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The dimensional structure of posttraumatic stress symptomatology in 323,903 U.S. veterans

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ABSTRACT

There is ongoing debate regarding the optimal dimensional structure of posttraumatic stress disorder symptomatology. A better understanding of this structure has significant implications, as it can provide more refined phenotypic measures for use in studies of the etiology and neurobiology of PTSD, as well as for use as endpoints in treatment studies of this disorder. In this study we analyzed the dimensional structure of PTSD symptomatology, as assessed using the PTSD Symptom Checklist-Military Version in 323,903 Veterans. Confirmatory factor analyses were used to compare two 4-factor models and a newly proposed 5-factor model to the 3-factor DSM-IV model of PTSD symptom dimensionality. To evaluate the external validity of the best-fitting model, we then conducted a structural equation model examining how the symptom dimensions of this model related to diagnoses of depression, anxiety, and substance use disorder. Results indicated that a newly proposed 5-factor 'dysphoric arousal' model comprised of separate re-experiencing, avoidance, numbing, dysphoric arousal, and anxious arousal symptom clusters provided a significantly better fit to the data compared to the DSM-IV and the two alternative four-factor models. External validity analyses revealed that numbing symptoms were most strongly related to diagnoses of depression and substance use disorder, and that dysphoric arousal symptoms were most strongly related to a diagnosis of anxiety disorder. Thus the dimensional structure of PTSD may be best represented by five symptom dimensions. The clinical implications of these results and implications for further refinement of extant PTSD assessment instruments are discussed.

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In recent years, there has been ongoing debate regarding the optimal characterization of the structure of posttraumatic stress disorder (PTSD) symptomatology (Armour et al., 2013a; Elhai et al., 2011; Elhai and Palmieri, 2011; Friedman et al., 2011; King et al., 1998; Shevlin et al., 2009; Simms et al., 2002). This debate was relevant to the reformulation of diagnostic criteria for PTSD in the recently published 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), and will likely continue to inform the evolving conceptualization of the component symptom clusters that comprise the heterogeneous phenotype that characterizes this disorder (Friedman et al., 2011).

PTSD is one of the most prevalent and disabling psychiatric disorders among U.S. Veterans (Harpaz-Rotem and Rosenheck, 2011; Tanielian and Jaycox, 2008; Thomas et al., 2010). It is also prevalent among the general adult population, with 20% of the US adult population experiencing a traumatic event in a given year (Kessler et al., 2005; Kessler et al., 1995). A recent examination of the delivery of psychotherapy among the privately insured US population found that individuals diagnosed with PTSD were the most likely to receive psychotherapy compared to individuals diagnosed with other psychiatric disorders, thereby highlighting the psychological burden of this disorder (Harpaz-Rotem et al., 2012). To date, however, all studies that have examined the structure of PTSD symptomatology in Veterans have employed relatively small sample sizes and thus, the generalizability of these results to the broader population of U.S. Veterans is unknown.

Several studies have challenged that the structure of PTSD symptoms is comprised of three symptom clusters, as specified in DSM-IV: re-experiencing (Criterion B), avoidance/numbing (Criterion C), and hyperarousal (Criterion D). Two alternative four-factor models have been proposed and confirmatory factor analytic (CFA)

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studies have suggested that they provide superior fit to symptom-level PTSD data than the 3-factor DSM-IV model (King et al., 1998; Simms et al., 2002). These two four-factor models include the dysphoria model (Simms et al., 2002) and the emotional numbing model (King et al., 1998). In the dysphoria model, PTSD symptoms are separated into distinct four factors of re-experiencing, avoidance, dysphoria and hyperarousal symptoms. In the emotional numbing model, PTSD symptoms are separated into distinct four factors of re-experiencing, avoidance, emotional numbing and hyperarousal symptoms (see Table 1 for details). Several CFA studies have demonstrated the superiority of the two 4-factor models of PTSD symptoms over the DSM-IV 3-factor model (Elhai et al., 2009; Elhai et al., 2008; Elhai et al., 2011; Engdahl et al., 2011; Grubaugh et al., 2010; Mansfield et al., 2010; Palmieri et al., 2007; Yufik and Simms, 2010). A recent meta-analysis suggested that the dysphoria model is only marginally superior than the numbing model in characterizing PTSD symptom structure, irrespective of the sample studied or PTSD assessment instrument employed (Yufik and Simms, 2010). Given that each of the two 4-factors models have demonstrated superiority that varied based on sample characteristics, testing conditions and instruments used, it is yet premature to determine which of these models better represents the latent structure of PTSD. The DSM-5 PTSD symptom clusters, however, more closely resemble the emotional numbing model in its inclusion of 4 symptom dimensions: intrusion symptoms, avoidance, negative alterations in cognitions and mood, and alterations in arousal and reactivity (Friedman et al., 2011).

One of the debates surrounding the latent structure of PTSD symptomatology involves three specific Hyperarousal symptoms (D1–D3) and whether they represent one of two constructs – Dysphoria or Hyperarousal. In an attempt to address this issue, Shevlin et al. (2009) analyzed data from a large, nationally representative sample of civilian U.S. adults, and found that symptoms D1-D3 were not clear indicators of either the Dysphoria or the Hyperarousal factors but rather that they cross-loaded on both factors, thereby supporting the 4-factor dysphoria model. More recently, Elhai et al. (2011) have attempted to reconcile differences between the numbing and dysphoria models. In their investigation, they found support for a novel 5-factor model that separates fear-based panic symptoms (i.e., hypervigilance, exaggerated startle; "anxious arousal") from hyperarousal symptoms characterized by dysphoria-related arousal abnormalities (symptoms D1–D3) represented by anger/irritability, sleep difficulties, and concentration problems (i.e., "dysphoric arousal"). This solution is in line with a theoretical model proposed by Watson (2005), which separates symptoms that involve restlessness and agitation (i.e., irritability) from more fear-based, panic-like symptoms (i.e., exaggerated startle response).

Table 1
Item mappings for each of the PTSD factor models.

PTSD symptom	Model			
	DSM-IV	Dysphoria	Numbing	5-Factor
B1. Intrusive thoughts	R	R	R	R
B2. Recurrent dreams	R	R	R	R
B3. Flashbacks	R	R	R	R
B4. Emotional reactivity	R	R	R	R
B5. Physiological reactivity	R	R	R	R
C1. Avoiding thoughts of trauma	A	A	A	A
C2. Avoiding reminders of trauma	A	A	A	A
C3. Inability to recall aspects of trauma	A	D	N	N
C4. Loss of Interest	A	D	N	N
C5. Detachment	A	D	N	N
C6. Restricted affect	A	D	N	N
C7. Sense of foreshortened future	A	D	N	N
D1. Sleep disturbance	H	D	H	DA
D2. Irritability/anger	H	D	H	DA
D3. Difficulties concentrating	H	D	H	DA
D4. Hypervigilance	H	H	H	AA
D5. Exaggerated startle response	H	H	H	AA

R = Re-experiencing; A = Avoidance; H = Hyperarousal; D = Dysphoria; N = Emotional numbing; DA = Dysphoric Arousal; AA = Anxious Arousal.

A growing number of CFA studies, which have been conducted in nationally representative civilian samples, general adult samples of medical patients, survivors of domestic violence, natural disasters, a violent riot, and military veterans have found that this newly proposed 5-factor model provides a significantly better representation of PTSD symptom structure than the DSM-IV and both of the four-factor models (Armour et al., 2012, 2013a, 2013b; Elhai et al., 2011; Pietrzak et al., 2012a; Pietrzak et al., 2012b; Wang et al., 2011a, 2011c). Some studies have also examined how the 5-factor model relates to external measures of psychopathology, such as depression and anxiety (Pietrzak et al., 2012b; Wang et al., 2012; Wang et al., 2011b). Results of these studies have demonstrated that re-experiencing, avoidance, and anxious arousal symptoms are most strongly linked to anxiety, numbing symptoms to depression, and dysphoric arousal symptoms to both anxiety and depression. Results of these studies provide preliminary support for the external validity of the 5-factor PTSD model.

In the current study, we examined the dimensional structure of PTSD symptoms from more than 320,000 U.S. veterans who presented for treatment at any VA medical center in the United States. To our knowledge, this is the largest dataset of symptom-level PTSD data ever assembled and thus provides a unique opportunity to assess the dimensional structure of PTSD symptomatology. Our primary aim was to evaluate the potential robustness of the 5-factor model in characterizing PTSD symptom dimensionality relative to two 4- factor models (numbing and dysphoria) and the 3-factor DSM-IV model. Based on a growing body of CFA research that has highlighted the superiority of the 5-factor model relative to the two 4- and 3-factor DSM-IV models in characterizing the structure of PTSD symptoms (Armour et al., 2013a; Elhai et al., 2011; Pietrzak et al., 2012a), we hypothesized that the 5-factor model would provide the best structural representation of PTSD symptomatology in this sample. We then repeated the analyses with two restricted subsamples, first with women only and then with only veterans diagnosed with PTSD to evaluate the stability of the factor structure among these important veteran subsamples. As a secondary aim, we evaluated how the 5-factor Dysphoric Arousal model relates to other common psychiatric conditions in veterans—depression, other anxiety disorder, and substance use disorder.

1. Method

Since the beginning of Fiscal Year 2008, the U.S. Department of Veterans Affairs (VA) has mandated mental health providers to assess PTSD symptoms using the PTSD Checklist Military Version (PCL-M; (Weathers et al., 1991) during their initial contact with Veterans who have served in the conflicts in Iraq and/or Afghanistan and who present for mental health assessment or treatment at a VA medical center. In 2010, the required reporting expanded to all patients with a diagnosis of PTSD. The PCL-M is a 17-item self-report instrument developed to assess the presence and severity of military-related PTSD symptoms that is based on the DSM-IV diagnostic criteria for PTSD. The PCL-M screening results are collected by the VA mental health provider and are entered by the provider into the electronic medical record. Using the VA electronic medical record databases that capture outpatient care and test results, we identified PCL-M scores that were completed for every Veteran who received mental health care between October 1, 2008 and September 31, 2012. The data were