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Latent typologies of DSM-5 PTSD symptoms in U.S. military veterans

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ABSTRACT

Posttraumatic stress disorder (PTSD) is a heterogeneous condition that can be characterized by unique typologies of symptoms. To date, no study has examined predominant PTSD typologies using DSM-5 criteria. We used latent class analysis (LCA) to identify typologies of DSM-5 PTSD symptoms in 158 U.S. veterans who screened positive for this condition. A three-class solution provided the best fit to the data, described as Dysphoric (36.2%), High Symptom (34.0%) and Threat (29.8%). The Threat class had higher probabilities of intrusions and avoidance compared to the Dysphoric class; the Dysphoric class had higher probabilities of negative affect, anhedonia and externalizing behavior relative to Threat; the High Symptom class had high probabilities of all symptoms. Compared to the Threat class, the Dysphoric class was more likely to have a lifetime history of major depressive, alcohol and drug use disorders; the High Symptom class was more likely to have a lifetime history of alcohol, drug, and nicotine use disorder, current generalized anxiety, or to have attempted or currently contemplated suicide. The High Symptom class reported greater mental, physical and cognitive impairment and lower quality of life. These findings underscore the importance of a personalized approach to the assessment and treatment of DSM-5 PTSD.

1. Introduction

Posttraumatic stress disorder (PTSD) is characterized by four main symptom clusters according to the DSM-5: intrusions, avoidance, negative cognitions and mood, and alterations in arousal reactivity (American Psychiatric Association, 2013). The clinical manifestation of PTSD is highly heterogeneous and can be diagnosed by numerous combinations of these symptoms and clusters (Galatzer-Levy and Bryant, 2013). Understanding the predominant clinical manifestations of PTSD symptoms is important, as it provides insight into the underlying nature of the disorder, informs etiological models and guides treatment approaches (e.g., Contractor et al., 2018; Litz et al., 2018; Pietrzak et al., 2014b). Litz et al. (2018) examined trauma in a large cohort of military service personnel, finding different types of trauma were associated with different outcomes. For example, they found that individuals who experienced traumatic loss were more likely to have re-experiencing, avoidance, guilt and sadness-related PTSD symptoms than those who experienced life threatening trauma. A data analytic approach for understanding PTSD's phenomenology involves identifying subgroups of individuals that cluster into predominant symptom typologies. Latent Class Analysis (LCA) has shown to be a powerful technique for examining how psychopathology aggregates within individuals and it allows classification of symptoms across psychiatric disorders (e.g., El-Gabalawy et al., 2013).

Latent class analysis (LCA) has been used to classify individuals with PTSD as internalizing (e.g., predominantly depressive) versus externalizing (e.g., aggressive and substance using; Wolf et al., 2012). By contrast, when used in trauma-exposed (but not necessarily diagnosed) populations, LCA produced classes defined primarily by levels of severity, such as no symptoms, intermediate symptoms, and pervasive/severe symptoms (e.g., Breslau et al., 2005). More recent analyses report latent classes defined by the prominence of certain symptoms. For example, Pietrzak et al. (2014a) used LCA to examine PTSD typologies in 2,463 U.S. adults diagnosed with lifetime PTSD. They reported three classes, described as “Dysphoric” (characterized predominantly by numbing and dysphoria symptoms), “Anxious-re-experiencing” (characterized predominantly by hyperarousal, re-experiencing and avoidance symptoms) and “High symptom” (characterized by elevations of all symptom clusters). These typologies were replicated in a sample of 4,352 World Trade Center responders with probable PTSD (Horn et al.,

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2016). These researchers further reported the classes were differentially associated with specific types of traumatic exposures, as well as psychiatric comorbidities and functioning. For example, traumatic exposures such as being caught in the dust cloud or handling human remains were uniquely linked to Threat class membership (where there was a direct threat to life), and the prevalence of a positive screen for depression was highest in the High Symptom class (83.3%), followed by the Dysphoric (74.1%) and Threat (52.8%) classes. Collectively, this study suggests that trauma survivors with PTSD exhibiting predominantly anxious-re-experiencing symptoms may benefit from treatments focused on reducing hyperarousal, while those with dysphoric symptoms could benefit from treatments such as behavioral activation. They further suggest the High Symptom class deserves the most clinical attention, given its elevated rates of psychiatric comorbidities and functional difficulties.

While the above studies help to advance the literature on latent typologies of PTSD, they utilized DSM-IV-based measures. To date, no study of which we are aware has evaluated predominant latent typologies specific to DSM-5 PTSD. The PTSD checklist for the DSM-5 (PCL-5; Weathers et al., 2013) is a relatively new measure that has 20 items that map onto the four symptom clusters of the DSM-5 rather than the tripartite model of the DSM-IV (American Psychiatric Association, 1994). The PCL-5 has significant changes, including eight revised items and three new items (Weathers et al., 2013). In this study, we used LCA to evaluate the predominant symptom-based typologies of PTSD in a sample of 158 U.S. veterans who screened positive for PTSD as indicated by the PCL-5. We hypothesized that Threat, Dysphoric and High Symptom classes will best represent PTSD symptoms in veterans assessed with the PCL-5, similar to previous analyses using DSM-IV-based measures (e.g., Pietrzak et al., 2014a; Horn et al., 2014). Similar to these studies, we expected that the nature of the traumatic event, current and lifetime psychiatric comorbidities and functioning would be differentially related to each class, with the highest rates of comorbidities and functional difficulties among the High Symptom class. We had three main aims: 1) to identify predominant typologies of DSM-5 PTSD symptoms in a nationally representative sample of U.S. military veterans; 2) to characterize sociodemographic, military, and trauma characteristics of these typologies; and 3) to determine how these typologies relate to psychiatric comorbidities and functional impairment.

2. Methods

2.1. Sample

The sample was drawn from the National Health and Resilience in Veterans Study (NHRVS), which is a nationally representative survey of 1,468 US veterans conducted from September to October 2013. The NHRVS sample was selected from a research panel of approximately 50,000 households that is maintained by GfK Knowledge Networks. GfK Knowledge Networks covers 98% of US households and uses a probability-based approach to access a nationally representative sample of households, permitting generalizability to the U.S. population (see Klingensmith et al., 2014 for a detailed description of data collection). Of the entire sample, a subset of 158 veterans (mean age = 53.4, SD = 11.9) screened positive for PTSD, scoring 31 or higher on the Posttraumatic Checklist for the DSM-5 (Bovin et al., 2016; Weathers et al., 2013), which is indicative of probable PTSD. We included these individuals in the current study instead of the entire sample for three reasons: (1) we wanted to identify predominant classes DSM-5 PTSD in those who screened positive for the condition; (2) to permit comparability of latent classes to prior studies, which similarly focused on trauma-affected individuals who screened positive for PTSD (e.g., Horn et al., 2016); and (3) LCA/LPA of psychiatric symptoms in samples drawn from the general population or with subclinical symptoms tend to extract classes that differ only with respect to severity of symptoms (e.g., no/minimal symptoms, moderate symptoms, high symptoms) instead of both the nature and severity of symptoms. Participants completed a 60-minute web based survey. The study was approved by the Human Subject Committee of the VA Healthcare System in Connecticut and all participants provided informed consent.

2.2. Assessments

2.2.1. Sociodemographic characteristics

Age, sex, race/ethnicity, education, marital status, and household income were assessed.

2.2.2. Trauma history

The Trauma History Screen (Carlson et al., 2011) is a self-report measure that assesses the life-time occurrence (No vs. Yes) of 14 potentially traumatic events over the life-span. The measure assesses traumatic life events, including childhood and adulthood physical and sexual trauma, military-related trauma, motor vehicle accidents, or unexpected loss of a loved one. An additional potentially traumatic event—life-threatening illness or injury—was added in the NHRVS.

2.2.3. Posttraumatic stress disorder symptoms

The Posttraumatic Stress Disorder Checklist for the DSM-5 (PCL-5; Weathers et al., 2013) is a 20-item self-report measure designed to assess DSM-5 symptoms of PTSD. In the current study, participants were asked to rate their PTSD symptoms in relation to the "worst" traumatic event endorsed on the Trauma History Screen. For each symptom, respondents provide a self-report rating from 0–4, indicating the degree of distress associated with each symptom (0 = "not at all" to 4 = "extremely"). The PCL-5 has demonstrated good internal consistency ($\alpha = 0.96$), good test-retest reliability ($r = 0.84$) and convergent and discriminant validity (e.g., Bovin et al., 2016). Symptom endorsement was operationalized as endorsement of being at least "moderately bothered" by the symptom. Veterans who endorsed the required number of symptoms within each of the four DSM-5 symptom clusters were identified as screening positive for PTSD. For the purposes of this study, we analysed lifetime symptoms of DSM-5 PTSD ($\alpha = 0.81$). Confirmatory factor analysis (CFAs) has revealed the structure of PTSD symptoms assessed using the PCL-5 is best explained by a seven-factor "hybrid model", where symptoms cluster around re-experiencing, avoidance, negative affect, anhedonia, externalizing behaviors, as well as anxious and dysphoric arousal (Armour et al., 2015; Bovin et al., 2016; Pietrzak et al., 2015).

2.2.4. Psychiatric history

Modules from the Mini-International Neuropsychiatric Interview (Sheehan et al., 1998) adapted for self-report administration were used to assess lifetime diagnoses of major depressive disorder, social phobia, alcohol abuse or dependence and drug abuse according to DSM-IV criteria.

2.2.5. Nicotine dependence

The Fagerström Test for Nicotine Dependence (Heatherton et al., 1991) scores range from 0–10 points, with higher scores indicating higher dependence. Scores ≥ 5 indicate nicotine dependence.

2.2.6. Hazardous drinking

Hazardous drinking was assessed using the Alcohol Use Disorder Identification Test-10 (AUDIT; Babor et al., 2001), which is a 10-item screening measure for harmful or hazardous drinking. Scores range from 0–40, with scores ≥ 8 indicative of hazardous drinking ($\alpha = 0.83$).

2.2.7. Current depression and anxiety

Current depression and anxiety was assessed using the Patient Health Questionnaire-4 (PHQ-4; Kroenke et al., 2009), which is a four-

Table 1
Fit statistics of latent class analyses evaluating 1 to 6 class solutions of DSM-5 PTSD symptoms.

Number of classes	Log likelihood	AIC	BIC	SSA-BIC	Entropy	LMR adjusted LRT *p*-value	Bootstrap LRT *p*-value	% sample in smallest class
1	−1736.80	3513.61	3574.86	3511.55	–	–	–	100%
2	−1655.35	3392.69	3518.26	3388.47	0.827	0.19	< 0.0001	35.3%
3	−1607.50	3339.01	3528.89	3332.63	0.801	0.10	< 0.0001	24.7%
4	−1578.53	3323.06	3577.26	3314.53	0.866	0.53	< 0.0001	11.4%
5	−1552.77	3313.53	3632.04	3302.83	0.889	0.59	0.27	7.1%
6	−1533.74	3317.48	3700.31	3304.62	0.898	0.36	0.21	7.9%

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; SSA-BIC = Sample size adjusted Bayesian Information Criterion; LMR adjusted LRT = Lo-Mendell-Rubin adjusted likelihood ratio test.

item screening instrument for these disorders ($\alpha = 0.90$ for anxiety items and 0.89 for depression items). Scores ≥ 3 are indicative of a positive screen for depression and anxiety on the respective depression and anxiety items.

2.2.8. Suicidal ideation

Suicidal ideation during the previous two weeks was assessed using three items from the Patient Health Questionnaire-9 (Kroenke et al., 2001), which was modified to assess as a dichotomous variable of passive or active suicidal ideation (Thompson et al., 2004). Suicidal ideation was coded as a response ≥ 1 (“several days”) on either item. Another question asked respondents if they had ever made a suicide attempt during their entire life.

2.2.9. Somatization

The somatization subscale of the Brief Symptom Inventory (BSI; Derogatis, 2001) was used to measure current somatic complaints. Respondents report their level of distress due to somatic complaints in the last week, and items were summed to yield a total score ($\alpha = 0.73$).

2.2.10. Mental health service utilization

Mental health service utilization was assessed with the following question: “Have you ever received mental health treatment (e.g., prescription medication or psychotherapy for psychiatric or emotional problems)?” . Veterans who replied “yes” to this question received two follow-up questions: “Are you currently taking prescription medication for a psychiatric or emotional problem?” and “Are you currently receiving psychotherapy or counselling for a psychiatric or emotional problem?” .

2.2.11. Physical and emotional functioning

The Short Form-8 Health Survey (SF-8; Ware et al., 2001) is a validated, abbreviated version of the SF-12, which is one of the most widely used measures of physical ($\alpha = 0.85$) and emotional ($\alpha = 0.82$) functioning. Component summary scores range from 0–100, with 50 representing the average level of emotional functioning and each 10-point interval representing 1 standard deviation. Higher scores indicate better functioning.

2.2.12. Quality of life

The Quality of Life Enjoyment and Satisfaction – Short Form (Endicott et al., 1993) is a 14-item measure that asks respondents about their satisfaction in the past week and with various aspects of their lives, such as their work and family lives. Respondents are asked to rate their satisfaction in these areas from 1 (“very poor”) to 5 (“very good”) and scores are summed for a total score that reflects overall quality of life ($\alpha = 0.90$).

2.2.13. Cognitive functioning

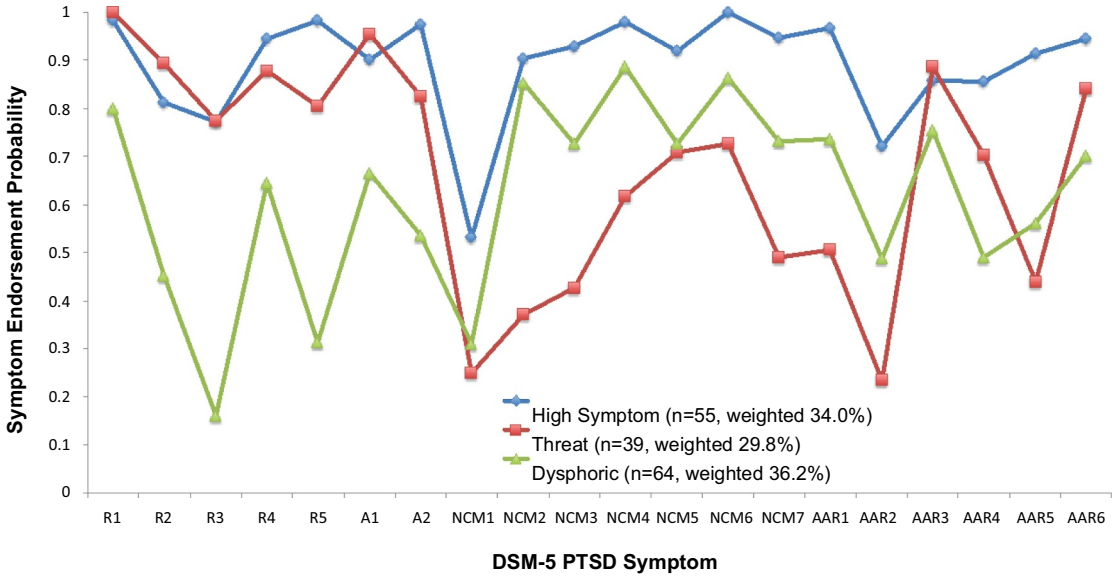
The Medical Outcomes Study Cognitive Functioning Scale (Stewart et al., 1992) is a six-item self-report measure that asks participants to rate how often they have had difficulties with cognitive functioning over the last month, including their memory, concentration and attention, as well as executive functioning ($\alpha = 0.91$).

2.3. Data analysis

We conducted LCAs using Mplus version 7.11 to identify predominant typologies of respondents who screened positive for PTSD. We compared 1–6 class unconditional LCAs and assessed their relative fit; we did not consider more nuanced models (i.e., > 6 classes) given the relatively small sample size. When choosing the best-fitting model, we considered theory, fit, interpretability, parsimony and average latent class probability of the solutions. In order to promote generalizability of the latent solution to the broader population of individuals with PTSD, we aimed to select a model in which at least 20% of the sample was in the smallest group. Better fitting models were determined on the basis of lower Bayesian Information Criterion, sample size-adjusted BIC, Akaike Information Criterion values, higher Entropy values, and significant differences in Lo-Mendell-Rubin adjusted (LMR) and Bootstrapped Likelihood Ratio Tests (LRTs), comparing models with one more class to more parsimonious models (e.g., 3 vs. 2 classes). Once we identified the optimal solution, we compared PTSD classes with respect to sociodemographic variables, trauma characteristics, and mental health variables using chi-square and multivariable logistic regression analyses. We conducted pairwise comparisons to examine associations between classes. To examine the relation between latent class variables and other variables/correlates (e.g., depression, mental health treatment), the 3-step method was used (Vermunt, 2010). Mplus version 7.4 software was used for analyses and the ‘R3Step’ command for the three-step method (Asparouhov & Muthen, 2014). Post-stratification weights were incorporated in analyses to permit generalizability to the U.S. veteran population.

3. Results

Fit statistics for the LCAs are shown in Table 1. Based on theory, parsimony, and fit statistics, a 3-class solution was determined to provide the optimal representation of latent classes of DSM-5 PTSD symptoms. While the 4-class solution had a higher entropy value than the 3-class solution, BIC values and LMR adjusted LRT test p-value were lower for the 3-class solution and the 3-class solution was more parsimonious (i.e., only 17 individuals were in the smallest class of the 4-class model). Fig. 1 shows plots of symptom endorsement probabilities by the three latent classes. The first class, labeled “High Symptom” ($n = 55$, weighted 34.0%), was characterized by high probabilities of all DSM-5 PTSD symptoms. The second class, labeled “Threat” ($n = 39$, weighted 29.8%) exhibited high probabilities of intrusion, avoidance, and anxious arousal symptoms. The third class, labeled “Dysphoric” ($n = 64$, weighted 36.2%), was characterized by high probabilities of negative affect and anhedonia symptoms. Fig. 2 shows plots of standardized 7-factor PTSD symptom scores by latent class. The Threat class scored higher than the Dysphoric class on the intrusions and avoidance symptom clusters; and lower on the negative affect and externalizing behaviors clusters. The High Symptom class scored higher than the Threat and Dysphoric classes on all of the symptom clusters, except that



Abbreviation	Symptom
R1	Intrusive thoughts
R2	Nightmares
R3	Flashbacks
R4	Emotional cue reactivity
R5	Physiological cue reactivity
A1	Avoidance of thoughts
A2	Avoidance of reminders
NCM1	Trauma-related amnesia
NCM2	Negative beliefs
NCM3	Blame of self or others
NCM4	Negative trauma-related emotions
NCM5	Loss of interest
NCM6	Detachment
NCM7	Restricted affect
AAR1	Irritability/anger
AAR2	Self-destructive/reckless behavior
AAR3	Hypervigilance
AAR4	Exaggerated startle response
AAR5	Difficulty concentrating
AAR6	Sleep disturbance

Fig. 1. Plot of symptom endorsement probabilities by latent class of PTSD.

avoidance symptom severity did not differ between the High Symptom and Threat classes.

Table 2 shows results of bivariate analyses comparing socio-demographic and military, characteristics by PTSD latent class. There were significant differences between classes on education, marital status, household income, war era and whether the VA was primary source of health care. There were no between-class differences with respect to age, sex, race, employment status, enlisted vs. drafted status, combat veteran status, branch of service, and years in military. With regard to the nature of worst trauma, the Threat class was more likely than the Dysphoric class to endorse military service-related trauma as their worst event (31.0% vs. 8.6%); and the Dysphoric class was more likely than the Threat Class to endorse sudden abandonment by spouse, partner, parent, or family as their worst event (21.4% vs. 1.7%). None of the other variables, including other index/worst traumas, differed across the classes.

Table 3 shows results of three-step analyses comparing PTSD latent classes with respect to trauma history, psychiatric comorbidities, measures of functioning and quality of life. With regard to trauma variables, the High Symptom class reported having experienced more traumatic events on average compared to the Threat and Dysphoric classes; they were also more likely to report a history of childhood abuse. With regard to lifetime psychiatric variables, the High Symptom and Dysphoric classes were more likely than the Threat class to screen positive for alcohol and drug use disorders; the High Symptom class was additionally more likely to screen positive for nicotine dependence and to have attempted suicide; and the Dysphoric class was more likely to screen positive for major depression. With regard to current psychiatric measures, the High Symptom class was more likely than the Threat class to screen positive for generalized anxiety and suicidal ideation; and the High Symptom and Dysphoric classes were less likely than the Threat class to screen positive for hazardous drinking. Both the High Symptom and Dysphoric classes were more likely than the Threat class to have ever received mental health treatment, and the High Symptom class was more likely to be currently engaged in treatment. There were no differences between the High Symptom and Threat classes in lifetime major depression and social phobia, or current major depression. The Threat and Dysphoric classes did not differ with respect to lifetime

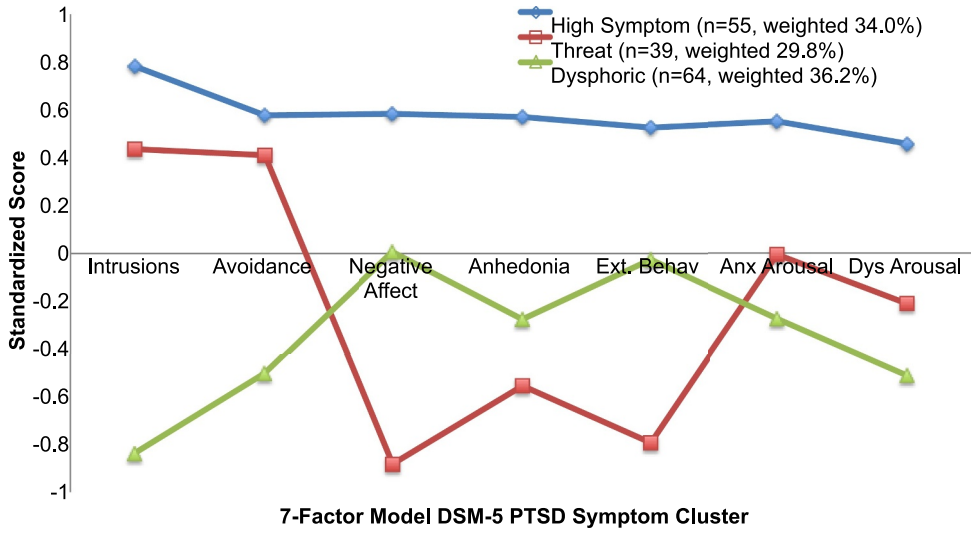


Fig. 2. Plot of standardized 7-factor PTSD symptom scores by latent class of PTSD.

Table 2
Sociodemographic, trauma-related, and psychosocial correlates of latent classes.

Variable	Full Sample (n = 158)	Class 2: Threat (n = 58)	Class 3: Dysphoric (n = 69)	Class 1: High Symptom (n = 64)	Bivariate Test of Difference	
		n (weighted %) or Mean (SE)	n (weighted %) or Mean (SE)	n (weighted %) or Mean (SE)	F/χ^2	p
Age, mean (SD), y	53.4 (11.9)	53.5 (1.9)	54.2 (1.7)	49.9 (1.8)	1.74	.18
Sex, n (%)						
Male	123 (83.3)	31 (82.8)	52 (84.5)	40 (83.6)	0.07	0.96
Female	35 (16.7)	8 (17.2)	12 (15.5)	15 (16.4)		
Race/Ethnicity						
Non- white	111 (70.3)	25 (56.9)	50 (71.8)	36 (68.2)	3.36	0.19
White	47 (29.7)	14 (43.1)	14 (28.2)	19 (31.8)		
Education						
Less than College	29 (18.4)	8 (48.3)	10 (28.2)	11 (47.0)	7.08	0.03
Some College	129 (82.6)	31 (51.7)	54 (71.8)	44 (53.0)		
Marital status						
Not Married/cohab.	61 (38.6)	10 (22.4)	22 (28.6)	29 (62.1)	24.88	< 0.001
Married/cohab.	97 (61.4)	29 (77.6)	42 (71.4)	26 (37.9)		
Employment Status						
Working	66 (41.8)	18 (46.6)	21 (36.6)	27 (53.0)	3.79	0.15
Retired/Not working	92 (58.2)	21 (53.4)	43 (63.4)	28 (47.0)		
Household Income						
< $35,000	65 (41.1)	17 (43.1)	19 (25.4)	29 (45.5)	14.80	0.022
$35,000-$59,999	37 (23.4)	12 (32.8)	14 (28.2)	11 (34.8)		
$60,000-$84,999	24 (15.6)	3 (13.8)	13 (21.1)	8 (7.6)		
$85,000 +	32 (20.2)	7 (10.3)	18 (25.4)	7 (12.1)		
Enlisted or Drafted						
Drafted	14 (8.9)	3 (15.5)	7 (8.6)	4 (6.1)	3.31	0.19
Enlisted	144 (91.1)	36 (84.5)	57 (91.4)	51 (93.9)		
Combat veteran						
No	70 (44.3)	13 (37.9)	32 (49.3)	25 (33.3)	3.85	0.15
Yes	88 (55.7)	26 (62.1)	32 (50.7)	30 (66.7)		
Branch of Service						
Army	70 (51.1)	19 (62.1)	25 (41.4)	26 (45.5)	14.39	0.07
Navy	45 (28.5)	9 (25.9)	20 (31.4)	16 (24.2)		
Air force	24 (15.2)	7 (6.9)	10 (14.3)	7 (9.1)		
Marine Corps	12 (7.6)	3 (3.4)	6 (8.6)	3 (7.6)		
Other	7 (4.4)	1 (1.7)	3 (4.3)	3 (13.6)		
War era (for combat veterans)						
Vietnam	37 (28.1)	12 (46.1)	16 (41.7)	9 (22.2)	29.59	< 0.001
World War II/Korea	4 (1.9)	1 (3.8)	1 (2.8)	2 (11.1)		
Iraq/Afghanistan	21 (14.6)	6 (23.1)	3 (8.3)	12 (46.7)		
Persian Gulf	16 (10.1)	4 (15.4)	9 (36.1)	3 (15.6)		
Other	10 (6.3)	3 (11.5)	3 (11.1)	4 (4.4)		
Years in military	6.4 (0.4)	5.6(0.7)	6.0 (0.7)	6.8 (0.6)	.94	0.39
VA Primary Source of Health Care						
Yes	73 (46.2)	22 (46.6)	18 (22.5)	33 (53.0)	14.73	0.001
No	85 (53.8)	17 (53.4)	46 (77.5)	22 (47.0)		

Note: SE = standard error

Table 3
Trauma and clinical variables by latent class of DSM-5 PTSD symptoms.

Variable	Full Sample (n = 158)	Class 1: Threat (n = 39) n (weighted %)	Class 2: Dysphoric (n = 64) n (weighted %)	Class 3: High Symptom (n = 55) n (weighted %)	Bivariate Test of Difference F or χ^2	p-value	Dysphoric vs. Threat AOR (95% CI)	High Symptom vs. Threat AOR (95% CI)
Trauma History Measures								
Number of traumas, mean (SE)	6.7 (0.2)	6.5 (0.4)	6.3 (0.4)	7.8 (0.4)	3.55	0.031	Pairwise contrast: 1,2 < 3	
Child abuse	76 (54.1%)	14 (44.1%)	30 (50.7%)	32 (66.7%)	6.92	0.031	1.43 (0.56-3.64)	**3.91 (1.34-11.36)***
Psychiatric Measures								
Lifetime								
Major Depression	66 (42.6%)	15 (32.8%)	33 (54.9%)	18 (37.9%)	7.31	0.026	**3.83 (1.72-8.55)****	1.39 (0.61-3.13)
Social Phobia	34 (17.4%)	7 (13.8%)	10 (15.5%)	10 (22.7%)	2.00	0.367	1.44 (0.50-4.12)	1.62 (0.60-4.39)
Alcohol Use Disorder	101 (65.5%)	21 (50.0%)	39 (64.3%)	41 (80.3%)	12.61	0.002	**2.23 (1.03-4.81)***	**4.27 (1.81-10.07)****
Drug Use Disorder	49 (31.3%)	9 (15.5%)	19 (32.4%)	21 (43.9%)	11.67	0.003	**3.70 (1.44-9.52)****	**2.90 (1.14-7.34)***
Nicotine Dependence	46 (37.9%)	10 (29.3%)	19 (35.2%)	17 (48.5%)	5.18	0.075	2.09 (0.91-4.76)	**2.48 (1.06-5.78)***
Suicide Attempt	40 (24.4%)	6 (17.2%)	13 (15.7%)	21 (38.2%)	13.07	0.001	0.76 (0.29-2.00)	**2.45 (1.01-5.94)***
Current								
Major Depression	58 (42.6%)	10 (32.8%)	17 (54.9%)	31 (37.9%)	7.31	0.026	0.70 (0.31-1.56)	2.00 (0.91-4.41)
Generalized Anxiety	62 (34.7%)	11 (32.8%)	18 (23.9)	33 (47.8%)	8.77	0.012	0.72 (.51-2.65)	**4.15 (1.80-9.59)****
Suicidal Ideation	50 (31.6%)	4 (15.3%)	20 (29.6%)	26 (48.5%)	16.12	0.001	2.27 (0.87-5.94)	**4.99 (1.91-13.04)****
Hazardous Drinking	39 (30.2%)	10 (39.7%)	16 (26.1%)	13 (26.2%)	3.52	0.172	**0.42 (0.18-0.96)***	**0.28 (0.11-0.72)****
Mental Health Treatment								
Ever Received Treatment	104 (63.2%)	25 (43.1%)	42 (65.7%)	37 (78.5%)	16.77	< 0.001	**2.45 (1.14-5.26)***	**3.86 (1.66-9.00)****
Current Treatment	63 (41.0%)	14 (32.8%)	20 (31.4%)	29 (58.2%)	12.48	0.002	1.09 (0.49-2.42)	**2.61 (1.17-5.86)***
							Pairwise contrasts	
Functioning, mean (SE)								
SF-8 Mental Summary	41.57 (.83)	42.87 (1.45)	42.43 (1.45)	36.56 (1.37)	5.83	0.004	3 < 1,2	
SF-8 Physical Summary	41.02 (.75)	40.31 (1.32)	44.94 (1.32)	37.85 (1.25)	7.72	0.001	1,3 < 2	
MOS Cog. Funct. Scale	62.95 (1.87)	63.42 (3.12)	72.63 (3.10)	46.31 (2.90)	18.40	< 0.001	3 < 1 < 2	
Quality of Life	41.97 (.82)	43.02 (1.45)	41.98 (1.44)	37.93 (1.35)	3.43	0.035	3 < 1,2	
BSI-Somatic Symptoms	6.13 (.30)	5.97 (.56)	5.38 (.55)	7.65 (.51)	4.56	0.012	1,2 < 3	

Note: PTSD = posttraumatic stress disorder; SE = standard error; CI = confidence interval; MOS = Medical Outcomes Study; BSI = Brief Symptom Inventory; Reference group = Threat class (Class 1). AOR = Adjusted odds ratio are adjusted for education, marital status and primary source of healthcare.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

social phobia, nicotine dependence, suicide attempt; current major depression, generalized anxiety and suicidal ideation; and current mental health treatment.

With regard to functioning variables, the High Symptom class scored lower than the Threat and Dysphoric classes on measures of mental functioning (Cohen's $d = 0.36$ and 0.33, respectively) and overall quality of life (d's = 0.23 and 0.23, respectively), and higher on a measure of somatic symptoms (d's = 0.25 and 0.34, respectively). The High Symptom class also scored lower on a measure of cognitive functioning than the Threat class ($d = 0.45$), which scored lower on this measure than the Dysphoric class ($d = 0.24$). Finally, the Dysphoric class scored higher on a measure of physical functioning than the Threat ($d = 0.28$) and High Symptom classes ($d = 0.44$). There were no differences between the Threat and Dysphoric classes on mental functioning, quality of life, and somatic symptoms. There were no differences between the Threat and High Symptom classes on physical functioning.

4. Discussion

Results of this study indicate that U.S. military veterans who screened positive for PTSD were best characterized by three typologies, which we refer to as Threat (29.8%), Dysphoric (36.2%) and High Symptom (34.0%). Unlike previous LCA studies that primarily varied on symptom severity (e.g., Breslau et al., 2005), these classes varied both with respect to overall symptom severity and probabilities of certain symptoms. Using the 7-factor model of DSM-5 PTSD symptoms (Armour et al., 2015; Pietrzak et al., 2015), the Threat and Dysphoric classes had lower severity of overall PTSD symptoms compared to the High Symptom class, and were differentiated by greater severity of intrusions and avoidance symptoms in the Threat class and greater severity of negative affect and externalizing symptoms in the Dysphoric class. The High Symptom class reported the greater severity of PTSD symptoms, and was more likely to have a lifetime history of alcohol, drug, and nicotine use disorder, current generalized anxiety, to have attempted suicide, and to be currently contemplating suicide. The Threat and Dysphoric Classes had fewer differences in severity of comorbid mental disorders and their level of functioning. These typologies of DSM-5 PTSD symptoms in U.S. veterans are similar to those observed in a general population sample of U.S. adults diagnosed with DSM-IV PTSD (Pietrzak et al., 2014a) and World Trade Center (WTC) responders (Horn et al., 2016), suggesting they may be largely consistent across trauma-exposed populations with PTSD, although replication of these findings in larger samples using DSM-5-based measures is needed.

The Threat class was more likely than the other classes to report military-related trauma as their worst trauma. This is consistent with prior work indicating that the Threat class was more associated with exposure to traumas regarding threatened death or injury. For example, a prior LCA study of WTC responders with PTSD found that greater exposure to the disaster site (e.g., being caught in the dust cloud) was associated with a Threat-related profile of PTSD symptoms (Horn et al., 2016). Furthermore, a study of a nationally representative sample of U.S. adults with PTSD found that exposure to assaultive and military trauma was linked to a Threat-related profile of PTSD symptoms (Pietrzak et al., 2014a). Collectively, these findings suggest that exposure to life-threatening traumatic events may be strongly linked to the development of intrusive and avoidance symptoms. In contrast, abandonment-related distress was associated with membership in the Dysphoric class compared to the Threat class. This finding has some

parallels with previous analyses in adults with PTSD, which found that individuals in a Dysphoric class were more likely than those in a Threat class to report unexpected death of someone close as their worst event (Pietrzak et al., 2014a). These results suggest that precipitating traumatic events may lead to differential expression of PTSD symptoms. They also underscore the importance of assessing trauma history in symptomatic trauma survivors.

The Dysphoric class was more likely than the Threat class to have a lifetime history of major depressive disorder, which is consistent with what was previously observed in adults with PTSD (Pietrzak et al., 2014a). That the Dysphoric class reported greater severity of negative affect and externalizing behaviors (i.e., irritability/aggression, self-destructive or reckless behavior) aligns with prior work linking "silent" forms of child maltreatment, such as neglect/abandonment-related distress, with increased risk for depression (Infurna et al., 2016) and aggressive behavior (Van Wert et al., 2017). The Dysphoric class was also more likely than the Threat class to have a history of alcohol and drug use disorders, which may develop as a form of "self-medication" for abandonment-related distress and associated dysphoric symptoms (e.g., Leeies et al., 2010). These results suggest that trauma survivors with PTSD who present with symptom profile characterized predominantly by dysphoric symptoms may be at increased risk for depression and substance use disorders.

While additional research is needed to confirm this possibility, different classes of PTSD may be differentially responsive to specific types of treatments. For example, there is some evidence for the use of behavioral activation in the treatment of emotional numbing and dysphoric symptoms (e.g., Gros et al., 2012), which may be helpful for trauma survivors presenting with a dysphoric profile. Further, trauma survivors presenting with a Threat profile may benefit from interventions that target re-experiencing, avoidance, and hyperarousal symptoms, such as exposure-based treatments that focus on reducing avoidance behaviors and intrusive thoughts (Foa et al., 2007). The High Symptom profile is the most concerning with respect to their overall level of psychiatric comorbidities, suicidality, and reduced functioning. This class also had elevated rates of comorbid psychiatric disorders, which is consistent with prior work (Horn et al., 2016; Pietrzak et al., 2014a). They also scored lower on measures of mental and cognitive functioning, as well as quality of life, higher on a measure of somatic symptoms, and were more likely than the Threat class to have attempted suicide.

These findings also suggest that trauma survivors presenting with elevations across symptom domains will likely require the most intensive monitoring and treatment compared to trauma survivors presenting with Threat and Dysphoric profiles. Of note, the majority of the sample (63.2%) had engaged in mental health treatment in their lifetimes; the Dysphoric and High Symptom classes were more likely than the Threat class to have engaged in treatment; and the High Symptom class was more likely to be currently engaged in treatment. This suggests that veterans with greater severity of PTSD symptoms are more likely to engage in mental health treatment. Further research is needed to characterize factors that motivate initiation and engagement in mental health treatment in veterans and other trauma-affected populations with different latent profiles of PTSD symptoms.

This study has several methodological limitations worth noting. First, the study is cross-sectional, so we cannot ascertain the stability of the latent classes of PTSD. Second, the sample size was small; recruitment of a larger sample would have enabled examination of more nuanced typologies of PTSD symptoms. Relatedly, optimal cut scores for identifying probable PTSD using the PCL-5 have not yet been established for general population samples; the score of 31 that was used in the current study is derived from a study that calibrated PCL-5 scores against the gold standard Clinician-Administered PTSD Scale in treatment-seeking veterans (Bovin et al., 2016). Third, some measures in this study relied on the DSM-IV criteria while others relied on DSM-5 criteria. For example, the Trauma History Screen is based on the DSM-IV definition of PTSD, which includes participants with abandonment-related traumatic stress; however, this trauma does not qualify as a Criterion A trauma in DSM-5. Individuals who endorsed this event may be more likely to meet criteria for major depressive disorder or an adjustment disorder. Fourth, the sample was predominantly comprised of older, male, and white veterans, so they may not generalize to other trauma-affected or non-military populations.

Notwithstanding these limitations, results extend prior work on DSM-IV PTSD (Horn et al., 2016; Pietrzak et al., 2014a) to suggest that DSM-5 PTSD symptoms may aggregate into three "person-based" typologies of Threat, Dysphoric, and High Symptom profiles. This study examines a number of important demographic variables, including ethnicity and war era. Results suggest that the expression of PTSD symptoms may be linked to different traumatic events. Further research is needed to utility multi-method approaches to characterize biological and endophenotypic factors underlying different PTSD symptom profiles; characterize trajectories of each of the PTSD classes and transitions between classes over time; and examine how different PTSD classes respond to different types of treatment that target their predominant symptom profiles.

Declarations of Interest

None.

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Supplementary materials

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