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Factorial Invariance of Posttraumatic Stress Disorder Symptoms Across Three Veteran Samples

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Abstract

Research generally supports a 4-factor structure of posttraumatic stress disorder (PTSD) symptoms. However, few studies have established factor invariance by comparing multiple groups. This study examined PTSD symptom structure using the Davidson Trauma Scale (DTS) across three veteran samples: treatment-seeking Vietnam-era veterans, treatment-seeking post-Vietnam-era veterans, and Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veteran research participants. Confirmatory factor analyses of DTS items demonstrated that a 4-factor structural model of the DTS (reexperiencing, avoidance, numbing, and hyperarousal) was superior to five alternate models, including the conventional 3-factor model proposed by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994). Results supported factor invariance across the three veteran cohorts, suggesting that cross-group comparisons

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are interpretable. Implications and applications for DSM-IV nosology and the validity of symptom measures are discussed.

Posttraumatic stress disorder (PTSD) is defined by a spectrum of 17 symptoms that may develop after exposure to traumatic events. These symptoms are grouped into three clusters based on the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*; American Psychiatric Association, 1994): reexperiencing (Criterion B), avoidance or numbing (Criterion C), and hyperarousal (Criterion D). Few studies exploring the factor structure of PTSD, however have supported a 3-factor model of symptoms (see King, King,Orazem,&Palmieri, 2006).

Most recent confirmatory factor analytic (CFA) studies examining PTSD measures support one of two 4-factor models of PTSD symptoms. As detailed by King and colleagues (2006), many studies employing a variety of symptom questionnaires and populations support a 4-factor model (King, Leskin, King, & Weathers, 1998) that includes reexperiencing, avoidance, numbing, and hyperarousal factors (Andrews, Joseph, Shevlin, & Troop, 2006; Asmundson et al., 2000; Marshall, 2004; Palmieri & Fitzgerald, 2005). The reexperiencing and hyperarousal factors are analogous to *DSM-IV* symptom Clusters B and D, and the numbing and avoidance factors are drawn from Cluster C. In contrast, other studies have supported a 4-factor model identified by Simms and colleagues (2002), that includes intrusions, avoidance, dysphoria, and hyperarousal (Baschnagel, O'Connor, Colder, & Hawk, 2005;Messer, Hoge, & Castro, 2007). Here, intrusion and avoidance factors correspond to King et al.'s (1998) reexperiencing and avoidance factors. The dysphoria factor includes numbing-related symptoms as well as three symptoms from the hyperarousal cluster: sleep disturbance, irritability/anger, and difficulty concentrating. The two remaining PTSD symptoms load on the hyperarousal factor. Simms and colleagues (2002) note that symptoms loading on the dysphoria factor are common for depressed individuals, and may represent a nonspecific associated feature of both anxiety and depressive disorders.

Although an abundance of studies have examined the structure of PTSD symptoms in discrete populations, very few studies have compared the invariance of PTSD's factor structure across groups (King et al., 2006). This is an important issue, as the *DSM-IV* does not recognize different structures of PTSD symptoms for different demographic or trauma groups. Two recent studies have demonstrated factorial invariance of the King 4-factormodel across English- and Spanish-speaking groups (Marshall, 2004; Norris, Perilla, & Murphy, 2001). Further, Simms and colleagues (2002) found evidence for the factorial invariance of the dysphoria model across deployed and nondeployed Gulf War veterans. As King and colleagues emphasize in their comprehensive review, however, many more studies are needed to examine the factorial invariance of PTSD symptoms across populations that differ in terms of trauma history, ethnicity, gender, and age.

Thus, the current study was designed to assess the invariance of PTSD facture structure across three groups of veterans who differ in era of military service and treatment seeking status: treatment-seeking Vietnam-era veterans; treatment-seeking post-Vietnam-era veterans; and Operation Enduring Freedom/Operation Iraqi Freedom veteran research volunteers (OEF/OIF Registry). Although there is some evidence that the expression of PTSD symptoms may differ across veteran cohorts (Davidson, Kudler, Saunders, & Smith, 1990), no studies have directly examined the factorial invariance of PTSD across veteran groups. A notable point of contrast between the King et al. (1998) and Simms et al. (2002) studies is that although they both employed military veteran samples (Vietnam era and GulfWar I era, respectively), different PTSD symptom structures were supported for each veteran cohort. Thus, there is a need for further examination of factorial invariance of PTSD across veteran cohorts to interpret the

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similarities and differences in the presentation of PTSD among veterans of different wars (Rosenheck & Fontana, 1994).

In the current study, multigroup CFA (Gregorich, 2006) was used to examine the factorial invariance of PTSD symptoms using the Davidson Trauma Scale (DTS; Davidson et al., 1997) as an indicator of PTSD symptoms. The DTS is a 17-item self-report questionnaire of PTSD symptoms. In terms of number of items and self-report format, the DTS is similar to the Military Version of the PTSD Checklist (PCL-M;Weathers, Litz, Herman, Huska, & Keane, 1993) used by Simms et al. (2002). In contrast to the PCL-M, the DTS asks participants to rate both the frequency and severity of each symptom in reference to “the trauma that is most disturbing to you,” on a 5-point Likert-type scale. In this way, it is more similar to the Clinician-Administered PTSD Scale (CAPS-1) structured interview used by King et al. (1998). Although initial studies of the DTS’ psychometric properties have been promising, to date there have been no studies examining its factorial validity using CFA.

The present study was designed to first test the model fit of the conventional 3-factor structure of PTSD symptoms compared to five alternative theoretical models that have received empirical support in prior studies (seeTable 1) including the two 4-factor models reviewed above (King et al., 1998;Simms et al., 2002), two 2-factor models (Maes et al., 1998;Taylor, Kuch, Koch,Crockett,&Passey, 1998), and a unifactorial model that regards PTSD a unitary construct. First, each of the six models was statistically compared for each veteran cohort. Results indicated that the King 4-factor model of PTSD symptoms was supported for each group. Subsequently, multigroup CFA was employed to test factorial invariance of the King 4-factor model across the three veteran cohorts.

METHOD

Participants

The OEF/OIF sample consisted of 313 participants in the Mid-Atlantic Mental Illness Research, Education and Clinical Center Recruitment Database for the Study of Post-Deployment Mental Health (OEF/OIF Registry) based at the Durham Veterans Affairs Medical Center (VAMC) in Durham, North Carolina. The OEF/OIF Registry consists of volunteers who have served in the U.S. Armed Forces since September 11, 2001. Participants were recruited from four VISN-6 VAMCs through mailings advertisements, and clinician referrals. Diagnostic data were available on a subset of veterans (n = 132) who were administered the Structured Clinical Interview for DSM-IV (SCID I/P; First, Spitzer, Gibbon, & Williams, 1994) by trained research assistants. Primary traumas based on the DTS included traumas experienced in a war zone (e.g., combat or improvised explosive device; 59%); the unexpected death or injury of a loved one (17%); a threat or injury to themselves (e.g., motor vehicle accident [MVA], assault, work-related injury; 6%); and 6% rated either natural disasters, sexual or nonsexual abuse as a child, miscarriage, or abortion. The remaining 12% provided trauma descriptions that were clearly traumas (e.g., death of children), but the context was not clear enough to assign in the aforementioned categories. Demographic information for OEF/OIF participants is provided in Table 2.

The clinical samples were extracted from a de-identified patient intake database of the PTSD Clinic at the Durham VAMC (N = 3,237). Two thousand two hundred forty-one Vietnam-era veterans and 629 post-Vietnam-era veterans from the database were screened for inclusion. Patients were included in the study if they had been administered the CAPS and provided an identifiable traumatic event on the DTS. From the clinical database, data from a total of 814 Vietnam-era veterans and 320 post-Vietnam-era veterans (the majority serving in Gulf War-I) were included in the current study. Most (95%) of the Vietnam-era veterans rated traumas experienced in war zones on the DTS. The majority (80%) of the post-Vietnam-era veterans rated war-zone traumas as well, although a significant percentage rated other traumas, such as sexual assault or rape (4%). The majority of the veterans met CAPS criteria for PTSD.

Measures

The Davidson Trauma Scale (Davidson et al., 1997) is a17-item self-report measure of PTSD symptoms. Respondents are asked to identify the traumatic event they find most disturbing, and rate the frequency and severity of 17 symptoms they have experienced during the past week using a 5-point Likert-type scale. The DTS has demonstrated strong test-retest reliability (.86), good internal consistency ($\alpha = .99$), convergent validity (CAPS, $r = .78$), and concurrent validity (Davidson, Tharwani, & Connor, 2002). For the present study, frequency and severity scores were summed for each symptom, resulting in a total of 17 variables used in analyses.

Data Analysis

A series of CFAs were conducted to examine the structure of the DTS using LISREL 8.54 (Jöreskog&Sörbom, 2003a). The distribution of responses for the 17 items tended to have a strong positive skew for the OEF/OIF Registry sample with a modal response of zero, whereas the two clinical samples tended to demonstrate a mild negative skew. As a result, guidelines for analyzing nonnormal data were followed (Scientific Software International Inc., 2005). Parameters were estimated using diagonal weighted least squares estimation and analyses utilized the polychoric correlation matrix. The asymptotic covariance matrix calculated with PRELIS 8.54 (Jöreskog & Sörbom, 2003b) and was employed to correct for nonnormality of standard errors. Multivariate normality for each sample was ascertained through the test of close fit using PRELIS (Scientific Software International Inc., 2005).

Model fit was assessed by several common indices: Satorra-Bentler chi-square (S-Bχ^2) index, Robust Comparative Fit Index (CFI*), the Akaike Information Criterion (AIC), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Lower S-Bχ^2 values represent better model fit, and general recommendations for rejecting misspecified models were followed (Browne & Cudeck, 1993; Hu & Bentler, 1999): SRMR < .08, CFI > .95. Browne and Cudeck (1993) recommended RMSEA<.05 indicates close fit, <.08 indicates fair fit, and RMSEA > .10 indicates poor fit. In contrast, Hu and Bentler (1999) suggested RMSEA < .06 be used to indicate relatively good fit.

The relative goodness of fit between nested models was tested by using the S-B scaled χ^2 difference test (Crawford, 2007; Satorra & Bentler, 2001). A significant χ^2 difference test demonstrates that the model fit is improved by estimating path coefficients for the additional relationships. If the test is not significant, the models are deemed equivalent, and the model with fewer estimated relationships (i.e., the nested model) is retained for parsimony. Nonnested models were compared using the AIC, for which the smaller value is regarded as the better-fitting model.

Models were constructed to allow nested relationships according to the method described in Kelloway (1998). First, Model 4a (King et al., 1998) was specified as shown in Table 1, and the four latent variables were allowed to correlate. Model 3 was specified exactly as Model 4a, with the exception of setting the path between avoidance and numbing to 1.0. For Models 1, 2a, and 2b, paths between latent variables were either estimated freely or set to 1.0 depending on the expected relationships. Models 1, 2a, 2b, and 3 were nested within Model 4a, so models were compared using the χ^2 difference test. Model 4b (Simms et al., 2002) was compared to other models using the AIC.

A series of multisample CFAs were conducted using LISREL 8.54 (Jöreskog&Sörbom, 2003a) to test the factorial invariance of factor loadings across the three groups (Gregorich, 2006).Three aspects of factorial invariance were assessed: dimensional invariance, configural invariance, and metric invariance. Dimensional invariance requires that the measure is comprised of the same number of factors for each group. Configural invariance is more stringent, requiring that both groups display the same number of factors as well as identical corresponding items. The simplest way to establish configural invariance using CFA is to model each group separately and compare item clusters. Another method is to simultaneously model data from both groups to be compared with no equality constraints placed on parameter estimates across the samples. Significant factor loadings should be consistent across models and the model should demonstrate good fit. Both methods for testing configural invariance are used in the current study (Gregorich, 2006).

In addition to the requirements of configural invariance, metric invariance has the additional requisite of equivalent factor loadings across groups. The establishment of metric invariance ensures that items have the same meaning for groups being compared. Whereas criteria for dimensional and configural invariance are descriptive (i.e., number of factors and pattern of factors, respectively), metric invariance may be examined statistically in two steps. First, the data from the two groups are simultaneously modeled with equality constraints placed on factor loadings across the samples. A good-fitting model suggests metric invariance. The second step involves comparing the configural invariance model to the metric invariance model using a χ^2 difference test. If factor loadings are consistent across the two groups, the difference in model fit between the configural invariance model (no cross-group constraints) and the metric invariance model (cross-group constraints on factor loadings) should be small and nonsignificant.

RESULTS

Factor Structure Analyses

Model fit—Table 3 displays model-fit indices for the six models across groups. All models provided adequate fit according to the CFI*, and SRMR. Browne and Cudeck's (1993) RMSEA<.08 criterion indicated adequate fit for models 3, 4a, and 4b for all groups, and adequate fit for Model 2b for the Vietnam-era and post-Vietnam-era groups. Using a more conservative RMSEA criterion of <.06, only Model 4a was acceptable for the Vietnam-era and post-Vietnam-era groups. For each of the three groups, however, fit indices were generally superior for Model 4a.

Model fit for nested models (all but Model 4b) was compared statistically using the S-B scaled χ^2 difference test (see Table 4). For each sample, results demonstrated that Model 4a provided superior fit compared with Model 3, which, in turn, was superior to Models 1, 2a, and 2b. Per the AIC, Model 4b demonstrated better model fit than Models 1, 2a, 2b, and 3, with the exception of Model 3 and Model 4b being essentially equivalent for the Vietnam-era cohort. However, for all three groups, the AIC indicated that model fit for Model 4a was superior to Model 4b.

Parameter estimates—Standardized factor loadings (i.e., parameters) for Model 4a are presented in Table 5. Each estimated factor loading was positive, statistically significant, and in most cases, high. An exception across groups was the relatively smaller loading of (C3) "unable to recall important parts of the event" on numbing. Notably, no cross-loadings from latent variables to indicators (i.e., individual items) were suggested by the modification indices, providing evidence for factorial invariance across groups.

Latent variable correlations—Correlations between latent variable for Model 4a are presented in Table 6. All correlations were positive and moderate to strong, ranging from .65

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to .92. The strongest relationship across groups was between numbing and hyperarousal (.84, .86, and .92).

Factorial Invariance

Single-group analyses supported the King 4-factor model (i.e., Model 4a) for each of the three veteran groups, evincing dimensional invariance across these veteran cohorts. Items from the DTS were associated with the four factors in a consistent pattern across groups, demonstrating configural invariance. Furthermore, the model fit for the tests of configural invariance provided additional evidence for configural invariance across groups (Table 7). For each comparison between veteran groups, the SRMR and CFI* demonstrated adequate model fit, and the RMSEA demonstrated adequate model fit for the Registry vs. Vietnam-era and the post-Vietnam-era vs. Vietnam-era models.

Metric invariance was supported for the post-Vietnam-era vs. Vietnam-era comparison, S-B $\chi^2\Delta(13)=13.77$, $p = .39$. That is, factor loadings for these two veteran groups were similar, suggesting that each item had a similar meaning for veterans in both groups. In contrast, metric invariance was not supported for the comparison between the Registry group and the two clinical groups. The S-B $\chi^2\Delta$ test was significant for the Registry vs. post-Vietnam-era comparison, demonstrating the nonequivalence of factor loadings for these groups, $\chi^2\Delta$ (13) = 488.70, $p < .0001$. The S-B $\chi^2\Delta$ for the Registry vs. Vietnam-era comparison was negative, invalidating the S-B $\chi^2\Delta$ test, S-B $\chi^2\Delta$ (13) = −21.46 (Satorra & Bentler, 2001). Therefore, other indicators of fit from the configural and metric-invariance models were evaluated and compared (i.e., RMSEA, SRMR, CFI*, AIC). The metric-invariance model was an inferior fit compared with the configural-invariance model, indicating that the Registry and Vietnam-era groups did not have metric invariance.

DISCUSSION

The present study evaluated the factorial invariance of PTSD symptoms across three veteran samples: treatment-seeking Vietnam-era veterans, treatment-seeking post-Vietnam-era veterans, andOEF/OIF veteran study volunteers. Six hypothetical models of symptoms structure were compared based on prior factor-analytic studies of PTSD symptom measures. For each of the three veteran groups, the best-fitting model contained four intercor-related factors: reexperiencing, avoidance, numbing, and hyperarousal (King et al., 1998). Furthermore, the pattern of significant factor loadings was consistent across veteran groups, providing evidence for dimensional and configural invariance. These findings suggest that the structure of PTSD symptoms is equivalent across veteran cohorts.

This study was the first to provide evidence of the dimensional and configural invariance of PTSD symptoms for veterans who served during different eras. Metric invariance, that is, equivalence of factor loadings, was supported for the two treatment-seeking groups, i.e., Vietnam-era and post-Vietnam-era groups. However, metric invariance was not supported for the OEF/OIF group when compared to the two clinical samples. Two mechanisms may lead to a failure to establish metric invariance: either the manifest indicators (i.e., items) have different meaning across groups that are being compared, or the pattern of responses to items have degraded model fit (Gregorich, 2006). Both of these explanations are plausible in this study. For several items, the distribution of responses for OEF/OIF participants was negatively skewed, indicating that a majority of the respondents were asymptomatic. In contrast, responses for the two clinical groups were more widely distributed. It is possible that response characteristics alone account for the differences in factor loadings between the OEF/OIF group and two clinical groups. Another possibility is that the items took on different meanings for the OEF/OIF cohort due to group differences. For example, whereas over 90% of the post-Vietnam-era and Vietnam-era veterans carried a diagnosis of PTSD, only about a third of OEF/

OIF-participants carried diagnoses of PTSD. Furthermore, the OEF/OIF veterans completed the DTS in the context of a research project, whereas the post-Vietnam-era and Vietnam-era veterans were seeking treatment for PTSD. Whether the differences in factor loadings observed in this study point to dissimilar interpretations by participants in different groups or to a statistical phenomenon remains unknown. A study of factorial invariance that compares these cohorts within the setting of a PTSD clinic might be able to statistically confirm this hypothesis.

Despite a lack of documented metric invariance, the similar factor structure for the three veteran groups is striking, considering the several differences between these cohorts, such as age, combat theater, and percentage of draftees. Not only was the 4-factor structure consistent across groups demonstrating dimensional and configural invariance, but the rank order of factor loadings for each factor was also very similar across groups (Table 5). Thus, results of this study suggest that the King model of PTSD symptoms can be used across these veteran cohorts.

Concerning the best-fitting model of PTSD symptoms, the King 4-factor model was superior to the Simms dysphoria model for each of the three veteran cohorts. This was in contrast to previous studies with GulfWar I veterans (Simms et al., 2002) and OIF military personnel (Messer et al., 2007) that supported the dysphoria model. Simms and colleagues observed that the dysphoria factor in their model had a "strong resemblance to the nonspecific symptoms of many depressive and anxiety disorders" (p. 644), and this may be key to understanding differences in findings between studies supporting one of the two 4-factor models. It is possible that the three symptoms that are associated with hyperarousal in the *DSM-IV* nomenclature and the King model, but combined with the numbing items in the Simms dysphoria model may have different etiologies in PTSD and in depression. For example, sleep disturbance for an individual with PTSD may indicate restlessness related to hyperarousal, whereas an individual with depression may lose sleep due to ruminative thought. Thus, the presentation of these nonspecific symptoms might be related to other hyperarousal symptoms for individuals with PTSD, but more related to the experience of emotional numbing and anhedonia for those primarily experiencing depression. This might explain why studies to date employing samples with a high rate of PTSD support the King model (e.g., Palmieri&Fitzgerald, 2005), whereas the Simms dysphoria model has been supported in studies utilizing nonclinical samples (Baschnagel et al., 2005;Messer et al., 2007; Simms et al., 2002). A multigroup study that examines the factor structure of PTSD symptoms across clinical groups would be useful in testing this conjecture.

What is clear from the findings of this and other recent studies are that the two avoidance symptoms can be reliably differentiated from the other Cluster C numbing symptoms using factor analysis. Each latent factor supported by a factor analysis is thought to correspond to a causal mechanism (Cattell, 1978). Thus, results of this study support the *DSM-IV* PTSD field trial workgroup's contention that avoidance and numbing symptoms may "reflect distinct phenomena" (Kilpatrick et al., 1998, p. 833). This division also corresponds with theoretical distinctions between these two constructs (Asmundson, Stapleton, & Taylor, 2004; Breslau, Reboussin, Anthony, & Storr, 2005; Foa, Riggs, & Gershuny, 1995). A 4-factor model of PTSD symptoms is in conflict with the three symptom clusters currently used in the *DSM-IV*, which ostensibly infers a common link between the symptoms in each cluster, and can be used to direct future refinement of PTSD criteria.

On a more cautious note, it is important to appreciate that the current study used a self-report measure of PTSD symptoms, the DTS, as an indicator of the 17 characteristic PTSD symptoms. Furthermore, whereas factor analysis can help clarify structure, it cannot resolve questions concerning the number of symptoms or necessity of individual symptoms that would be required for a diagnosis of PTSD. Other methods, such as testing the predictive power of individual symptoms (e.g., Foa et al., 1995), are necessary to answer such questions.

The results of this study also have implications for the validity of PTSD symptom measures, which generally offer three subscales reflecting the *DSM-IV* symptom clusters (Davidson et al., 1997; Weathers et al., 1993). A measure's subscales should reflect the measure's underlying factor structure. Inconsistencies between a measure's factor structure and the subscales (i.e., the number of scales is different from the number of factors) will degrade a scale's factorial validity, bringing into question whether the subscales are valid indicators of the constructs of interest (see Clark & Watson, 1995). This is an important consideration, in that current research on PTSD relies heavily on these measures as bona fide indicators of PTSD symptoms. Subscales that do not correspond to the underlying constructs tapped by a measure may generate negative consequences, such as unexpected findings, misinterpretation, and a loss of information that may have otherwise improved our understanding of PTSD. Subsequently, researchers and clinicians should be encouraged to employ subscales only for measures that have demonstrated factorial validity in the target population.

There are several notable limitations of this study. Generalizability is limited in that only veterans were assessed, many with combat-related PTSD. Results are consistent, however, with findings of studies involving civilian samples (e.g., Asmundson et al., 2000). Another limitation is that this study did not examine models with second-order or bifactor designs, as such models produce challenges to interpretation and do not readily translate to questionnaire subscales that can be used in everyday practice (cf. Andrews et al., 2006; Simms et al., 2002).

Despite these limitations, this study addresses a key limitation of existing literature by demonstrating dimensional and configural invariance of PTSD symptoms across veteran cohorts, including Vietnam veterans and returning veterans from Iraq and Afghanistan. Results lend support for the King 4-factor structural model of PTSD symptoms as well as the conceptual distinction between avoidance and numbing symptoms. Further multigroup analyses comparing across gender, ethnicity, and trauma types are necessary to determine the factorial invariance of PTSD symptoms across a wide range of trauma-exposed populations.

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Table 1

Item Mapping for Six Models of Posttraumatic Disorder Stress Symptoms

	DTS Items	DSM-IV Symptom	Model					
			1	2a	2b	3	4a	4b
1.	Painful images, memories or thoughts of the event	B1	G	AA	R/A	R	R	R
2.	Distressing dreams of the event	B2	G	AA	R/A	R	R	R
3.	Felt as though the event was re-occurring	B3	G	AA	R/A	R	R	R
4.	Upset by something which reminded you of the event	B4	G	AA	R/A	R	R	R
5.	Avoiding any thoughts or feelings about the event	C1	G	DAV	R/A	A/N	A	A
6.	Avoiding doing things or going into situations which remind you about the event	C2	G	DAV	R/A	A/N	A	A
7.	Found yourself unable to recall important parts of the event	C3	G	DAV	H/N	A/N	N	D
8.	Had difficulty enjoying things	C4	G	DAV	H/N	A/N	N	D
9.	Felt distant or cut off from other people	C5	G	DAV	H/N	A/N	N	D
10.	Been unable to have sad or loving feelings/ generally felt numb	C6	G	DAV	H/N	A/N	N	D
11.	Found it hard to imagine having a long life span and fulfilling your goals	C7	G	DAV	H/N	A/N	N	D
12.	Had trouble falling asleep or staying asleep	D1	G	AA	H/N	H	H	D
13.	Been irritable or had outbursts of anger	D2	G	AA	H/N	H	H	D
14.	Had difficulty concentrating	D3	G	AA	H/N	H	H	D
15.	Felt on edge, been easily distracted, or had to stay ‘on guard’	D4	G	AA	H/N	H	H	H
16.	Been jumpy or easily startled	D5	G	AA	H/N	H	H	H
17.	Been physically upset by reminders of the event	B5	G	AA	R/A	R	R	R

Note. DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Factors on which item loads: G = general factor; AA = anxiety-arousal; DAV = depression-avoidance; R = reexperiencing; A = avoidance; N = numbing; A/N = avoidance/numbing; H = hyperarousal; R/A = reexperiencing and avoidance (i.e., intrusion and avoidance); H/N = hyperarousal and numbing; D = dysphoria. Models are based on the following sources: 2a = Maes et al. (1998); 2b = Taylor et al. (1998); 3 = Davidson et al. (1997); 4a = King et al. (1998); 4b = Simms et al. (2002).

Table 2

Demographics,War-Zone Service, and Percentage With PTSD Diagnoses for the Three Veteran Cohorts

	Vietnam-era (*n* = 814)	**OEF/OIF Registry (*n* = 313)**	**OEF/OIF Registry (*n* = 313)**
Median Age	45 yrs	38 yrs	37 yrs
Min–Max Age	40–74 yrs	21–67 yrs	18–59 yrs
Male *n* (%)	810 (99.5)	294 (91.9)	251 (80.2)
Marital status %			
Married	48	42	48
Divorced/separated	33	28	19
Never married	6	19	26
Race/Ethnicity %			
Caucasian	46	37	43
African American	51	55	45
Hispanic	1	2	4
Other/Unknown	2	6	9
Education in years, *M (SD)*	13.2 (2.3)	13.2 (1.9)	13.8 (3.0)
Combat exposure[a] %	96	89	85
CES *M (SD)*	23.5 (10.9)	14.3 (9.7)	13.0 (12.6)
DTS Total scores[b] *M (SD)*	95.8 (25.6)	97.9 (24.0)	51.9 (38.2)
PTSD Diagnosis %	94	90	31[c]

Note. OEF/OIF = Operation Enduring Freedom/Operation Iraqi Freedom. CES = Combat Exposure Scale.

[a]Combat exposure was determined by a Combat Exposure Scale score > 0.

[b]The Vietnam-era and Post-Vietnam-era participants scored significantly higher than the OEF/OIF Registry sample on the DTS, $F\ (2, 1444) = 300.18$, $p < .001$.

[c]Diagnostic information for the OEF/OIF Registry group was available for a subset of 132 participants.

Table 3

Indices of Fit for Tested Models

Group and model	*df*	S-B χ^2	RMSEA	RMSEA 90% CI	SRMR	CFI*	AIC
Vietnam							
1	119	1755.66	0.130	0.120–0.140**	0.080	0.94	1823.66
2a	115	1132.45	0.100	0.099–0.110**	0.066	0.96	1208.45
2b	115	692.84	0.079	0.073–0.084**	0.052	0.98	768.84
3	114	506.64	0.065	0.059–0.071**	0.047	0.98	584.64
4a	113	367.30	0.053	0.047–0.059	0.043	0.99	447.30
4b	113	505.19	0.065	0.060–0.071**	0.048	0.98	585.19
Post-Vietnam							
1	119	645.93	0.120	0.110–0.130**	0.078	0.94	713.93
2a	115	460.47	0.097	0.088–0.110**	0.068	0.96	536.47
2b	115	330.53	0.077	0.067–0.086**	0.059	0.97	406.53
3	114	266.19	0.065	0.055–0.075**	0.054	0.97	344.19
4a	113	219.43	0.054	0.044–0.065	0.050	0.98	299.43
4b	113	254.57	0.063	0.052–0.073*	0.054	0.98	334.57
OEF/OIF Registry							
1	119	697.07	0.120	0.120–0.130**	0.061	0.98	765.07
2a	115	435.11	0.094	0.085–0.100**	0.052	0.99	511.11
2b	115	390.29	0.088	0.078–0.097**	0.047	0.99	466.29
3	114	343.57	0.080	0.071–0.090**	0.044	0.99	421.57
4a	113	265.83	0.066	0.056–0.076**	0.040	0.99	345.83
4b	113	291.54	0.071	0.061–0.081**	0.041	0.99	371.54

Note. The S-B χ^2 values are all significant at $p < .05$.

* $p < .05$.

** $p < .01$.

Table 4

S-B Scaled χ^2 Difference Tests

Group and model	*df*Δ	S-B Scaled $\chi^2\Delta$	*p*
Vietnam			
1–3	5	1080.14	<.001
2a–3	1	78.23	<.001
2b–3	1	989.84	<.001
3–4a	1	109.26	<.001
Post-Vietnam			
1–3	5	341.61	<.001
2a–3	1	44.09	<.001
2b–3	1	33.86	<.001
3–4a	1	35.57	<.001
OEF/OIF Registry			
1–3	5	458.8	<.001
2a–3	1	9.58	.002
2b–3	1	17.54	<.001
3–4a	1	28.42	<.001

Note. OEF/OIF = Operation Enduring Freedom/Operation Iraqi Freedom.

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Table 5

Standardized Factor Loadings for Model 4a

DSM-IV PTSD Symptom	Reexperiencing			Avoidance			Numbing			Hyperarousal		
	1	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
B1	.82	.77	.86									
B2	.79	.79	.87									
B3	.83	.79	.88									
B4	.72	.69	.82									
B5	.85	.84	.94									
C1				.75	.70	.87						
C2				.87	.86	.90						
C3							.42	.55	.68			
C4							.81	.85	.92			
C5							.84	.84	.93			
C6							.77	.70	.87			
C7							.76	.72	.87			
D1										.72	.75	.83
D2										.75	.73	.86
D3										.80	.74	.90
D4										.86	.87	.94
D5										.80	.76	.90

Note. DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; PTSD = posttraumatic stress disorder; 1 = Vietnam-era veterans; 2 = post-Vietnam-era veterans; 3 = Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) Registry veterans. All factor loadings (i.e., parameter estimates) are significant at $p < .001$.

Table 6

Correlation Matrix of Latent Variables

Variables	Reexperiencing			Avoidance			Numbing		
	1	2	3	1	2	3	1	2	3
Avoidance	.77	.73	.81	–	–	–			
Numbing	.65	.70	.81	.73	.73	.81	–	–	–
Hyperarousal	.74	.74	.88	.69	.65	.79	.84	.86	.92

Note. 1 = Vietnam-era veterans; 2 = post-Vietnam-era veterans; 3 = Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) Registry veterans. All correlations are significant at $p < .001$.

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Table 7

Indices of Fit for Configural and Metric Invariance

Groups and model	*df*	S-B χ^2	RMSEA	RMSEA 90% CI	SRMR	CFI*	AIC
Registry vs. post-Vietnam							
Configural invariance	233	644.74	0.075	0.068–0.082	0.066	0.99	790.74
Metric invariance	246	744.95	0.080	0.074–0.087	0.111	0.99	864.95
Registry vs. Vietnam							
Configural invariance	233	813.26	0.067	0.062–0.072	0.053	0.99	959.26
Metric invariance	246	1020.96	0.075	0.070–0.080	0.074	0.99	1140.96
Post-Vietnam vs. Vietnam							
Configural invariance	233	598.67	0.056	0.048–0.058	0.044	0.98	744.67
Metric invariance	246	619.04	0.052	0.047–0.057	0.044	0.98	739.04

Note. The S-B χ^2 values are all significant at $p < .05$. The RMSEA 90% confidence intervals (CI) are all significant at $p < .001$.