptom at 2 and above on the PCL-5.

*Statistically significant at $p < .05$ after utilizing the Benjamini and Hochberg (1995) Linear Step-Up Approach to account for Type I error.

Table 5

Analysis of Variance and Post Hoc Tukey HSD Results for PAI Scales and Subscales

	High Symptoms		Moderate Symptoms		Low Anhedonia/ Externalizing Behaviors						
PAI Scale/ Subscale	*M*	*SD*	*M*	*SD*	*M*	*SD*	Overall F	Partial η^2	$d_{1\text{-}2}$	$d_{1\text{-}3}$	$d_{2\text{-}3}$
SOM	64.16_a	12.70	57.78_b	10.32	56.24_b	10.80	$F(2, 310) = 15.05$*	0.09	0.55	0.67	0.15
SOM-C	61.61_a	14.99	55.38_b	11.37	54.61_b	11.96	$F(2, 317) = 9.64$*	0.06	0.47	0.52	0.07
SOM-S	64.56_a	11.52	58.03_b	11.38	56.72_b	11.39	$F(2, 315) = 14.93$*	0.09	0.57	0.68	0.12
SOM-H	60.98_a	13.08	56.97_{ab}	10.28	55.09_b	11.22	$F(2, 315) = 7.78$*	0.05	0.34	0.48	0.17
ANX	74.27_a	12.90	67.38_b	13.55	64.23_b	14.50	$F(2, 311) = 15.76$*	0.09	0.52	0.73	0.22
ANX-A	71.22_a	12.15	63.17_b	13.64	62.35_b	14.11	$F(2, 319) = 14.47$*	0.08	0.62	0.67	0.06
ANX-P	73.34_a	14.04	66.74_b	13.78	63.28_b	14.57	$F(2, 314) = 15.09$*	0.09	0.47	0.70	0.24
ANX-C	71.58_a	12.08	67.09_{ab}	12.82	62.79_b	13.57	$F(2, 316) = 14.06$*	0.08	0.36	0.68	0.33
ARD	72.01_a	12.00	63.29_b	11.80	61.99_b	13.12	$F(2, 314) = 20.52$*	0.12	0.73	0.80	0.10
ARD-O	57.47_a	12.29	54.78_a	12.28	55.39_a	11.59	$F(2, 318) = 1.30$	0.01	0.22	0.17	-0.05
ARD-P	63.70_a	11.66	58.06_b	11.61	57.39_b	11.93	$F(2, 319) = 9.43$*	0.06	0.48	0.53	0.06
ARD-T	75.71_a	13.84	65.45_b	12.23	62.75_b	12.96	$F(2, 315) = 30.49$*	0.16	0.79	0.97	0.21
DEP	71.61_a	13.46	68.25_a	13.97	57.92_b	12.18	$F(2, 312) = 36.98$*	0.19	0.24	1.07	0.79
DEP-C	70.70_a	13.75	67.35_a	14.74	58.25_b	13.53	$F(2, 315) = 26.80$*	0.15	0.24	0.91	0.64
DEP-A	68.11_a	15.00	67.31_a	15.50	54.16_b	11.83	$F(2, 315) = 39.51$*	0.20	0.05	1.03	0.95
DEP-P	65.89_a	10.42	61.69_a	10.65	57.44_b	10.91	$F(2, 319) = 19.38$*	0.11	0.40	0.79	0.39
MAN	55.34_a	11.74	55.74_a	10.85	53.64_a	10.50	$F(2, 312) = 1.14$	0.01	-0.04	0.15	0.20
MAN-A	56.25_a	11.78	57.00_a	11.71	53.84_a	10.55	$F(2, 318) = 2.42$	0.02	-0.06	0.22	0.28
MAN-G	48.60_a	11.80	49.90_a	11.98	50.32_a	10.89	$F(2, 316) = 0.71$	0.004	-0.11	-0.15	-0.04
MAN-I	58.83_a	12.49	57.34_{ab}	11.07	54.69_b	11.92	$F(2, 316) = 3.83$*	0.02	0.13	0.34	0.23
PAR	63.42_a	11.27	62.40_a	11.56	56.08_b	10.87	$F(2, 312) = 15.46$*	0.09	0.09	0.66	0.56
PAR-H	64.00_a	13.70	63.00_a	12.56	57.19_b	12.49	$F(2, 313) = 9.90$*	0.06	0.08	0.52	0.46
PAR-P	57.95_a	11.66	57.05_a	12.04	52.08_b	10.03	$F(2, 319) = 10.26$*	0.06	0.08	0.54	0.45
PAR-R	62.20_a	11.02	61.30_a	11.56	55.95_b	10.96	$F(2, 318) = 11.43$*	0.07	0.08	0.57	0.47
SCZ	62.64_a	13.16	62.38_a	12.11	53.14_b	11.29	$F(2, 315) = 24.07$*	0.13	0.02	0.77	0.79
SCZ-P	53.10_a	13.12	52.82_{ab}	12.11	48.57_b	10.17	$F(2, 319) = 5.86$*	0.04	0.02	0.39	0.38

SCZ-S	58.02$_a$	13.92	58.60$_a$	12.82	50.55$_b$	10.98	F(2, 319) = 15.65*	0.09	-0.04	0.60	0.67
SCZ-T	66.56$_a$	13.80	65.92$_a$	14.76	57.67$_b$	12.32	F(2, 315) = 16.80*	0.10	0.04	0.68	0.61
BOR	68.35$_a$	10.58	65.70$_a$	10.54	59.49$_b$	11.21	F(2, 314) = 21.70*	0.12	0.25	0.81	0.57
BOR-A	63.65$_a$	11.38	61.58$_a$	9.80	54.71$_b$	11.57	F(2, 318) = 21.88*	0.12	0.19	0.78	0.64
BOR-I	68.37$_a$	10.34	66.09$_a$	11.20	61.60$_b$	11.78	F(2, 317) = 11.76*	0.07	0.21	0.61	0.39
BOR-N	68.39$_a$	11.88	67.05$_a$	12.23	60.99$_b$	12.21	F(2, 319) = 13.22*	0.08	0.11	0.61	0.50
BOR-S	57.02$_a$	14.04	54.48$_{ab}$	12.38	51.90$_b$	9.60	F(2, 317) = 5.91*	0.04	0.19	0.43	0.23
ANT	56.90$_a$	12.34	57.06$_{ab}$	11.86	52.80$_b$	10.45	F(2, 314) = 5.30*	0.03	-0.01	0.36	0.38
ANT-A	54.62$_a$	11.04	53.23$_a$	10.08	51.20$_a$	9.76	F(2, 317) = 3.52*	0.02	0.13	0.33	0.20
ANT-E	54.93$_a$	11.94	55.49$_a$	12.62	51.94$_a$	9.73	F(2, 317) = 3.40*	0.02	-0.05	0.27	0.32
ANT-S	57.75$_a$	14.15	59.23$_a$	14.00	54.33$_a$	12.04	F(2, 318) = 3.96*	0.02	-0.11	0.26	0.38
ALC	56.68$_a$	14.33	54.32$_{ab}$	12.71	51.10$_b$	9.23	F(2, 315) = 7.00*	0.04	0.17	0.46	0.29
DRG	55.52$_a$	14.00	55.71$_{ab}$	12.60	51.08$_b$	10.28	F(2, 313) = 5.55*	0.03	-0.01	0.36	0.40
SUI	65.51$_a$	18.76	64.68$_a$	16.38	53.70$_b$	12.38	F(2, 319) = 22.21*	0.12	0.05	0.74	0.76
AGG	51.22$_a$	12.93	49.51$_a$	12.61	48.02$_a$	11.10	F(2, 314) = 2.15	0.01	0.13	0.27	0.13
AGG-A	51.21$_a$	11.92	48.80$_a$	13.29	47.69$_a$	11.13	F(2, 316) = 2.69	0.02	0.19	0.31	0.09
AGG-P	53.06$_a$	12.66	51.26$_{ab}$	10.26	48.10$_b$	8.70	F(2, 317) = 7.27*	0.04	0.16	0.46	0.33
AGG-V	49.56$_a$	12.12	48.85$_a$	12.57	49.31$_a$	12.98	F(2, 318) = 0.06	0.00	0.06	0.02	-0.04

Note. AGG = Aggression; AGG-A = Aggressive Attitude; AGG-P = Physical Aggression; AGG-V = Verbal Aggression; ALC = Alcohol Problems; ANX = Anxiety; ANX-A = Affective (Anxiety); ANX-C = Cognitive (Anxiety); ANX-P = Physiological (Anxiety); ARD = Anxiety-Related Disorders; ARD-O = Obsessive Compulsive; ARD-P = Phobias; ARD-T = Traumatic Stress; ANT = Antisocial Features; ANT-A = Antisocial Behaviors; ANT-E = Egocentricity; ANT-S = Stimulus-Seeking; BOR = Borderline Features; BOR-A = Affect Instability; BOR-I = Identity Problems; BOR-N = Negative Relationships; BOR-S = Self-Harm; d = Cohen's d; DEP = Depression; DEP-A = Affective (Depression); DEP-C = Cognitive (Depression); DEP-P = Physiological (Depression); DRG = Drug Problems; M = mean; MAN = Mania; MAN-A = Activity Level; MAN-G = Grandiosity; MAN-I = Irritability; PAI = Personality Assessment Inventory; PAR = Paranoia; PAR-H = Hypervigilance; PAR-P = Persecution; PAR-R = Resentment; SD = standard deviation; SCZ = Schizophrenia; SCZ-P = Psychotic Experiences; SCZ-S = Social Detachment; SCZ-T = Thought Disorder; SOM = Somatic Complaints; SOM-C = Conversion; SOM-H = Health Concerns; SOM-S = Somatization; SUI = Suicide; 1 = High Symptoms; 2 = Moderate Symptoms; 3 = Low Anhedonia/Externalizing Behaviors; means in the same row that do not have the same subscript differ at $p < .05$ after using the Benjamini and Hochberg (1995) procedure.

*Statistically significant at $p < .05$ after utilizing the Benjamini and Hochberg (1995) Linear Step-Up Approach to account for Type I error.

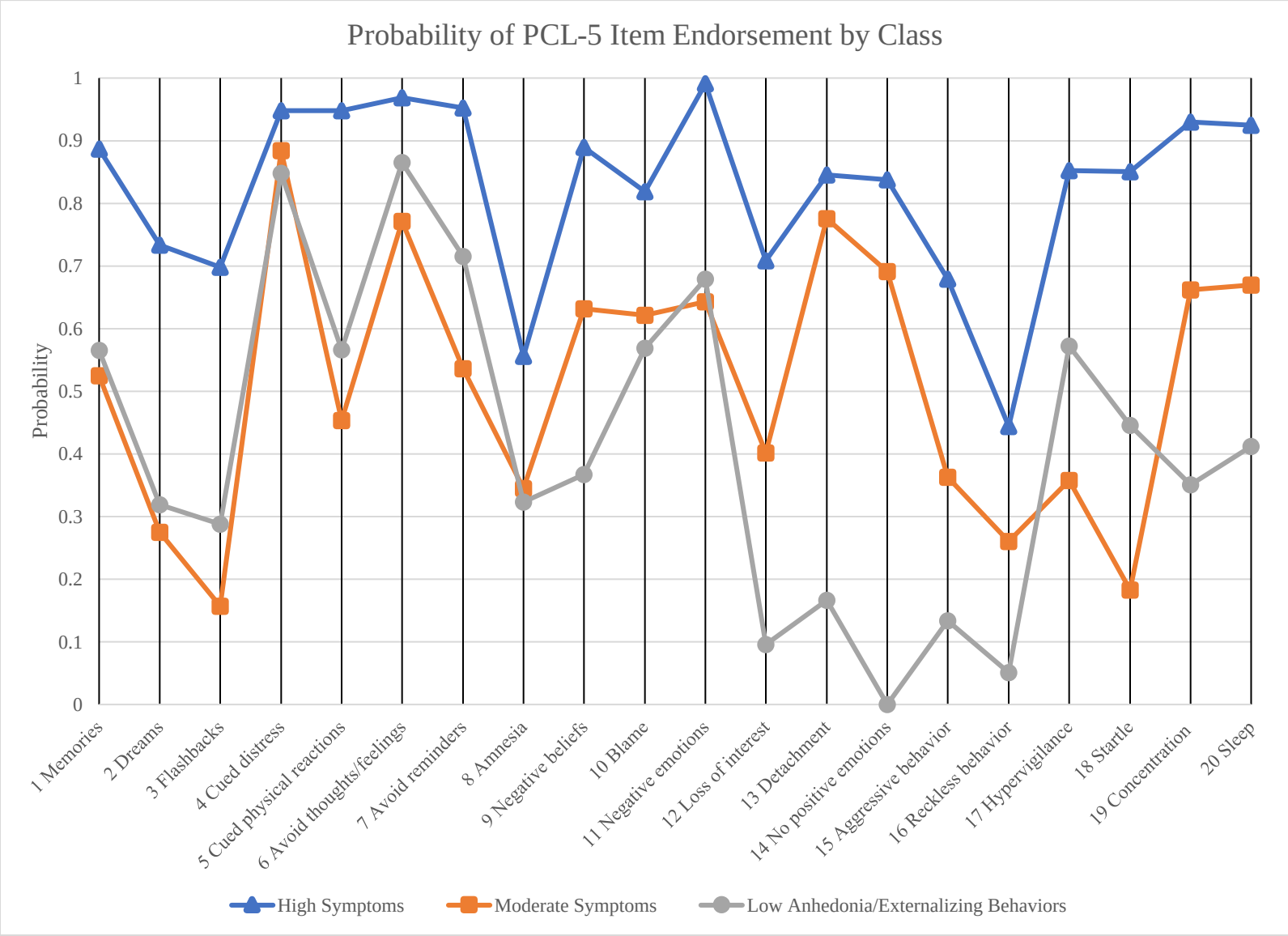

Figure 1. Probability of PCL-5 Item Endorsement by Class

Table A1
Frequency of Traumatic Event Types

	Overall Sample		High Symptoms		Moderate Symptoms		Low Anhedonia/ Externalizing Behaviors	
Event Type	*n*	%	*n*	% of class	*n*	% of class	*n*	% of class
Sexual assault	92	28.60	40	39.20	12	18.50	40	25.80
Transportation accident	60	18.60	14	13.70	10	15.40	36	23.20
Suicide	48	14.90	12	11.80	15	23.10	21	13.50
Physical assault	31	9.60	10	9.80	6	9.20	15	9.70
Assault with a weapon	15	4.70	3	2.90	1	1.50	11	7.10
Life-threatening illness or injury	11	3.40	2	2.00	4	6.20	5	3.20
Other unwanted or uncomfortable sexual experience	11	3.40	5	4.90	4	6.20	2	1.30
Serious accident at work, home, or during recreational activity	11	3.40	3	2.90	1	1.50	7	4.50
Natural Disaster	9	2.80	2	2.00	3	4.60	4	2.60
Other Criterion A event	8	2.50	3	3.00	1	1.50	4	2.60
Fire or explosion	7	2.20	1	1.00	1	1.50	5	3.20
Sudden, unexpected death of someone close to you	7	2.20	2	2.00	2	3.10	3	1.90
Exposure to toxic substance	6	1.90	2	2.00	3	4.60	1	0.60
Combat or exposure to a warzone	2	0.60	1	1.00	1	1.50	0	0
Captivity	1	0.30	1	1.00	0	0	0	0
Serious injury, harm, or death you caused to someone else	1	0.30	0	0	0	0	1	0.60
Severe human suffering	1	0.30	0	0	1	1.50	0	0
Sudden, violent death	1	0.30	1	1.00	0	0	0	0

Note. *n* = number of participants.

Table A2
Descriptive Statistics for PCL-5 Items

	N	*M*	*SD*	Skewness	Kurtosis	Observed range	Possible range
PCL-5 Total	317	37.36	14.72	0.53	-0.52	10-80	0-80
1 Memories	322	2.12	1.19	-0.01	-0.95	0-4	0-4
2 Dreams	321	1.48	1.33	0.42	-1.08	0-4	0-4
3 Flashbacks	322	1.31	1.26	0.61	-0.74	0-4	0-4
4 Cued distress	322	2.68	1.03	-0.47	-0.25	0-4	0-4
5 Cued physical reactions	321	2.16	1.22	-0.04	-1.01	0-4	0-4
6 Avoid thoughts/feelings	322	2.80	1.06	-0.78	0.09	0-4	0-4
7 Avoid reminders	322	2.48	1.30	-0.44	-0.92	0-4	0-4
8 Amnesia	322	1.38	1.38	0.60	-0.95	0-4	0-4
9 Negative beliefs	322	1.98	1.41	-0.02	-1.31	0-4	0-4
10 Blame	322	2.24	1.45	-0.28	-1.30	0-4	0-4
11 Negative emotions	322	2.54	1.24	-0.44	-0.86	0-4	0-4
12 Loss of interest	322	1.29	1.34	0.77	-0.61	0-4	0-4
13 Detachment	321	1.69	1.35	0.24	-1.17	0-4	0-4
14 No positive emotions	322	1.45	1.38	0.53	-1.02	0-4	0-4
15 Aggressive behavior	322	1.22	1.28	0.71	-0.70	0-4	0-4
16 Reckless behavior	322	0.75	1.17	1.42	0.83	0-4	0-4
17 Hypervigilance	322	2.03	1.41	-0.02	-1.27	0-4	0-4
18 Startle	320	1.73	1.43	0.22	-1.30	0-4	0-4
19 Concentration	321	1.99	1.40	-0.03	-1.28	0-4	0-4
20 Sleep	322	2.09	1.41	-0.10	-1.28	0-4	0-4

Note. M = mean; *N* = sample size; *PCL-5* = Posttraumatic Disorder Checklist-5; *SD* = standard deviation; means and standard deviations were obtained by treating PCL-5 items as continuous.

Table A3

Descriptive Statistics for PAI Scales and Subscales

PAI Scale/Subscale	*N*	*M*	*SD*	Skewness	Kurtosis
SOM	313	59.06	11.84	0.81	0.23
SOM-C	320	56.98	13.23	1.05	0.66
SOM-S	318	59.48	11.92	0.64	0.35
SOM-H	318	57.34	11.92	0.88	0.32
ANX	314	68.02	14.46	0.06	-0.74
ANX-A	322	65.32	13.98	0.05	-0.59
ANX-P	317	67.16	14.87	0.30	-0.76
ANX-C	319	66.42	13.49	-0.07	-0.92
ARD	317	65.42	13.27	0.05	-0.28
ARD-O	321	55.93	11.97	0.17	-0.37
ARD-P	322	59.52	12.09	0.10	-0.62
ARD-T	318	67.37	14.27	0.14	-0.84
DEP	315	64.31	14.38	0.31	-0.52
DEP-C	318	64.03	14.94	0.33	-0.66
DEP-A	318	61.23	15.25	0.54	-0.58
DEP-P	322	60.98	11.30	0.02	-0.29
MAN	315	54.59	10.98	0.44	0.27
MAN-A	321	55.23	11.23	0.27	-0.21
MAN-G	319	49.69	11.39	0.44	-0.47
MAN-I	319	56.53	12.04	0.29	-0.26
PAR	315	59.60	11.64	0.27	-0.12
PAR-H	316	60.46	13.25	0.05	-0.39
PAR-P	322	54.94	11.30	1.13	1.61
PAR-R	321	59.00	11.46	0.10	-0.49
SCZ	318	58.02	12.93	0.41	-0.12
SCZ-P	322	50.86	11.74	1.09	1.10
SCZ-S	322	54.54	12.90	0.56	-0.19
SCZ-T	318	62.15	13.96	0.43	-0.38
BOR	317	63.55	11.57	0.00	-0.40
BOR-A	321	58.94	11.88	0.22	-0.56
BOR-I	320	64.65	11.60	-0.15	-0.68
BOR-N	322	64.56	12.56	-0.22	-0.68
BOR-S	320	54.04	11.91	1.12	1.47
ANT	317	54.98	11.53	0.88	0.66
ANT-A	320	52.70	10.33	0.93	0.73
ANT-E	320	53.61	11.16	1.24	2.77
ANT-S	321	56.41	13.27	0.79	0.09
ALC	318	53.51	11.99	1.24	1.38
DRG	316	53.41	12.20	1.55	2.71
SUI	322	59.66	16.46	1.13	0.66
AGG	317	49.32	12.06	0.89	0.22
AGG-A	319	49.02	11.91	0.74	-0.10

AGG-P	320	50.31	10.61	1.55	1.95
AGG-V	321	49.30	12.59	0.47	-0.64

Note. AGG = Aggression; AGG-A = Aggressive Attitude; AGG-P = Physical Aggression; AGG-V = Verbal Aggression; ALC = Alcohol Problems; ANX = Anxiety; ANX-A = Affective (Anxiety); ANX-C = Cognitive (Anxiety); ANX-P = Physiological (Anxiety); ARD = Anxiety-Related Disorders; ARD-O = Obsessive Compulsive; ARD-P = Phobias; ARD-T = Traumatic Stress; ANT = Antisocial Features; ANT-A = Antisocial Behaviors; ANT-E = Egocentricity; ANT-S = Stimulus-Seeking; BOR = Borderline Features; BOR-A = Affect Instability; BOR-I = Identity Problems; BOR-N = Negative Relationships; BOR-S = Self-Harm; DEP = Depression; DEP-A = Affective (Depression); DEP-C = Cognitive (Depression); DEP-P = Physiological (Depression); DRG = Drug Problems; M = mean; MAN = Mania; MAN-A = Activity Level; MAN-G = Grandiosity; MAN-I = Irritability; *N* = sample size; PAI = Personality Assessment Inventory; PAR = Paranoia; PAR-H = Hypervigilance; PAR-P = Persecution; PAR-R = Resentment; SD = standard deviation; SCZ = Schizophrenia; SCZ-P = Psychotic Experiences; SCZ-S = Social Detachment; SCZ-T = Thought Disorder; SOM = Somatic Complaints; SOM-C = Conversion; SOM-H = Health Concerns; SOM-S = Somatization; SUI = Suicide.