**Component Structure of the Penn Inventory for Posttraumatic Stress
Disorder (PTSD) Among Veterans Seeking Department of Veterans Affairs
Disability Benefits: Concordance by Race/Ethnicity, Gender, Service Era, and Type
of Military Exposure**

Karen Wahmanholm, MD, MPH^{1,2}
Melissa A Polusny, PhD^{2,3,4}
Joseph Westermeyer, MD, PhD, MPH^{1,2}
Maureen Murdoch, MD, MPH^{4,5,6}

¹ Psychiatry Department, Minneapolis VA Health Care System, Minneapolis, MN

² Department of Psychiatry, University of MN Medical School, Minneapolis, MN

³ Mental Health Service, Minneapolis VA Health Care System Minneapolis, MN

⁴ Center for Care Delivery and Outcomes Research, Minneapolis, MN

⁵ Section of General Internal Medicine, Minneapolis VA Health Care System,
Minneapolis, MN

⁶ Department of Medicine, University of Minnesota Medical School, Minneapolis, MN

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Abstract

Background: Although a common neurobiological mechanism for PTSD has been proposed, contextual issues related to race/ethnicity, gender, other sociohistorical factors, and the type of trauma experienced could influence how PTSD presents in any given individual. **Objective:** To analyze and compare the patterns of correlations (the component structure) of Veterans' responses to the Penn Inventory for PTSD according to their race/ethnicity, gender, service era (e.g., World War II v. Vietnam Conflict), and military trauma exposures (i.e., combat v. sexual assault). **Subjects:** 3,337 nationally representative Veterans who applied for PTSD disability benefits between 1994 and 1998 and returned a mailed questionnaire between 1998 and 2000. **Study Design:** Secondary analysis of a cross-sectional survey conducted in 2008. **Methods:** Using Principal Components analysis, component scores and component comparability coefficients were calculated for each pre-defined subgroup. **Results:** In the overall sample and across all subgroups, Principal Components analysis consistently identified 2 main latent variables: "alienation and numbing" and "re-experiencing and sleep disturbance." These two components explained 46.3% of the variance in subjects' responses. For most planned comparisons, the component comparability coefficient met or exceeded 0.80 (all $ps < 0.001$), suggesting that the patterns of correlations across subgroups' responses were highly similar. Hispanic Veterans were a notable exception: component comparability coefficients between them and the other race/ethnicity categories ranged from 0.29 to 0.70. **Conclusion:** Except for Hispanic Veterans, subjects' response patterns to the Penn Inventory for PTSD did not vary substantively by race/ethnicity, gender, trauma exposure, or service era. Implications are discussed.

Tags: PTSD, Posttraumatic Stress Disorder, Disability Benefits, Veterans, Measurement, Instrumentation, Scale, Factor Analysis, Component Analysis, Race/Ethnicity Differences, Gender Differences, Sex Differences, Military Sexual Trauma, Sexual Assault, Rape, Combat, World War II, Korean Conflict, Vietnam Conflict, DSM, Review Synthesis

Introduction

Although posttraumatic stress disorder (PTSD) affects up to 12% of United States adults,¹⁻⁵ its lifetime prevalence is considerably higher among combat Veterans.⁶⁻¹¹ PTSD is the most common psychiatric condition for which Veterans seek Department of Veterans Affairs (VA) disability benefits, and the third most common condition for which they seek VA disability benefits overall. Of the 4.4 million Veterans indemnified by VA for military-related disorders in 2016, almost 20% were service connected for PTSD.¹²

Though the original diagnostic criteria for PTSD were largely developed and based on Vietnam combat Veterans' symptoms,¹³⁻¹⁵ PTSD may develop as a result of any horrific trauma, including natural disasters, criminal assault, domestic violence, childhood physical or sexual abuse, and life-threatening illness.¹⁶⁻¹⁸ Many researchers believe the neurobiological basis of PTSD, such as hyperactivity of the noradrenergic system¹⁹⁻²¹ and psychophysiological changes,^{22,23} apply universally, regardless of the actual trauma experienced.^{19,22,24-27}

Yet, PTSD could manifest differently in some individuals because of ethnocultural or gender differences.^{26,28-30} Sufferers' responses to trauma may vary according to the context and meaning they assign to their experiences – contexts and meanings that could differ by culture, ethnicity, or gender.^{29,31-36} Additionally, different criterion symptoms may be more or less prominent among different populations,^{30,36-39} and somatically-based symptoms or idioms, may be more prominent in non-Western populations.^{29,30,37,38} In addition to usual DSM criteria, complex forms of PTSD may develop in survivors of prolonged trauma, presenting with somatization, alexithymia and impulse dysregulation, dissociation, sense of self alterations, and relationship disruptions.^{40,41}

Comorbid psychiatric conditions and trauma exposures could also vary by gender, socioeconomic class, or ethnic group and affect either vulnerability to PTSD or its symptom presentation.^{28,33,42} For example, Norris² found lower lifetime rates of trauma reported by African Americans or blacks than by whites, but higher trauma effects in black persons. On net, men tend to report more types of trauma than women,^{5,42,43} except for sexual assaults.⁴² Military women have substantially greater odds of both pre-military abuse and in-service sexual assault compared to military men.⁴⁴⁻⁴⁷

Military culture itself may affect the contexts and meanings survivors apply to trauma. Compared to civilian sexual assault, for example, military sexual trauma may be particularly damaging⁴⁸ because assault by comrades-in-arms or by superior officers disrupts the interdependency and trust considered essential for individual and troop survival. For service members who file assault charges, events surrounding the investigation could also contribute to PTSD's development. For example, service women filing sexual assault claims have reported being disbelieved, shamed, and retaliated against.⁴⁹ Unlike other employers, the military is simultaneously responsible for victims' treatment and perpetrators' adjudication. Concerns for overall troop safety and military readiness may outweigh individual survivors' therapeutic concerns or needs for justice.⁵⁰

However, placing survivors' needs second to the organizations' could compound the former's distress or precipitate distress where none previously existed. Additionally, in the military, survivors' ability to limit future threat, e.g., by quitting or avoiding the perpetrator(s), is often curtailed.

For combat Veterans, the sociohistorical context of war differs across eras and could influence the odds of developing PTSD or how it presents.^{51,52} World War II Veterans experienced higher levels of combat, were more likely to have killed the enemy, and were more likely to have been wounded compared to later war cohorts,⁵³ whereas Vietnam Veterans may have witnessed more abusive violence and been "more frequent targets and observers of killing" compared to earlier war Veterans.⁵¹ Public support for World War II was considerably higher than for the Korean or Vietnam Conflicts,^{51,52} and the high mobilization of all men in the former ensured that World War II servicemen were reasonably representative of all socioeconomic classes. In later conflicts, younger men from the lower socioeconomic strata were overrepresented. While combat severity has consistently been associated with PTSD development; e.g.,^{3,46,54-59} social support, a welcoming public "homecoming," and higher socioeconomic status may also be protective.^{57,60-63} For many Vietnam Veterans, that Conflict's violence came at a critically important juncture of their lifespan development (i.e., late adolescence, very early adulthood) and could have predisposed them to developing a more complex form of PTSD relative to developmentally older Veterans from earlier wars.⁴¹

Although there might be theoretical reasons to suppose that PTSD might present differently across race or ethnicity groups, gender, or service era, the few studies examining this question have been equivocal. For example, in a sample of Hispanic community violence victims, Marshall⁶⁴ found a similar latent structure in the PTSD symptoms of English-speakers compared to Spanish-speakers. In a comparison of white Vietnam era Veterans to black and Hispanic Veterans, Ortega and Rosenheck³⁹ found black Veterans had lower guilt and higher hyperarousal and avoidance scores; Puerto Rican Hispanic Veterans had higher re-experiencing, hyperarousal, guilt and avoidance scores; and Mexican American Veterans had higher hyperarousal and lower numbing scores. In a study of United States and Mexican hurricane victims, Mexicans reported greater intrusion and avoidance but less arousal, after controlling for trauma severity.³⁷ Elhai and colleagues⁶⁵ identified few differences in MMPI-2 responses of male combat Veterans compared to (mostly) female child abuse survivors and, in a confirmatory factor analysis of United States male and female adolescents, the PTSD factor structure appeared equivalent.⁶⁶ In a sample of Somali peacekeepers and Gulf War I Veterans, King and colleagues⁶⁷ identified the same 4 underlying factors for men and women's responses to the PTSD Checklist,⁶⁸ but substantial dissimilarities in factor loadings, factor intercorrelations, and residuals. Hovens and colleagues⁶⁹ identified two additional latent factors, "Concentration Problems" and "Lack of Interest," when they compared Dutch women resistance fighters' responses and men's responses on the Dutch PTSD Scale, but these two factors' importance and stability (one was a couplet) were unclear. In studies comparing Vietnam Conflict Veterans to World War II Veterans, the former have generally been shown to have severer PTSD,^{51,70-72} depression,⁷¹ global illness severity,⁷¹ situational adjustment problems,^{72,73} and work impairment,^{71,73} as well as greater

hostility,⁷¹ psychoticism,^{70,71} and guilt.^{51,71} Korean Conflict Veterans have been found to have severer PTSD symptoms and greater maladjustment, psychiatric distress, and suicidality when compared to World War II Veterans.^{51,52}

This study's goal was to explore these issues further by comparing the component structure of Veterans' responses to a validated instrument of PTSD symptoms according to their race/ethnicity, gender, service era, and military trauma exposure (combat v. sexual trauma). Findings of substantive differences might call into question PTSD's construct validity in some subgroups—or our measure's construct validity—and perhaps suggest fruitful areas for exploring impacts of race/ethnicity, gender, and trauma context on PTSD presentation. Findings of similarity would offer reassuring evidence for the construct validity of PTSD and of our measure.

Methods

Setting and Subjects

As described elsewhere,^{74,75} participants were 1,654 men and 1,683 women from an eligible pool of 4,918 nationally representative Veterans who applied for VA disability benefits for PTSD between 1994 and 1998. Veterans were mailed a questionnaire, monetary incentive, and cover letter inviting them to participate in the study. The cover letter included the elements of informed consent (including risks and benefits of participation and the voluntary nature of participation); Veterans' signified their consent to take part in the study by returning a completed survey. The Minneapolis VA Medical Center's Human Studies Subcommittee approved the study's protocol.

Participants returned completed questionnaires between 1998 and 2000. Respondents' mean age was 48 years ($SD = 13$). Almost a quarter were white and 17%, African American or black. Almost all the men (94%) and nearly a third of women reported some combat exposure. Almost three quarters of women and 4% of men reported in-service sexual assault.⁷⁶ About three fifths of the sample's PTSD disability claims were approved. Respondents and non-respondents did not differ significantly in terms of combat injury, combat exposure, or exposure to unwanted sexual attention while in the service.^{74,75} Based on a claims audit of 537 randomly selected Veterans, non-respondents appeared as likely as respondents to have been diagnosed with PTSD by a qualified clinician.⁷⁷ Based on the claims audit, we estimate that 80% of the sample had a clinical diagnosis of PTSD at the time they filed their disability claim.

Measures

PTSD symptomatology. Veterans' PTSD symptomatology was measured using the Penn Inventory for Posttraumatic Stress Disorder (Penn Inventory),⁷⁸ a 26-item, self-report measure of PTSD severity with 0.94 internal consistency and 0.87-0.96 test-retest reliability over a period of 3 to 8 days. Criterion validity was originally established in relation to a structured PTSD clinical protocol.⁷⁸ Scores of 35 or more predict PTSD in Veterans with 93% to 97% accuracy.^{44,79} Although originally developed in Vietnam

combat Veterans, the Penn Inventory has also been validated in general psychiatric patients and civilian disaster survivors.⁷⁸ Importantly, it measures PTSD independently of the inciting trauma,⁸⁰ making it an ideal test of PTSD responses in populations with heterogeneous trauma exposures. Further, African Americans were well represented in the development samples,^{78,81} and it was been shown to have similar psychometric properties among women and men.⁸²

Race/ethnicity. Respondents self-identified their race/ethnicity by selecting from 6 survey categories, checking as many as applied. The categories were: 1) American Indian or Alaskan Native, 2) Asian, 3) Black or African American, 4) Hispanic or Latino, 5) Native Hawaiian or Other Pacific Islander, and 6) White. We compared the Penn Inventory component structure for Veterans who self-identified as white, black, American Indian, or Hispanic. Too few subjects self-identified as Asian or Hawaiian/Pacific Islander to do separate factor analyses on those groups.

Military trauma exposures. Veterans' *combat exposure status* was measured using a modified, 22-item version of the Combat Exposure Index (CEI).⁸³ Scores ≥ 1 indicated combat exposure. Three items from the criminal sexual misconduct subscale of the Sexual Harassment Inventory (SHI)⁸⁴ plus a fourth question asking about other in-service sexual experiences determined Veterans' *in-service sexual assault status*.

Service era. Veterans' service era was abstracted from the Veterans Benefits Administration's (VBA) Veterans Issues Tracking Adjudication Log (VITAL). We compared the Penn Inventory response patterns of Veterans who served in World War II, the Korean Conflict, the Vietnam Conflict, post-Vietnam Conflict, the Gulf War I, and post-Gulf War I. Veterans who served in more than one conflict ($n = 57$) were assigned to the most recent conflict. Veterans categorized as serving in the Korean Conflict included 2 Veterans who had served just prior to that conflict and 52 Veterans who had served just after it.

Analysis

Although the Penn Inventory's internal consistency, test-retest reliability and criterion validity have been substantiated, there has been no published factor analysis of subjects' test responses. Consequently, we used exploratory factor analysis to estimate the scale's factor structure. While ideally a comparison of the factor structure across subgroups would employ confirmatory factor analysis, we believed that "confirming" a scale's factor structure in the same population from which it was initially derived would substantially increase our Type I error. Thus, we used Nunnally's^{85, pg. 433} technique for comparing factor scores and responses' patterns of correlations across different persons using exploratory factor techniques.

First, we conducted a separate factor analysis on the Penn Inventory responses for each subgroup of interest and calculated factors scores for each individual in that subgroup as usual. We then took each subgroups' factor loadings, using them as weights, and applied them to the other subgroups' responses. Thus, for each individual, we created

13 sets of factor scores corresponding to the “male” weights, the “female” weights, and so on. All factor scores were computed using the regression method. The resulting factor scores were then correlated using Pearson’s product-moment correlation coefficient. This correlation is known as the *comparability correlation coefficient*. Per Everett,⁸⁶ a comparability correlation coefficient of 0.90 or more indicates that the different factor versions are essentially the same, and coefficients of 0.80 or more indicate that they are “very similar.”

For all analyses, we used Principal Component extraction. In component analysis, factors are the linear combinations of actual variables, and factor scores for individual respondents can be perfectly determined;^{85, pg. 424} consequently, whether or how we rotated the factors was relatively unimportant to the study’s goals. However, using a known factor structure, Everett⁸⁶ has shown that Varimax rotation is preferable to no rotation or to oblique rotation when computing factor comparability coefficients (assuming ≥ 0.50 correlation between factors). When the correlation between factors is less than 0.30, Varimax rotation is essentially equivalent to oblique methods. Thus, although data suggest that PTSD symptom clusters are conceptually correlated to one another, we used the Varimax procedure to rotate factors. We determined the number of factors to extract by inspecting the Scree plot.⁸⁷ Because membership in more than one group (e.g., some Veterans reported both combat exposure and military sexual assault) could have spuriously inflated the apparent concordance of response patterns of correlations within affected subgroups, we conducted a second set of analyses in which all such Veterans were excluded. Analyses were conducted in 2008 using SPSS for Windows, release 11.

Results

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of the entire sample was 0.97 and Bartlett’s Test of Sphericity was significant at a p-value of < 0.0001 . In the subgroups the KMO sampling adequacy ranged from 0.84 to 0.97. In all subgroups the p-value for Bartlett’s Test of Sphericity was < 0.0001 .

Scree plot

As Figure 1 shows, there was a sharp elbow at the second component, suggesting the scale had just two meaningful components. We found the same sharp elbow at the second component for each of the pre-defined Veteran subgroups (data not shown)

Results of Component Analysis

Table 1 shows the Penn Inventory’s component structure for the entire sample. As can be seen from the Table, few items loaded uniquely on just one component, suggesting that most items tapped into both the scale’s underlying latent variables. That said, the first component appeared to be comprised of items predominantly related to alienation and to lack of direction. Many of these items are similar to the numbing and decreased responsiveness symptoms listed in Criterion C of DSM-IV diagnostic criteria for PTSD.⁸⁸

Component 1 also included Criterion D hyperarousal symptoms related to anger and concentration. The second component was predominantly composed of re-experiencing symptoms, classic to Criterion B, plus sleep disturbance items that are generally categorized as hyperarousal symptoms in Criterion D. We named Component 1, “Alienation and Numbing,” and Component 2, “Re-Experiencing and Sleep Disturbance.”

Correlation of Subgroup Component Scores

As can be seen in Tables 2 through 5, the comparability correlation coefficients across planned subgroup comparisons generally met or exceeded 0.80, suggesting that the response pattern correlations in these subgroups were either very similar or substantially the same. Even unplanned comparisons, e.g., between women and combat-exposed Veterans, generally showed comparability correlation coefficients exceeding 0.80.

The one notable exception was the finding of relatively low Component 1 comparability correlation coefficients between self-identified Hispanic Veterans and Veterans selecting other race/ethnicity categories. Component 2 comparability correlation coefficients between Hispanic Veterans and Veterans selecting the other race/ethnicity categories were especially low. The component structure of Hispanic Veterans’ responses showed that most items related to sleep difficulties loaded with alienation items and explained 41.5% of the variance in these Veterans’ responses, whereas the second component, explaining 5.9% of the variance, was related to items assessing numbing, hyperarousal, and re-experiencing trauma. Compared to other Veterans, self-identified Hispanic Veterans were more likely to be male (56.4% v. 49.2%), and they reported severer combat exposure and PTSD symptomatology and fewer military sexual assaults (data not shown). Yet their component comparability correlation coefficients were especially low when compared to men and to combat-exposed Veterans.

Results did not change importantly when the analyses were repeated to exclude subjects with membership in multiple subgroups (data not shown).

Discussion

Few studies have compared the factor or component structure of PTSD symptoms across sociodemographic groups or across differing traumatic experiences. Although the Penn Inventory was developed based on Vietnam Veterans’ symptoms, our exploratory analyses indicated consistency in the Penn Inventory’s response patterns of correlations across gender, most race/ethnicity categories, trauma type, and service era. In the overall sample and across most subgroups, we identified two major components of PTSD symptomatology: 1) “Alienation and Numbing,” and 2) “Re-experiencing and Sleep Disturbance”.

Table 6 summarizes most of the extant literature on the latent structure of PTSD up until 2008. As Table 6 shows, relatively little consistency has been found in the number and types of factors extracted from diverse samples using different PTSD measures.

Further, inconsistent or overly broad factor labels may have masked additional discrepancies across studies.^{cf. 89} For example, in one study, sleep disturbances loaded on a factor named “Intrusions;” increased irritability loaded on a factor named “Numbing.”¹⁶ In other studies, these symptoms loaded together on a factor named “Hyperarousal,” whereas other symptoms of hyperarousal (e.g., exaggerated startle) loaded on a factor named “Intrusions and Avoidance.”^{90,91} Items labeled as “Avoidance” on the Purdue Post-Traumatic Stress Scale⁹² included “felt guilty about surviving or about what [I] had to do to survive during the war” and “lost interest in one or more of [my] activities (e.g., work, hobbies, etc.),” whereas an item one might consider prototypical of avoidance, “To what extent have you avoided activities that reminded you of the war?,” loaded almost equally on the “Arousal” and “Avoidance” factors.⁹³

As Simms and colleagues⁸⁹ note, it is exceptionally difficult to compare factor structures across studies because samples, methods, and measures differ. Criteria for PTSD have also changed over the years, offering another difficulty. Studies performed in the 1980’s using DSM-III^{e.g., 94-96} did not emphasize avoidance symptoms. The three symptom criteria (Criteria B, C & D) for DSM-III were, respectively, 1) re-experiencing; 2) “numbing of responsiveness to or reduced involvement with the external world;” and 3) a miscellaneous category that included hyperalertness, sleep disturbance, avoidance, memory or concentration problems and guilt. Since then avoidance symptoms have taken an increasingly more important role in diagnostic criteria for PTSD. In DSM-III-R, avoidance joined numbing in Criterion C (“Persistent avoidance of stimuli associated with the trauma *or* numbing of general responsiveness”), and, in DSM-IV, it became essential to meeting Criterion C (“Persistent avoidance of stimuli associated with the trauma *and* numbing of general responsiveness”).

The Penn Inventory was constructed using DSM-III-R criteria, and, though it contains items from each of the 3 symptom criteria needed for diagnosis of PTSD in DSM-IV, there are no items that specifically assess avoidance. This could explain why a evaluation of the Penn Inventory in 80 traumatized British citizens demonstrated somewhat lower specificity than had previously been reported for it.⁸² Because avoidance was not directly assessed in our sample, we do not know if it varied across our subgroups.

While PTSD’s precise factor structure is uncertain, most data available up until 2005 supported a hierarchical structure. That is, lower order factors – whatever their name and number, loaded onto a higher order, “PTSD,” factor.^{13,37,90,91,97-104} While there are exceptions,^{e.g., 64,80,102,105,106} even they could be consistent with a hierarchical model.^{64,80,102,106,107} Our own findings of a very large first component (recognizing that our techniques were geared toward such a finding), substantial loadings on both components for many items, and positive loadings on both components for most items are also consistent with a higher order “PTSD” factor. Increasingly, investigators have suggested that PTSD be considered a “continuum of disturbance severity”^{13, pg. 332} rather than a categorical disorder that is present or absent.^{13,63,90,100,103,108-111} High correlations between avoidance symptoms and either intrusive or arousal symptoms in previous work^{112,113} suggest that failure to assess avoidance does not necessarily doom a test’s usefulness in ranking individuals according to their PTSD symptom *severity*. Indeed,

based on taxometric analyses that strongly supported PTSD's dimensional latent structure, Ruscio, Ruscio & Keane¹⁰⁸ have suggested that "assessment instruments designed to differentiate individuals with and without PTSD may be less useful and less powerful than those that measure the severity with which PTSD symptoms are experienced."

The Penn Inventory has a number of highly desirable characteristics for a self-report measure, including a good correspondence between symptom severity and trauma severity,^{77,78} convergent validity with other PTSD measures,^{78,114,115} clinically relevant benchmarks,^{78,81,116} sensitivity to treatment effects,^{78,81,116,117} and the ability to measure PTSD symptoms regardless of the inciting trauma.⁷⁸ Normative values are available for Veteran and non-Veteran clinical populations^{78,82,115,118} and for non-clinical populations.⁷⁸ To these we now add data suggesting similar psychometric properties across several race/ethnicity groups, gender, service era, and two types of trauma.

Among our Hispanic Veterans, symptoms of alienation and sleep problems explained more variance in their responses than did symptoms related to numbing, re-experiencing, or hyperarousal. Using the PTSD Checklist-Civilian¹¹⁹ version in Spanish- and English-speaking trauma victims, Orlando and Marshall¹²⁰ also identified non-equivalence across distressing dreams, avoidance of trauma reminders, and hypervigilance.¹¹⁹ However, their data did not suggest that these items held greater salience for one group compared to the other. Though PTSD's construct validity has generally been supported in Hispanic samples,^{37,39} Jenkins³⁰ has questioned the cultural validity of some Criterion C symptoms in Salvadoran women refugees.

The Penn Inventory's emphasis on spirituality and alienation is relatively unique among PTSD measures and may be particularly salient for Hispanic persons.^{39,121,122} In a qualitative assessment of post-trauma effects in 24 Mexican disaster survivors, depression and family concerns clustered together and were distinct from more usual DSM criteria for PTSD.¹²³ In a sample of 63 Hispanic Veterans, those with PTSD were significantly more likely to negatively rate their social relationships compared to mentally healthy controls, and they reported weaker linkages to their cultural heritage as well.¹²¹ In a much larger, nationally representative sample of Veterans in treatment for PTSD, Puerto Rican Hispanics were significantly more likely to need assistance with interpersonal relationships than white or African American or black Veterans. Thus, the Penn Inventory's low component comparability coefficients for Hispanic Veterans relative to other subgroups in this study may reflect a cultural phenomenon whereby Hispanic Veterans manifest PTSD symptoms somewhat differently than others.¹²⁴

This study was limited to Veterans who applied for PTSD disability benefits. Results may not be generalizable to other populations with PTSD symptoms. Confirmatory factor analysis was not suitable for this initial analysis, but in the future would offer a more rigorous test of subgroups' factor structure similarities and differences. Among Hispanic individuals, heterogeneous PTSD response patterns by country of origin have been identified.^{39,64} Our Hispanic subgroup's relatively small size plus the potential for such within-group heterogeneity could have resulted in factorial instability. We recommend

replicating our work in larger samples where Hispanic subgroups might be identified and analyzed separately. Developing and incorporating an “avoidance” item into the Penn Inventory might increase its relevancy to current PTSD theories. It would be interesting to see how adding such an item might influence the Penn Inventory’s factor structure.

For the most part, our results were promising and supported excellent stability in the Penn Inventory’s factor structure across gender, service era, military trauma exposures, and service era. The Penn Inventory’s performance in Hispanic Veterans should be explored more deeply. Despite the low component comparability coefficients recorded for Hispanic Veterans, the Penn Inventory might actually be a measure of choice for PTSD in this population because it taps into items that may be particularly relevant to them. Head-to-head comparisons with other PTSD measures might help elucidate these issues.

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Figure

Scree Plot

1

Table 1. Component Analysis of Entire Sample's Responses to the Penn Inventory for PTSD

Item's content (Group Number):	Component Loadings	
	Component 1 Alienation and Numbing	Component 2 Re-Experiencing and Sleep Disturbance
Hard to shape goals (18)	.71	.27
Unclear goals (23)	.70	.24
Poor self-knowledge (15)	.68	.31
Able to enjoy things with others (3)	.63	.25
Achieving things I want (20)	.63	.32
Feel more confused about my life (14)	.62	.41
Not feeling understood (25)	.62	.44
Not caring about actions' consequences (2)	.57	.17
Feeling different from others (1)	.56	.41
Worried about being understood (5)	.56	.23
Feeling distracted (9)	.54	.42
Difficulty concentrating (11)	.51	.47
Meaning from spiritual life (10)	.51	.05
Difficult to control anger (16)	.51	.25
Trouble coping with unwanted thoughts (19)	.50	.48
Afraid to show anger/violence (6)	.47	.35
Troubling nightmares (13)	.22	.75
Intense trauma experience(s) (17)	.14	.72
Flashback severity (8)	.12	.72
Sleep difficulty/nightmares (21)	.30	.65
Anxious when confronted with trauma reminders (7)	.37	.61
Intrusive, bad memories (24)	.39	.60
Feeling jumpy or uptight (4)	.50	.51
Unable to share and process traumas (12)	.40	.44
Unable to grieve for others (26)	.33	.44
Trouble remembering things (22)	.39	.42
<i>Eigen Value</i>	10.7	1.3
Variance Explained	41.2%	5.0%

Note: N = 3,337. Results are of a Principal Component Analysis extraction with Varimax rotation (with Kaiser Normalization). Rotation converged after 3 iterations.

Table 2. “Alienation and Numbing” (Component 1) Correlations across Race/Ethnicity, Gender, and Trauma Type

Category	Race/ethnicity				Gender		Military Trauma Type	
	White n = 2,444	Black n = 560	American Indian n = 233	Hispanic n = 179	Men n = 1,655	Women n = 1,682	Combat n = 2,059	Sexual Assault n = 1,264
White	1.00							
Black	.91***	1.00						
American Indian	.84***	.80***	1.00					
Hispanic	.68***	.50***	.60***	1.00				
Men	.88***	.98***	.75***	.41***	1.00			
Women	.99***	.86***	.82***	.73***	.82***	1.00		
Combat-Exposed	.97***	.98***	.83***	.54***	.97***	.93***	1.00	
In-Service Sexual Assault	.99***	.85***	.83***	.75***	.80***	1.00***	.92***	1.00

***p < 0.001

Table 3. “Alienation and Numbing” (Component 1) Correlations across Service Eras

Category	World War II n = 239	Korean Conflict N = 102	Vietnam Conflict N = 1664	Post- Vietnam Era N = 603	Gulf War I N = 523	Post-Gulf War I N = 209
World War II	1.00					
Korean Conflict	.98***	1.00				
Vietnam Conflict	.84***	.87***	1.00			
Post-Vietnam Era	.82***	.85***	.99***	1.00		
Gulf War	.85***	.87***	.99***	.99***	1.00	
Post-Gulf War	.84***	.88***	.96***	.96***	.95***	1.00

***p < 0.001

Table 4. “Re-experiencing and Sleep Disturbances” (Component 2) Correlations across Race, Gender, and Trauma Type

Category	Race/ethnicity				Gender		Military Trauma Type	
	White	Black	American Indian	Hispanic	Men	Women	Combat	Sexual Assault
	n=2,444	n=560	n = 233	n = 179	n=1,655	n=1,682	n=2,059	n=1,264
White	1.00							
Black	.87***	1.00						
American Indian	.88***	.80***	1.00					
Hispanic	.45***	.29***	.70***	1.00				
Men	.85***	.98***	.78***	.22***	1.00			
Women	.99***	.82***	.90***	.55***	.79***	1.00		
Combat-Exposed	.96***	.97***	.84***	.30***	.96***	.93***	1.00	
In-Service	.98***	.81***	.92***	.61***	.77***	1.0***	.89***	1.00
Sexual Assault								

***p < 0.001

Table 5. “Re-experiencing and Sleep Disturbances” (Component 2) Correlations across Service Eras

Category	World War II n=239	Korean Conflict n=102	Vietnam Conflict n=1,664	Post- Vietnam Era n=603	Gulf War I n=523	Post-Gulf War I n=209
World War II	1.00					
Korean Conflict	.97***	1.00				
Vietnam Conflict	.78***	.80***	1.00			
Post-Vietnam Era	.80***	.80***	.99***	1.00		
Gulf War I	.82***	.82***	.98***	.99***	1.00	
Post-Gulf War I	.83***	.84***	.94***	.94***	.93***	1.00

***p < 0.001

Table 6. Summary of PTSD Factor Analysis Results through 2008

Authors	Sample*	Factor Analysis Type	Scale Used	Factors Extracted
Using DSM-III Criteria for PTSD:				
Glover et al. ¹²⁵ DSM-III	339 male Vietnam combat Veterans with a diagnosis of PTSD	Exploratory and Confirmatory	Vietnam-Related Experiences Questionnaire	<ol style="list-style-type: none"> 1. Vulnerability 2. Guilt 3. Dreams of Death/ Destruction 4. Depression 5. Rebelliousness
Hendrix et al. ⁹³ DSM-III but has 4 avoidance questions	139 male and 4 female Vietnam Veterans	Exploratory	Purdue Post-Traumatic Stress Scale ⁹²	<ol style="list-style-type: none"> 1. Arousal 2. Avoidance 3. Global Perception of Stress
Hovens et al. ⁶⁹ DSM-III	967 male and female Dutch resistance fighters	Exploratory	The Dutch PTSD Scale ⁶⁹	<ol style="list-style-type: none"> 1. Intrusive War memories and Accompanying Sleep Problems 2. General Physiological Arousal 3. Detachment from other people 4. Rage 5. Active Confrontation with War Stimuli 6. Guilt
	Subgroup analysis of the 144 women	Exploratory		<p>All factors listed above plus:</p> <ol style="list-style-type: none"> 7. "Concentration Problems" 8. "Lack of Interest"
Keane et al. ¹²⁶ DSM-III	362 male Vietnam Veterans help-seeking Veterans	Exploratory	Mississippi Scale for Combat-Related PTSD ¹²⁶	<ol style="list-style-type: none"> 1. Intrusive Thoughts/ Depression/ Suicidal 2. Interpersonal Adjustment Problems 3. Lability of Affect/Memory 4. Ruminative Features of PTSD 5. Interpersonal Problems 6. Sleep Problems
Silver et al. ⁹⁴ DSM-III	405 Vietnam counseling-seeking combat Veterans	Exploratory	"list of symptoms . . . drawn from clinical observations and research results"	<ol style="list-style-type: none"> 1. Depression/Dysthymia 2. Survivor Guilt 3. Re-Experiencing 4. Numbed Responsiveness/ Detachment/Apprehension
	The same 405 Vietnam Veterans plus 63 individuals seeking counseling for personal problems	Exploratory		<ol style="list-style-type: none"> 1. Depression 2. Re-experiencing 3. Anger 4. Detachment

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Watson et al. ¹²⁷ DSM-III	131 male Vietnam Veterans with PTSD	Exploratory	DSM-III PTSD Interview ¹²⁸	<ol style="list-style-type: none"> 1. Intrusive Thoughts and Their Effects 2. Increased Arousal 3. Impoverished Relationships (a numbing/avoidance factor) 4. Guilt 5. Cognitive Interference
Wilson et al. ⁹⁵	114 male Vietnam combat Veterans	Exploratory	Vietnam Era Stress Inventory ¹²⁹	<ol style="list-style-type: none"> 1. Depression 2. Physical Symptoms, & Memory Impairment 3. Stigmatization, Alienation, & Cynicism 4. Sensation-seeking & Authority Conflict 5. Anger & Rage 6. Intrusive Imagery 7. Intimacy Conflict
Using DSM-III-R Criteria for PTSD:				
Davidson et al. ⁹⁹ DSM-III-R	353 male and female survivors of heterogeneous traumas (e.g., combat, sexual assault, natural disaster)	Exploratory	Davidson Trauma Scale ⁹⁹	<ol style="list-style-type: none"> 1. General Severity Factor 2. Intrusion
	Subgroup of the 67 subjects with PTSD diagnosis	Exploratory		<ol style="list-style-type: none"> 1. General Severity Factor 2. Reduced Enjoyment/ Estrangement/Lack of Loving Feeling/foreshortened Future 3. Avoiding Activities/Insomnia 4. Avoiding Thoughts, Feelings, Situations 5. Hyperarousal 6. Amnesia
Foa et al. ¹⁶ DSM-III-R	72 female rape victims & 86 female victims of non-sexual assault	Exploratory	The PTSD Symptom Scale ¹¹²	<ol style="list-style-type: none"> 1. Arousal/Avoidance 2. Numbing 3. Intrusion
Hovens et al. ¹³⁰ DSM-III-R	76 Dutch men and women with war-related trauma and 59 Dutch psychiatric outpatients	Exploratory	The Self-Rating Inventory for Posttraumatic Stress Disorder ¹³⁰	<ol style="list-style-type: none"> 1. Numbing 2. Intrusion 3. Avoidance 4. Sleeping Problems

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Keane et al. ¹³¹ DSM-III-R	68 Vietnam Veterans with a PTSD diagnosis; sample's gender composition not specified	Exploratory	Structured Clinical Interview for DSM-III-R PTSD Module ¹³²	<ol style="list-style-type: none"> 1. Intrusive Experiences/Reliving Experiences/Affect Restriction/Hypervigilance 2. Reactivity/Avoidance/Startle 3. Irritability/Impaired Concentration 4. Diminished Interest/ Detachment /Estrangement
		Exploratory	Mississippi Scale for Combat-Related PTSD ¹²⁶	<ol style="list-style-type: none"> 1. Re-experiencing/Reliving Trauma/Nightmares 2. Numbing/Restricted Affect/Anger/Irritability 3. Impulse control/Destructive Impulses 4. Inability to concentrate/Enjoy Activities or People in Life
King et al. ⁹⁷ DSM-III-R	2,272 Vietnam theater and era Veterans (NVVRS respondents) randomly divided into 3 subsamples	Exploratory	Mississippi Scale for Combat-Related PTSD ¹²⁶	Subsample 1: <ol style="list-style-type: none"> 1. Single-factor solution
Higher order factor		Confirmatory		Subsamples 2 & 3: <ol style="list-style-type: none"> 1. Re-experiencing/Situational avoidance 2. Withdrawal and numbing 3. Arousal/Lack of behavioral or emotional control 4. Self-Persecution
King et al. ¹³³ DSM-III-R	300 Vietnam Veterans, 123 battered women, 142 adult survivors of child sexual abuse, 36 maritally distressed women, 105 psychiatric outpatients, 105 high-risk adolescents	Exploratory	The Los Angeles Symptom Checklist ¹³³	<ol style="list-style-type: none"> 1. General PTSD factor 2. Stress Reactions 3. Interpersonal Relations
Lauterbach et al. ¹⁰⁴ DSM-III-R	440 male and female undergraduate college students (previously studied in ⁴³) and 402 introductory psychology college students	Confirmatory	The Civilian Mississippi PTSD Scale (35-item version)	<ol style="list-style-type: none"> 1. Re-Experiencing and Situational Avoidance 2. Withdrawal and numbing 3. Arousal and Lack of Behavioral or Emotional Control 4. Self-Persecution (Guilt and Suicidality)
Support for higher order factor using 35 item version, not the 39-item version				
Maes et al. ¹⁰⁰ DSM-III-R	130 Antwerp hotel-fire victims	Exploratory & Confirmatory	Composite International Diagnostic Interview PTSD Module	<ol style="list-style-type: none"> 1. Depression/Avoidance 2. Anxiety/Arousal
Support for higher order factor	55 Belgian car accident victims			

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McFall et al. ¹³⁴ DSM-III-R	101 Vietnam combat Veterans of with PTSD and 102 Veterans with substance use disorders but no PTSD; sample's gender composition not specified	Exploratory	Mississippi Scale for Combat-Related PTSD ⁹⁶	<ol style="list-style-type: none"> 1. Intrusive Re-experiencing/ Numbing-Avoidance 2. Anger Discontrol/Lability 3. Social Alienation
Sack et al. ²⁷ DSM-III-R	209 Khmer refugees aged 13-25 years	Exploratory	Diagnostic Interview for Children and Adolescents ¹³⁵	<ol style="list-style-type: none"> 1. Arousal 2. Avoidance 3. Intrusion 4. Numbing
	98 study participants' parents	Confirmatory		Same factors as the children's responses
Taylor et al. ⁹¹ DSM-III-R	103 male and female Canadian motor vehicle accident survivors	Exploratory	Structured Clinical Interview for DSM-III-R PTSD Module ¹³⁶	<ol style="list-style-type: none"> 1. Intrusion/Avoidance 2. Hyperarousal/Numbing
DSM-III-R/DSM-IV	419 mostly male United Nations peacekeepers deployed from Canada to Bosnia	Exploratory	PTSD Symptom Scale ¹¹²	<ol style="list-style-type: none"> 1. Intrusion/Avoidance 2. Hyperarousal/Numbing
Vreven et al. ⁸⁰ DSM-III-R	451 non-Veteran men and 217 non-Veterans women who participated in the National Vietnam Veterans Readjustment Study ^{7,8}	Confirmatory	The Civilian Mississippi PTSD Scale	<ol style="list-style-type: none"> 1. Re-experiencing and Situational Avoidance 2. Withdrawal and Numbing 3. Arousal/Lack of Control 4 Self-persecution (guilt and suicidality)
Using DSM-IV Criterion for PTSD:				
Amdur et al. ¹³⁷ DSM-IV	195 male combat Veterans with PTSD	Confirmatory	Impact of Event Scale ¹³⁸	<ol style="list-style-type: none"> 1. Intrusion 2. Effortful Avoidance 3. Sleep Disturbance 4. Emotional Numbing
Anthony et al. ¹³ DSM-III-R and DSM-IV	5,664 male and female children and adolescents exposed to Hurricane Hugo	Confirmatory	Modified Frederick Reaction Index For Children ¹³⁹	<ol style="list-style-type: none"> 1. Arousals 2. Intrusions/Active Avoidance 3. Numbing/Passive Avoidance
Asmundson et al. ¹⁰¹ DSM-IV	349 men and women with routine medical patients	Confirmatory	PTSD Checklist-Civilian Version ¹¹⁹	<ol style="list-style-type: none"> 1. Intrusions/Re-experiencing 2. Avoidance 3. Numbing 4. Hyperarousal

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Asmundson et al. ¹⁰² DSM-IV Text Revision	400 male Canadian United Nations peacekeepers	Confirmatory	PTSD Checklist-Military Version ⁶⁸	Support for both a hierarchical model with two factors: 1. Intrusion/Avoidance 2. Numbing/Hyperarousal and support for a non-hierarchical, 4 intercorrelated factors model:
	768 male United Nations (Canadian) peacekeepers with and without chronic back pain	Confirmatory		1. Re-experience 2. Avoidance 3. Numbing 4. Hyperarousal
Asukai et al. ¹⁴⁰ DSM-III-R/IV	914 Japanese automobile factory workers, 61 Japanese victims of mass arsenic poisoning, 86 survivors of the Hanshin-Awaji earthquake, and 658 survivors of the Tokyo Metro system sarin attack	VARCLUS Cluster Analysis	Impact of Event Scale-Revised, Japanese version ¹⁴⁰	1. Intrusion 2. Avoidance 3. Hyperarousal
Briggs et al. ¹⁴¹	73 treatment-seeking women with history of childhood sexual abuse	Not provided	Unnamed measure ¹⁴²	1. Dissociation 2. Intrusive thoughts 3. Numbing of response 4. anger and mood 5. Depersonalization & Hyperarousal
Buckley et al. ⁹⁰ DSM-IV	217 male and female motor vehicle accident survivors	Confirmatory	Clinician Administered PTSD Scale ¹⁴³	1. Intrusion/Avoidance 2. Hyperarousal/Numbing
Cordova et al. ¹⁰³ DSM-IV	142 female breast cancer survivors	Confirmatory	PTSD Checklist-Civilian Version ¹¹⁹	1. Re-Experiencing 2. Avoidance/Numbing 3. Arousal *moderate fit with DSM-IV
Creamer et al. ¹⁴⁴ DSM-IV	120 male Australian Vietnam Veterans hospitalized for PTSD and 154 community-dwelling adults with "varying levels of traumatic stress symptomatology"	Confirmatory and Exploratory	The Impact of Event Scale-Revised ¹¹³	Either : 1. Single General Factor Or: 1. Intrusion/Hyperarousal 2. Avoidance
DuHamel et al. ¹⁰⁶ DSM-IV	236 male and female cancer survivors who received bone marrow or stem cell transplantation	Confirmatory	PTSD Checklist ¹¹⁹	1. Re-experiencing 2. Avoidance 3. Numbing 4. Hyperarousal

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Engdahl et al. ⁹⁸ DSM-III-R and DSM-IV	247 male former prisoners of war and 83 male World War II combat Veterans	Confirmatory	Mississippi Scale for Combat-Related PTSD ⁹⁶ Impact of Event Scale ¹³⁸ MMPI-2 (Pk) scale	1. A single, PTSD factor was found for each scale
Foy et al. ⁶⁶ DSM-IV Unable to test for a higher order factor	639 male and female adolescents enrolled in 4 high schools	Confirmatory	The Los Angeles Symptom Checklist ¹³³	1. Re-Experiencing 2. Avoidance and numbing 3. Arousal
Gaffney et al. ¹⁴⁵	385 men and women participating in a clinical trial assessing the efficacy of sertraline on PTSD symptoms	Exploratory	The Clinician- Administered PTSD Scale, Part 2 ¹⁴³ & Davidson Trauma Scale ⁹⁹	1. Depression symptoms/ Avoidance/Numbing 2. Re-experiencing/intrusion
Hamada et al. ¹⁴⁶ DSM-IV	3,732 male and female Kauai children aged 6 to 15 years exposed to Hurricane Iniki	Exploratory	The Kauai Recovery Index ¹⁴⁶	1. Re-experiencing 2. Arousal 3. Avoidance 4. "Idiosyncratic" couplet
King et al. ⁶⁷ "supported single higher- order factor"	3,310 male and female Somali peacekeepers and 962 male and female Gulf War I Veterans	Confirmatory	PTSD Checklist ¹¹⁹	1. Re-experiencing 2. Effortful Avoidance 3. Emotional Numbing 4. Hyperarousal
King et al. ¹⁰⁵ DSM-IV	524 male treatment- seeking military Veterans	Confirmatory	Clinician Administered PTSD Scale ¹⁴³	1. Re-Experiencing 2. Effortful Avoidance 3. Emotional Numbing 4. Hyperarousal
Marshall et al. ⁶⁴ DSM-IV	299 English-speaking and 120 Spanish- speaking men and women hospitalized after serious community violence	Confirmatory	PTSD Checklist- Civilian Version ¹¹⁹	1. Re-experiencing 2. Avoidance 3. Numbing 4. Hyperarousal
McDonald et al. ¹⁴⁷	313 OEF/OIF Registry participants, 814 Vietnam era Veterans and 320 post-Vietnam era Veterans obtained retrospectively from PTSD clinic at Durham VA	Confirmatory	Davidson Trauma Scale ⁹⁹	1. Re-experiencing 2. Avoidance 3. Numbing 4. Hyperarousal

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Norris et al. ³⁷ DSM-IV	200 Mexican male and female adults exposed to Hurricane Paulina and 270 United States male and female adults exposed to Hurricane Andrew	Confirmatory	Revised Civilian Mississippi Scale ¹⁴⁸	1. Intrusion 2. Avoidance 3. Numbing 4. Arousal
Ruscio et al. ¹⁰⁸ DSM-IV	1,230 male combat Veterans assessed for PTSD	Taxometric	Mississippi Scale for Combat-Related PTSD ⁹⁶ and/or Clinician Administered PTSD Scale ¹⁴³	Unidimensional disorder
Scott et al. ¹⁴⁹	292 Australians: -52 Vietnam Veterans diagnosed with PTSD -64 subjects receiving counseling for trauma - 176 trauma workers, soldiers, and accident victims	Exploratory	Posttraumatic Stress Scale ¹⁴⁹	1. Emotional problems 2. Re-experiencing and Avoiding problems
Simms et al. ⁸⁹ DSM-IV (no higher order analysis)	3,695 male and female Gulf War era Veterans	Confirmatory	PTSD Checklist-Military Version ⁶⁸	1. Intrusions 2. Avoidance 3. Hyperarousal 4. Dysphoria
Smith et al. ¹⁵⁰ DSM-IV	111 male and female adults ~ 4 years status post bone marrow transplantation	Exploratory	PTSD Checklist-Civilian Version ¹¹⁹	1. Numbing 2. Dreams/Memories of Cancer Treatment 3. Hyperarousal 4. Responses to Cancer-Related Reminders and Avoidance/Numbing
Stewart et al. ¹⁵¹ DSM-IV	374 male and female homeless adolescents	Confirmatory	Study-specific measure of PTSD based on DSM-IV	1. Re-experiencing 2. Increased arousal 3. Avoidance 4. Numbing
Ventureya et al. ¹⁵² DSM-IV	113 French male and female outpatients with PTSD and 31 male and female non-clinical controls	Exploratory	French version of PTSD Checklist-Civilian ¹⁵³	1. Re-experiencing 2. Numbing 3. Hyperarousal

McDonald et al. ¹⁴⁷ DSM-IV	313 OEF/OIF participants in the Durham VA Postdeployment Mental Health (OEF/OIF Registry) plus 814 Vietnam-era Veterans and 320 post-Vietnam Veterans (mostly Gulf War I era)	Multigroup Confirmatory	Davidson Trauma Scale ⁹⁹	For all three groups, a 4-factor model with intercorrelations between factors tended to have the best fit (better than Simms et al.'s 4 factor model with "dysphoria" as one of the factors ⁸⁹): 1. Re-experiencing 2. Avoidance (2 items) 3. Numbing 4. Hyperarousal Metric invariance was supported for Vietnam and Gulf War I Veterans but not between these two groups and the OEF/OIF sample. Metric invariance: same number of factors, identical corresponding items in those factors, and equivalent factor loadings for each item. Configural invariance was shown for all three groups, signifying the same number of factors and the same items in each factor.
DSM criterion not specified:				
Brunet et al. ¹⁵⁴ DSM not specified	223 Canadian franco-phone women who were pregnant during a deadly 1998 ice storm or who became pregnant shortly thereafter	Exploratory	Impact of Event Scale-Revised-French version ¹⁵⁴	1. Hyperarousal 2. Avoidance 3. Intrusion
Callahan et al. ¹⁵⁵ DSM version not specified	89 mothers and fathers of medically fragile infants	Exploratory	The Perinatal PTSD Questionnaire II ¹⁵⁵	1. Symptom Severity 2. Intrusion/Avoidance/Guilt 3. Intrusion/Cognitive Avoidance
Larsson et al. ¹⁰⁷ DSM not specified	321 Swedish men and women involved in the aftermath of a mass murder	Confirmatory	Impact of Event Scale ¹³⁸	1. General Factor 2. Intrusion 3. Avoidance 4. Sleep disturbance
Shevlin et al. ¹⁵⁶ DSM not specified	731 male British World War II and Korean Conflict Veterans	Confirmatory	Impact of Event Scale ¹³⁸	1. Intrusion 2. Avoidance

*Samples are from the United States unless otherwise specified