Journal of Anxiety Disorders 22 (2008) 1355–1368

The PTSD Symptom Scale's latent structure: An examination of trauma-exposed medical patients

James A. Naifeh [a], Jon D. Elhai [a,*], Todd B. Kashdan [b], Anouk L. Grubaugh [c]

[a] Disaster Mental Health Institute, The University of South Dakota, Vermillion, SD, United States
[b] Department of Psychology, George Mason University, Fairfax, VA, United States
[c] Ralph H. Johnson Veterans Affairs Medical Center, Department of Psychiatry and Behavioral, Sciences, Medical University of South Carolina, Charleston, SC, United States

Received 15 October 2007; received in revised form 23 January 2008; accepted 28 January 2008

Abstract

Several studies have employed confirmatory factor analysis (CFA) to evaluate the latent structure of posttraumatic stress disorder (PTSD) assessment measures among various trauma-exposed populations. Findings have generally failed to support the current three-factor *DSM-IV* PTSD conceptualization, demonstrating the need to consider alternative models. The present study used CFA to evaluate seven models, including intercorrelated and hierarchical versions of two models with the most empirical support. Data were utilized from a heterogeneous trauma-exposed sample of general medical patients ($n = 252$). Based on several indices, the three-factor *DSM-IV* PTSD model was shown to be inferior to alternative models. The strongest support was found for an intercorrelated four-factor model, separating avoidance and numbing symptoms into distinct factors. Validity for this model was partially supported by divergent relations between factors and external variables. Implications of the results are discussed, and a framework is proposed for resolving discrepant findings in the PTSD CFA literature.

Keywords: Confirmatory factor analysis; Posttraumatic Stress Disorder Symptom Scale; Posttraumatic stress disorder; Medical patients

Studies examining the latent structure of posttraumatic stress disorder (PTSD) assessment measures using confirmatory factor analysis (CFA) have generally provided little support for the current three-factor *DSM-IV* PTSD model. This three-factor model includes intrusion (e.g., unwanted trauma-related memories or dreams), avoidance/emotional numbing (e.g., avoiding thoughts related to the trauma, restricted range of affect), and hyperarousal (e.g., sleep or concentration problems, hypervigilance). While alternative models have been proposed and tested, previous studies have been hampered by several methodological limitations in assessing PTSD, and statistical limitations in conducting CFAs.

With few exceptions (e.g., Cordova, Studts, Hann, Jacobsen, & Andrykowski, 2000; Foy, Wood, King, King, & Resnick, 1997), researchers have found that the *DSM-IV* PTSD model inadequately fit observed sample data (e.g., Anthony, Lonigan, & Hecht, 1999; Baschnagel, O'Connor, Colder, & Hawk, 2005; Creamer, Bell, & Failla, 2003; DuHamel et al., 2004; Marshall, 2004; McWilliams, Cox, & Asmundson, 2005; Palmieri & Fitzgerald, 2005; Simms, Watson, & Doebbeling,

* Corresponding author at: Disaster Mental Health Institute, The University of South Dakota, 414 East Clark Street – SDU 114, Vermillion, South Dakota, 57069-2390, United States.
Tel.: +1 605 677 6575; fax: +1 203 413 6227.
E-mail addresses: jonelhai@fastmail.fm, jelhai@usd.edu (J.D. Elhai).

0887-6185/$ – see front matter
doi:10.1016/j.janxdis.2008.01.016

2002), or did not fit *as well* as similar, alternative models (e.g., Andrews, Joseph, Shevlin, & Troop, 2006; Asmundson et al., 2000; Elhai, Gray, Docherty, Kashdan, & Kose, 2007; Palmieri, Marshall, & Schell, 2007). Among studies finding support for the three-factor model, neither adequately tested other factor structures (Cordova et al., 2000; Foy et al., 1997).

Alternative PTSD CFA models vary with respect to (a) factor quantity (i.e., the number of factors into which the 17 PTSD symptoms are organized, (b) factor quality (i.e., the specific symptoms assigned to each factor and resulting factor labels), and/or (c) whether factors are intercorrelated or hierarchical. Intercorrelated models may be viewed as specifying distinct, but related factors, while hierarchical models assume that individual factors are subsumed under one or more higher-order, unitary factors or constructs.

The most widespread support exists for a PTSD model proposed by King, Leskin, King, and Weathers (1998), consisting of four intercorrelated factors (i.e., intrusion, avoidance, numbing, and hyperarousal). It is similar to the three-factor *DSM-IV* PTSD model, except that effortful avoidance symptoms are distinguished from those of emotional numbing. The King et al. (1998) model is generally consistent with theoretical work proposing that avoidance and numbing have different underlying mechanisms (Asmundson, Stapleton, & Taylor, 2004). For example, it has been suggested that avoidance constitutes an effortful emotional response to PTSD's intrusive symptoms, while numbing is an automatic biological response to an extended state of hyperarousal (Foa, Zinbarg, & Rothbaum, 1992). In CFA studies, the model has proven superior to alternative models across a variety of trauma-exposed populations (e.g., military veterans, cancer survivors, refugees) (Cuevas et al., 2006; DuHamel et al., 2004; Elhai et al., 2007; King et al., 1998; Marshall, 2004; McWilliams et al., 2005; Palmieri & Fitzgerald, 2005; Palmieri, Marshall, et al., 2007; Sack, Seeley, & Clarke, 1997; Schinka, Brown, Borenstein, & Mortimer, 2007). Additionally, two studies found that a hierarchical version of King et al.'s (1998) model provided the best fit to observed data (Andrews et al., 2006; Asmundson et al., 2000).

More recently, an alternative four-factor intercorrelated model was proposed by Simms et al. (2002), consisting of intrusion, avoidance, hyperarousal, and dysphoria. In this model, the dysphoria factor comprises PTSD's emotional numbing symptoms as well as three symptoms from the hyperarousal cluster (sleep problems, irritability, and concentration problems). Inclusion of the dysphoria factor is consistent with theoretical and empirical evidence pointing toward general distress as an underlying component in many anxiety and mood disorders (e.g., Clark & Watson, 1991; Watson, 2005). Thus far, it has demonstrated superior fit relative to alternative models in PTSD CFA studies of Gulf War veterans (Simms et al., 2002), college students following the September 11, 2001 terrorist attacks (Baschnagel et al., 2005), utility workers exposed to the World Trade Center's Ground Zero, and women survivors of intimate partner violence (Krause, Kaltman, Goodman, & Dutton, 2007).

Finally Buckley, Blanchard, and Hickling (1998) tested a two-factor hierarchical model consisting of two first-order factors, intrusion/avoidance and hyperarousal/numbing, subsumed under a higher-order "PTSD" factor. While many CFAs have tested intercorrelated and/or hierarchical versions of the model (e.g., DuHamel et al., 2004; McWilliams et al., 2005; Simms et al., 2002), evidence of its superiority over alternative models is limited (e.g., Asmundson, Wright, McCreary, & Pedlar, 2003). Other models have garnered even less support, such as a three-factor hierarchical model (intrusion/avoidance, numbing, and hyperarousal) (Anthony et al., 1999, 2005), and a two-factor intercorrelated model (depression/avoidance, and anxiety/hyperarousal) (Maes et al., 1998), and thus will not be emphasized in this paper.

While evidence from PTSD CFA studies is growing, results have yet to converge on a single best-fitting PTSD model. The King et al. (1998) and Simms et al. (2002) four-factor intercorrelated models have consistently emerged as top candidates, although relatively few studies have compared these models, and findings are inconsistent regarding the superiority of one over the other. Of studies supporting King et al.'s model, some possess methodological limitations, such as a small sample size (e.g., Schinka et al., 2007) or assessment of PTSD following events that may not meet *DSM-IV* criteria for a traumatic stressor (e.g., sexual harassment; Palmieri & Fitzgerald, 2005). Likewise, some findings supporting Simms et al.'s model are complicated by the absence of a clearly identified index traumatic event (e.g., general military experiences; Simms et al., 2002) or a questionable degree of trauma exposure (e.g., Western New York state college students' reactions to the September 11, 2001 terrorist attacks; Baschnagel et al., 2005). That being said, support for the Simms et al. model has been strengthened by methodological improvements in some studies, including cross-sample validation (Krause et al., 2007; Simms et al., 2002).

More recently, Palmieri, Weathers, Difede, & King (2007) analyzed data from 2960 World Trade Center's

Ground Zero utility workers who completed both the PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) and Clinician-Administered PTSD Scale (CAPS; Blake et al., 1990). They found that Simms et al.'s model was superior for the PCL, a paper-and-pencil self-report measure, while King et al.'s model was superior for the CAPS, a structured clinical interview. After accounting for method of assessment, Simms et al.'s model evidenced a slight advantage (Palmieri, Weathers, et al., 2007). However, the finding that CAPS data were more consistent with King et al.'s model is especially noteworthy, as this measure is considered to be the ''gold standard'' of PTSD assessment. As the study's authors note, CAPS items include follow-up probes that may increase diagnostic validity over paper-and-pencil questionnaires (Palmieri, Weathers, et al., 2007).

Given these methodological inconsistencies and limitations inherent in many of the PTSD CFA studies, the current investigation's aim was to improve upon previous PTSD CFA research. We used the PTSD Symptom Scale (PSS; Foa, Riggs, Dancu, & Rothbaum, 1993) among a heterogeneous sample of trauma-exposed primary care medical patients. In fact, primary care patients serve as a relevant population to evaluate PTSD, given the robust relationship between trauma and PTSD with both health problems (Schnurr & Green, 2004) and health service utilization (Elhai, North, & Frueh, 2005).

Several aspects of this study represent substantial improvements over previous similar research. First, most previous PTSD CFA studies used homogeneous samples of trauma victims (e.g., motor vehicle accident or cancer survivors), limiting model generalizability to different traumatized populations. The present study, however, sampled a more heterogeneous, general medical patient sample exposed to a variety of traumatic events. Second, few of the previous CFA studies using heterogeneous trauma-exposed samples actually linked participants' PTSD ratings to a specific index trauma. The current study's participants, however, rated their PTSD symptoms specifically in relation to their ''most distressing'' traumatic event, a necessary methodology for establishing a temporal relationship between the event and symptom onset (Frueh, Elhai, & Kaloupek, 2004). Third, previous studies' authors often neglected to specify whether they tested for multivariate non-normality prior to estimating model parameters, a crucial issue in ensuring adequately robust estimation procedures and that fit indices are properly adjusted (Kline, 2004). We utilized tests of multivariate normality and selected model estimation procedures and fit indices accordingly. Finally, we decided a priori that the best-fitting model should be further evaluated by assessing its factors' relationships with relevant external variables, including depressive symptoms and functional impairment, rarely reported on in previous similar studies. Evidence of divergent associations between a model's factors and external variables provides additional support for those factors as distinct constructs.

The seven models tested in the current study are presented in Fig. 1, and mappings of individual PSS items are presented in Table 1. These models represent a combination of those traditionally tested and/or empirically supported within the PTSD CFA literature. Model 1 is a one-factor, general PTSD model, traditionally serving as a basic reference point for evaluating more complex models. Model 2 represents an intercorrelated version of Buckley et al.'s (1998) two-factor model. Models 3 represents an intercorrelated version of the three-factor *DSM-IV* (American Psychiatric Association, 2000) PTSD model. Despite a lack of empirical support, this model was given consideration based on precedent and its official status within *DSM-IV* nosology. While previous PTSD CFA studies have often tested hierarchical versions of Models 2 and 3, it has been noted that at least four first-order factors are necessary for inclusion of a higher-order factor, as ''a hierarchical model with two first-order factors (and without equality of constraints on the loadings) is not identified, and one with three first-order factors is just-identified and equivalent in fit to a correlated three-factor model'' (Palmieri, Weathers, et al., 2007, p. 330). For each additional model, intercorrelated (i.e., first-order factors) and hierarchical (i.e., first-order factors subsumed under a higher-order ''PTSD'' factor) versions were tested. Models 4a and 4ah represent intercorrelated and hierarchical versions of King et al.'s four-factor (1998) model (separating avoidance and numbing factors), respectively. Finally, Models 4b and 4bh represent intercorrelated and hierarchical versions of Simms et al.'s (2002) four-factor model (which includes a dysphoria factor), respectively.

We hypothesized that the King et al. (1998) four-factor intercorrelated model would provide the best fit to the observed data. Our sample is heterogeneous with respect to trauma history, and the literature supports this model across a wide variety of trauma-exposed populations. Additionally, this model generally appears to be superior in cases where PTSD was assessed based on a specific, personally experienced index event, as it was in the current study. We further hypothesized that, relative to avoidance, King et al.'s (1998) numbing factor would demonstrate a greater association with depression, mental health-related and physical health-related impair-

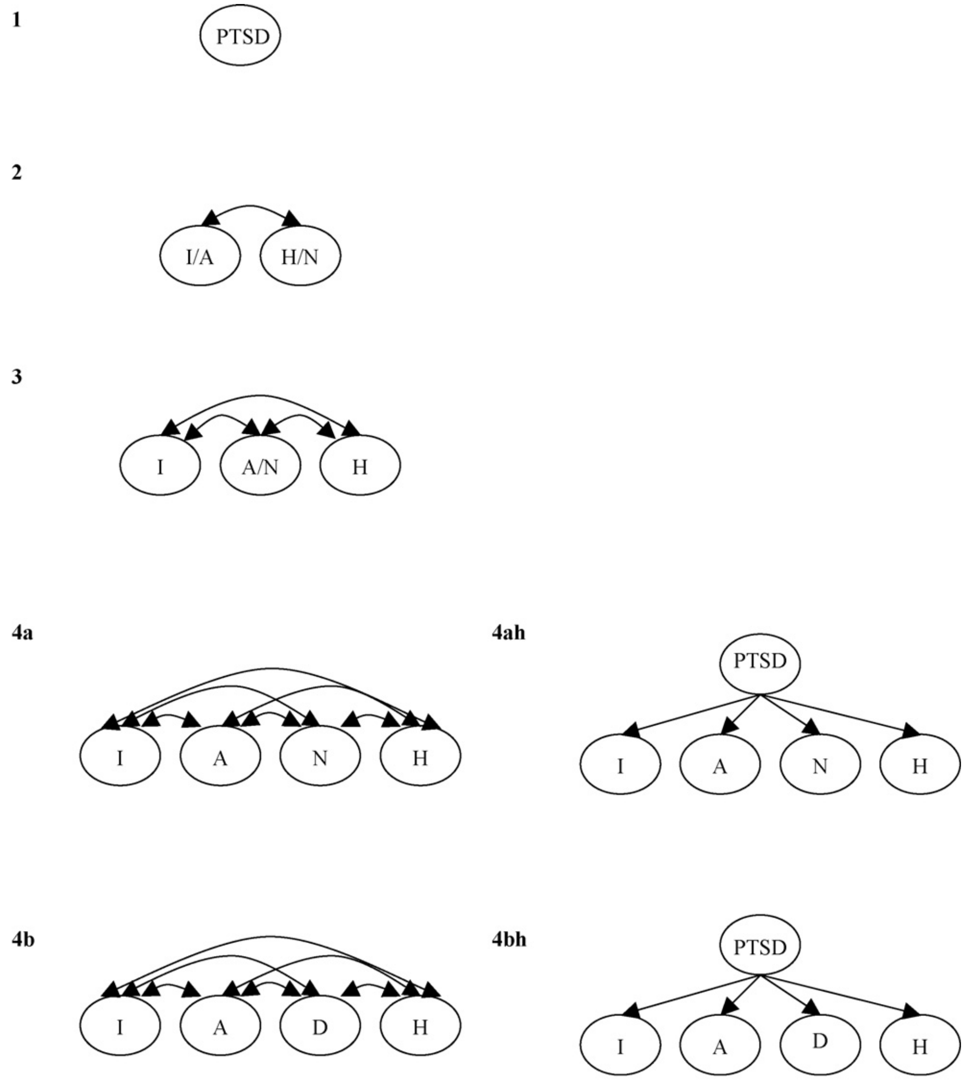

Fig. 1. Tested models. *Note*—Model 1: one-factor model; Model 2: Buckley et al. (1998); Model 3: *DSM-IV* (American Psychiatric Association, 2000); Model 4a: King et al. (1998); Model 4b: Simms et al. (2002); PTSD: posttraumatic stress disorder; I: intrusion; A: avoidance; N: numbing; H: hyperarousal; D: dysphoria; h: hierarchical model.

ment, based previous findings showing numbing to be more strongly related to mental and physical health-related symptoms (e.g., Kuhn, Blanchard, & Hickling, 2003; Palmieri & Fitzgerald, 2005; Palmieri, Marshall, et al., 2007).

1. Method

1.1. Participants

Three hundred and ninety-five medical patients served as participants (demographics are described below). Patients were at least age 18, presenting for appointments at two locations of a primary care medical clinic, affiliated with a Midwestern university's medical school. Recruitment occurred in two cohorts: (a) spring 2005 ($n = 194$), and (b) spring 2006 ($n = 201$). Data were collected as part of a larger project on mental healthcare attitudes and utilization in primary care (Elhai, Schweinle, & Anderson, in press).

1.2. Procedure

Medical patients presenting for appointments on a wide variety of days were consecutively invited by research assistants to participate while in the clinics'

Table 1
PTSD Symptom Scale (PSS) item mappings for tested models

DSM-IV criteria and PSS items	Models				
	1	2	3	4a, 4ah	4b, 4bh
B1: Intrusive thoughts	PTSD	I/A	I	I	I
B2: Nightmares	PTSD	I/A	I	I	I
B3: Reliving trauma	PTSD	I/A	I	I	I
B4: Emotional cue reactivity	PTSD	I/A	I	I	I
B5: Physiological cue reactivity	PTSD	I/A	I	I	I
C1: Avoidance of thoughts	PTSD	I/A	A/N	A	A
C2: Avoidance of reminders	PTSD	I/A	A/N	A	A
C3: Trauma-related amnesia	PTSD	H/N	A/N	N	D
C4: Loss of interest	PTSD	H/N	A/N	N	D
C5: Feeling detached	PTSD	H/N	A/N	N	D
C6: Feeling numb	PTSD	H/N	A/N	N	D
C7: Hopelessness	PTSD	H/N	A/N	N	D
D1: Difficulty sleeping	PTSD	H/N	H	H	D
D2: Irritable/angry	PTSD	H/N	H	H	D
D3: Difficulty concentrating	PTSD	H/N	H	H	D
D4: Overly alert	PTSD	I/A	H	H	H
D5: Easily startled	PTSD	I/A	H	H	H

Model 1: one-factor model; Model 2: Buckley et al. (1998); Model 3: *DSM-IV* (American Psychiatric Association, 2000); Model 4a: King et al. (1998); Model 4b: Simms et al. (2002); PTSD: posttraumatic stress disorder; I: intrusion; A: avoidance; N: numbing; H: hyperarousal; D: dysphoria; the letter "h" added after a model label: hierarchical model.

waiting rooms. Participants were offered $10 compensation for completing the study. Three hundred and ninety-five patients agreed to participate among 477 invited, with an overall participation response rate of 82.8%. After informed consent was obtained, participants were presented paper-and-pencil versions of the survey materials.

1.3. Instruments

Several surveys were administered as part of the larger project, but only those relevant to the present study are discussed here. All participants in both cohorts were administered the following three measures.

1.3.1. Demographic Survey

This survey inquired about gender, age, educational level, employment and relationship status, annual income, race and ethnicity.

1.3.2. Stressful Life Events Screening Questionnaire (SLESQ)

The SLESQ (Goodman, Corcoran, Turner, Yuan, & Green, 1998) is a 13-item self-report scale assessing trauma exposure history, measuring PTSD's traumatic stressor criterion A1. The SLESQ uses behaviorally specific questions, and emphasizes traumas of an interpersonal nature. It also briefly inquires about some relevant trauma characteristics (e.g., age at onset), although we did not include such probes in our administration. Test–retest reliability is adequate, with a median kappa coefficient of .73, ranging from .31 to 1.00 for individual items, and only four items falling below .60 (Goodman et al., 1998). In terms of validity, SLESQ trauma prevalence rates are consistent with those found in major epidemiological trauma studies. Convergent validity with a more extensive trauma interview was found adequate, with a mean kappa of .64. The majority of events (63%) reported during the interview, but not on the SLESQ, failed to meet PTSD's criterion A standard upon further elaboration. Thus, the SLESQ appears to discriminate reasonably well between criterion A and non-criterion A events (Goodman et al., 1998).

1.3.3. Posttraumatic Stress Disorder Symptom Scale-Self Report (PSS)

The PSS is a 17-item *DSM-IV*-based PTSD measure querying symptom frequency using a four-point Likert scale (0 = "Not at all," to 3 = "5 or more times per week/very much/almost always") (Foa et al., 1993). Internal consistency ranges from .65 to .71, with test–retest reliability between .66 and .77. The PSS correlates .87 with the CAPS, with diagnostic sensitivity of .88 and specificity of .96 (Foa & Tolin, 2000). Participants endorsing at least one trauma on the SLESQ were instructed to complete the PSS based on their most distressing/only event. Items are summed for a total score. A ‘‘probable’’ PTSD diagnosis is determined by a score of ‘‘1’’ or higher on at least one intrusion, three avoidance/numbing, and two hyperarousal items (Foa et al., 1993).

In addition, the second cohort ($n = 201$) was also administered two measures relevant to this paper, described below.

1.3.4. Health Survey Short Form-12 (SF-12)

The SF-12 (Ware, Kosinski, & Keller, 1996) measures perceived physical and mental health functional impairment. Test–retest reliability ranges from .86 to .89 for the physical health component score (PCS) and .76 to .77 for the mental health component score (MCS), over a 2-week period. In terms of validity, PCS scores are associated with a number of health criteria, including diabetes, health symptoms, and reported change in general and physical health. MCS scores are associated with reported changes in mental health and depression. PCS and MCS scores discriminated individuals with minor versus serious relevant health conditions (Ware et al., 1996).

1.3.5. Center for Epidemiological Studies-Depression Scale (CES-D)

The CES-D (Radloff, 1977) is a 20-item self-report instrument of depression, using a four-point Likert scale (0 = ‘‘rarely,’’ to 3 = ‘‘most of the time’’). Excellent internal consistency (.84–.90) and adequate 1-month test–retest reliability (.67) have been revealed, as well as good construct validity against similar depression measures (Knight, Williams, McGee, & Olaman, 1997; Radloff, 1977). Items are summed (reverse-coding four) for a total score.

1.4. Analysis

Of the total sample of 395 participants, we only investigated those endorsing at least one previous traumatic event on the SLESQ ($n = 297$, or 75.2%). This trauma prevalence rate is slightly higher than general population estimates (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995), but is expected for medical patients because of the substantial relation between trauma exposure and healthcare utilization (Elhai et al., 2005).

Among the 297 trauma-exposed participants, there were nominal amounts of missing item-level PSS data. Missing items were found to be missing completely at random, Little’s MCAR $\chi^2(80) = 65.64$, $p > .05$. More than 10% of PSS items were missing by 45 participants, who were deleted from subsequent analyses. Analyses revealed that participants excluded due to missing PSS data were more likely to be working and reported experiencing fewer traumatic events (small effects for both). For the remaining participants ($N = 252$), missing values were estimated using maximum likelihood (ML) procedures (Schafer & Graham, 2002). For the second cohort’s CES-D and SF-12, no participants were missing more than 10% of items. Omitted CES-D and SF-12 items were found to be missing at random, Little’s MCAR $\chi^2(167) = 163.95$, $p > .05$, and thus estimated using ML procedures. There were no differences between cohorts on demographic variables, number of traumatic events endorsed, or PTSD severity.

We conducted CFAs on the models discussed above (using the traditional correlation/covariance matrix based on Pearson correlations, for the 17 PSS items), with Mplus 4.2 software (Muthén & Muthén, 2006b). Standardized parameters are presented in this paper to facilitate interpretation. Chi-square tests of model fit were examined, along with several goodness-of-fit indices, including the Tucker–Lewis Index (TLI), Comparative Fit Index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). For good-fitting models, Hu and Bentler (1999) recommended TLI/CFI > .95, RMSEA < .06, and SRMR < .08. We also examined the Bayesian Information Criterion (BIC), a fit index that allows for comparisons between non-nested models, where lower values indicate better fit (Kline, 2004).

Prior to conducting the CFAs, PSS items were examined for univariate and multivariate normality. Univariate tests revealed skewness ranging from 1.37 to 2.99 ($M = 2.03$), and kurtosis ranging from 1.14 to 8.59 ($M = 3.51$) for individual PSS items. Because of substantial multivariate skewness, $\chi^2(969) = 8400.00$, $p < .001$, and kurtosis, $z = 130.99$, $p < .001$, we used ML estimation CFAs with a mean-adjusted Satorra–Bentler chi-square statistic that is robust to non-normality (Satorra & Bentler, 2001). We estimated that based on our sample of 252 participants, we exceeded 80% power in detecting a well-fitting model across analyses (MacCallum, Browne, & Sugawara, 1996).

Among the second participant cohort, factor scores were estimated for the best-fitting PTSD model. These factors were analyzed for associations with the CES-D and SF-12’s PCS and MCS total scores, using Pearson correlations.

2. Results

2.1. Demographic and trauma characteristics

Of 252 participants included in the current study, 72.6% ($n = 183$) were women. Age ranged from 18 to

Table 2
PTSD Symptom Scale (PSS) item correlations (r), means, and standard deviations

PSS items*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1: Intrusive thoughts	–																
2: Nightmares	.60	–															
3: Reliving trauma	.69	.71	–														
4: Emotional cue reactivity	.68	.62	.71	–													
5: Physiological cue reactivity	.62	.53	.66	.65	–												
6: Avoidance of thoughts	.62	.57	.63	.68	.54	–											
7: Avoidance of reminders	.56	.52	.60	.61	.51	.68	–										
8: Trauma-related amnesia	.44	.32	.44	.40	.34	.37	.29	–									
9: Loss of interest	.56	.34	.50	.57	.53	.51	.50	.39	–								
10: Feeling detached	.58	.30	.52	.57	.55	.47	.53	.38	.69	–							
11: Feeling numb	.51	.41	.45	.53	.35	.60	.56	.37	.53	.59	–						
12: Hopelessness	.56	.40	.50	.61	.45	.57	.58	.41	.69	.67	.69	–					
13: Difficulty sleeping	.47	.38	.45	.50	.44	.44	.41	.26	.47	.46	.40	.49	–				
14: Irritable/angry	.49	.39	.42	.50	.50	.47	.33	.17	.50	.49	.48	.52	.63	–			
15: Difficulty concentrating	.54	.39	.49	.53	.51	.45	.44	.37	.56	.58	.52	.66	.69	.74	–		
16: Overly alert	.51	.48	.56	.56	.54	.55	.51	.27	.48	.53	.55	.61	.54	.52	.62	–	
17: Easily startled	.60	.53	.56	.62	.52	.53	.49	.33	.54	.51	.55	.61	.56	.56	.69	.79	–
Item mean (standard deviation)	.59 (.84)	.31 (.67)	.40 (.75)	.61 (.85)	.25 (.57)	.47 (.86)	.39 (.86)	.28 (.70)	.25 (.66)	.32 (.73)	.38 (.77)	.50 (.90)	.52 (.93)	.45 (.82)	.46 (.86)	.47 (.87)	.42 (.86)

* All correlations are statistically significant ($p < .01$).

89 years ($M = 47.2$, S.D. = 17.2), and educational level ranged from 8 to 24 years ($M = 13.8$, S.D. = 2.4). The majority was Caucasian ($n = 233$, 92.5%), with few identifying as African-American ($n = 2$, .8%), or Native American ($n = 19$, 7.5%); four participants (1.6%) identified their ethnicity as Hispanic or Latino. Most were married ($n = 140$, 55.8%), single ($n = 50$, 19.9%), or divorced, separated or widowed ($n = 43$, 17.1%). Annual income was less than \$25,000 for 37.5% ($n = 93$), \$25,000 to \$34,999 for 19.0% ($n = 47$), \$35,000 to \$49,999 for 21.4% ($n = 53$), and \$50,000 or higher for 22.1% ($n = 55$). Most were working full-time ($n = 115$, 45.8%), part-time ($n = 31$, 12.4%), were unemployed ($n = 44$, 17.5%), or retired ($n = 53$, 21.1%). Except for a higher percentage of women and being slightly older, this sample represented the local 2000 U.S. census data well (U.S. Census Bureau, 2002, January).

The most prevalent traumatic events endorsed by participants included sexual assault or abuse ($n = 92$, 36.7%), physical assault or abuse ($n = 139$, 55.6%), and life-threatening accident, illness, or injury ($n = 154$, 61.6%). SLESQ items most frequently endorsed as the "most distressing" index trauma were the unexpected death of someone close (32.5%), and life-threatening illness (15.4%). PSS PTSD severity ranged from 0 to 47 ($M = 7.1$, S.D. = 10.0), and 20.6% of this trauma-exposed sample met criteria for "probable" PTSD. The index traumatic events most commonly associated with a "probable" PTSD diagnosis were being physically forced to have sex ($n = 9$, 50%), robbery by physical force or weapon ($n = 1$, 50%), adult physical abuse ($n = 7$, 38.9%), and childhood sexual abuse ($n = 5$, 35.7%). Additionally, CES-D depression severity ranged from 0 to 51 ($M = 15.4$, S.D. = 11.6), and SF-12 functional impairment scores ranged from 20.7 to 57.9 ($M = 43.9$, S.D. = 6.9) for MCS, and from 21.9 to 52.8 ($M = 43.1$, S.D. = 6.8) for PCS.

2.2. CFA model results

Correlations among the 17 PSS items are presented in Table 2 and CFA results for the seven tested models are presented in Table 3. For all models, the Satorra–Bentler chi-square test was significant ($p < .05$), suggesting less than an adequate fit. However, a non-significant chi-square test is not always sensitive to an adequate fit, and thus multiple fit indices are instead recommended for evaluating CFA model adequacy (Kline, 2004).

Model 1 demonstrated inadequate fit on most indices. Results for Model 2 were mixed, with only an adequate SRMR value. Model 3 was found to provide an adequate fit based on RMSEA and SRMR (but not TLI or CFI). The best fit was provided by Model 4a, which demonstrated excellent fit on all indices, as well as the smallest BIC value. The hierarchical version of this model (Model 4ah) also fit the data very well (except for TLI, which was slightly below .95). Finally, the alternative four-factor models (4b and 4bh) provided adequate fit based on RMSEA and SRMR (but not TLI or CFI).

Chi-square difference tests (Table 2) for the few nested models revealed that Model 1 had a significantly worse fit than all other models (note that since the Satorra–Bentler chi-square statistic is not normally distributed as a chi-square, difference tests were adjusted accordingly) (Muthén & Muthén, 2006a). Additionally, Model 4a performed significantly better than Model 3, $\chi^2_{\mathrm{Diff}}(3) = 41.33$, $p < .001$. Thus, the best-fitting model overall was the four-factor inter-correlated King et al. (1998) model (4a), which

Table 3
Fit indices and comparisons for tested models based on robust maximum likelihood estimation

Model	Satorra–Bentler χ^2(d.f.)	TLI	CFI	RMSEA	SRMR	BIC	Compared models	χ^2_{Diff}(d.f.)
1	313.00 (119)**	.83	.85	.08	.07	7874.25	1 vs. 2	46.23 (1)**
2	252.66 (118)**	.88	.90	.07	.06	7738.54	1 vs. 3	75.06 (3)**
3	202.21 (116)**	.92	.93	.05	.05	7628.26	1 vs. 4a	124.86 (6)**
4a	*163.94 (113)**	*.95*	*.96*	*.04*	*.05*	*7558.28*	1 vs. 4b	109.09 (6)**
4ah	177.70 (115)**	.94	.95	.05	.05	7577.16	3 vs. 4a	41.33 (3)**
4b	185.23 (113)**	.93	.94	.05	.05	7607.46		
4bh	196.46 (115)**	.93	.94	.05	.05	7622.54		

Italic indicates the best-fitting model. Chi-square difference tests are only conducted between nested models. Model 1: one-factor model; Model 2: Buckley et al. (1998); Model 3: *DSM-IV* (American Psychiatric Association, 2000); Model 4a: King et al. (1998); Model 4b: Simms et al. (2002). The letter "h" added after a model label: hierarchical model; TLI: Tucker–Lewis Index; CFI: Comparative Fit Index; RMSEA: root mean square error of approximation; SRMR: standardized root mean square residual; BIC: Bayesian Information Criterion.

* $p < .01$.

** $p < .001$.

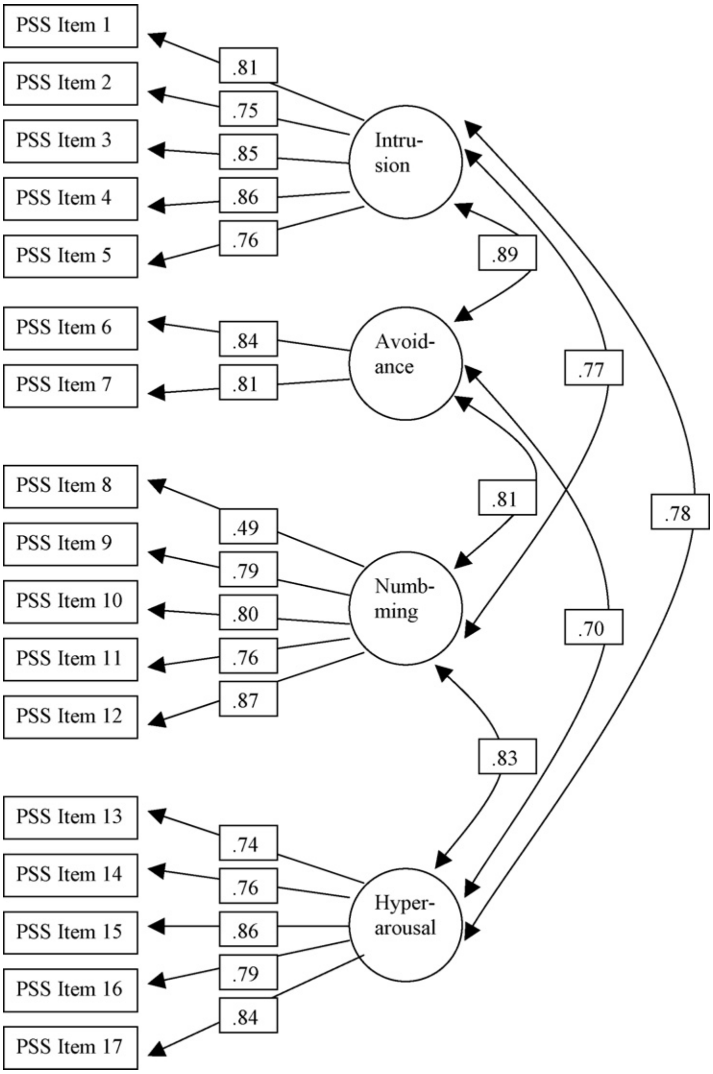

Fig. 2. Parameter estimates for Model 4a. *Note*: Squares denoting PSS items represent observed variables, and circles represent latent variables. Each PSS item has residual error variance associated with it.

separates avoidance and numbing symptoms into distinct factors. Parameter estimates for this model are presented in Fig. 2. All standardized factor loadings for the PSS items with their respective factors were high (.74–.87), with the exception of item 8, trauma-related amnesia (.49).

2.3. CFA model factor validation

Finally, we attempted to further validate the best-fitting PTSD model by examining relationships between its four factors (intrusion, avoidance, numbing, and hyperarousal) and relevant external variables from the second participant cohort. Specifically, we were interested in whether these analyses would support the separation of avoidance and numbing as distinct constructs (Asmundson et al., 2004). Table 4 displays correlations between model-generated PTSD factor scores on one hand and depression severity (CES-D total score), mental health-related (SF-12 MCS) and physical health-related (SF-12 PCS) functional impairment. All factors were significantly correlated with CES-D and PCS. Surprisingly, factor correlations with MCS were all non-significant. Contrary to our hypotheses, t-tests for dependent correlations revealed no difference between depression's association with numbing versus avoidance, $t(249) = .50$, $p = .62$. However, as hypothesized, numbing was significantly more correlated with physical health-related functional impairment than avoidance was, $t(249) = 5.57$, $p < .001$.

Table 4
Correlations (r) between Model 4a factors and external variables

Model 4a factors	CES-D	MCS	PCS
Intrusion	.52*	−.17	−.26*
Avoidance	.46*	−.15	−.25*
Numbing	.48*	−.05	−.41*
Hyperarousal	.59*	−.16	−.36*

CES-D: Center for Epidemiological Studies-Depression Scale; MCS: Health Survey Short Form-12 mental health component score; PCS: Health Survey Short Form-12 physical health component score.
* $p < .01$.

3. Discussion

In this study, we used CFA to evaluate the latent structure of the PSS among a sample of general medical patients. As hypothesized, King et al.'s (1998) four-factor intercorrelated model provided the best fit to the observed data. This model's structure is similar to that of the current three-factor PTSD model (American Psychiatric Association, 2000), except that symptoms of active avoidance and emotional numbing are separated into distinct factors. To date, this model has received the most widespread empirical support, proving superior to alternative models across a variety of trauma-exposed populations and PTSD assessment measures. Also consistent with previous research was a lack of support for the current three-factor PTSD model.

In addition to the CFA results, the separation of avoidance and numbing factors was partially supported by their differential relations with physical health-related functional impairment. Previous research has demonstrated similar findings with respect to health satisfaction (Palmieri & Fitzgerald, 2005), but to our knowledge, this is the first study specifically examining perceived impairment in the domain of physical health. While reasons for this remain unclear, it may be that greater emotional numbing (a) reduces motivation to engage in self-care, and/or (b) is indicative of chronic hyperarousal (e.g., Foa et al., 1992), which may have more widespread negative effects on health. It was surprising that none of the PSS factors were significantly correlated with mental health-related functional impairment. These counter-intuitive findings are consistent with at least one previous study using the SF-12 with primary care patients (Mittal, Fortney, Pyne, Edlund, & Wetherell, 2006), and may indicate that, although the SF-12 is sensitive to mental health-related impairment in patients seeking psychiatric treatment, it may be less sensitive among those seeking treatment for medical problems. Alternatively, these findings may indicate a general lack of perceived mental health-related impairment among our sample of medical patients. Also surprising was that avoidance and numbing were not differentially associated with depression, a finding that runs contrary to the extant literature (Amdur & Liberzon, 2001; Kashdan, Elhai, & Frueh, 2006; Palmieri, Marshall, et al., 2007).

Despite mixed results from our external validation analyses, the current CFA and a growing body of research (for a review, see Asmundson et al., 2004) suggest that avoidance and numbing should be regarded as distinct constructs. This has important implications for the future of PTSD research, assessment, and treatment. Available evidence suggests that, relative to avoidance, numbing is associated with decreased life satisfaction (Palmieri & Fitzgerald, 2005), increased relationship problems (Cook, Riggs, Thompson, Coyne, & Sheikh, 2004; Ruscio, Weathers, King, & King, 2002), prospective loss of resources (Johnson, Palmieri, Jackson, & Hobfoll, 2007), and interpersonal revictimization (Krause, Kaltman, Goodman, & Dutton, 2006) There is also emerging evidence that numbing severity is related to more pervasive PTSD-related disturbance (Breslau, Reboussin, Anthony, & Storr, 2005), and is a stronger negative prognostic indicator of PTSD treatment response (Taylor et al., 2001), compared to avoidance. Finally, in a randomized controlled trial, Taylor et al. (2003) found that exposure therapy was superior to both eye movement desensitization and reprocessing (EMDR) and relaxation training in reducing intrusion and avoidance symptoms, but not numbing or hyperarousal. Thus, exposure therapy, one of the most widely supported PTSD treatments (Bradley, Greene, Russ, Dutra, & Westen, 2005), may demonstrate differential effects on avoidance and numbing when these symptoms are examined separately. These data support the notion that avoidance and numbing might have different underlying mechanisms (e.g., Foa et al., 1992), presenting a significant challenge to the validity of a diagnostic cluster that encompasses both constructs. They also appear to identify emotional numbing as a potentially important indicator of comorbid psychosocial difficulties and negative treatment response. Clinicians may therefore benefit greatly from the development of assessment instruments and treatments that more precisely target symptoms of emotional numbing.

Despite our current findings in support of King et al.'s (1998) model, we must acknowledge the theoretical appeal of Simms et al.'s (2002) four-factor PTSD model, which has recently received increased empirical support. Of the nine identified PTSD CFA studies evaluating both of these models (including the present study), four found the Simms et al. (2002)

model to be superior, while the five remaining studies supported the King et al. (1998) model. Thus, the natural question is: Why do some PTSD CFAs find stronger support for King et al.'s (1998) model, while others find stronger support for Simms et al.'s (2002) model? Although there are several possible reasons (e.g., differences in time since the trauma, assessment instrument used, or symptom severity of the sample), we believe one answer may lie in the particular sample characteristics and/or assessment methodologies of these studies.

Including the present study, most CFAs that found greater support for King's model, rather than Simms' (McWilliams et al., 2005; Palmieri & Fitzgerald, 2005), assessed PTSD by instructing participants to rate their symptoms based on an index trauma to which they were personally exposed. However, this was not the case in three of the four studies supporting Simms et al.'s model over King's (Baschnagel et al., 2005; Palmieri, Weathers, et al., 2007; Simms et al., 2002). Specifically, Simms et al. (2002) instructed Gulf War veterans to rate their PTSD symptoms based on "military experiences," rather than a specific military-related traumatic event, and Baschnagel et al. (2005) instructed *Western* New York state college students following the September 11, 2001 terrorist attacks to rate their attack-related PTSD symptoms, arguably an untenable assessment methodology due to the lack of direct exposure. Palmieri, Weathers, et al., 2007 found a slight advantage for Simms et al.'s model among utility workers who had *any* exposure to Ground Zero at the World Trade Center site, but the nature and extent of personal exposure, and whether this exposure met PTSD's criterion A1 among participants, was unclear.

In order to understand how these methodological differences may affect PTSD's factor structure, it is helpful to view them within the context of Watson's (2005) proposed quantitative hierarchical model of psychopathology. In that paper, Watson presented a compelling argument for the re-organization of mood and anxiety disorders based on empirical relations between specific syndromes, and he further noted that PTSD appears to share characteristics with both distress disorders (e.g., major depressive disorder, dysthymia, and generalized anxiety disorder) and fear disorders (e.g., panic disorder, agoraphobia, social phobia, and specific phobia). While PTSD has demonstrated a stronger (though relatively weak) empirical relation with the distress disorders, Watson acknowledged that structural data on PTSD is generally lacking (Watson, 2005). In light of this, we propose that PTSD assessed based on non-specific stressors or indirect trauma exposure may yield a factor structure more consistent with the generalized, underlying negative affect of distress disorders (i.e., Simms' four-factor model including a dysphoria factor). Conversely, PTSD assessed based on a specific, personally experienced stressor may yield a factor structure more consistent with the larger arousal component observed in fear disorders (i.e., the four-factor model including intrusion, avoidance, numbing, and hyperarousal). However, regardless of how methodological improvements might increase PTSD's association with fear disorders, it will likely maintain a significant relation with distress disorders due to the strong link between emotional numbing and depression (Amdur & Liberzon, 2001; Kashdan et al., 2006).

3.1. Strengths and limitations

The current study includes several methodological improvements over previous PTSD CFAs. These include using a heterogeneous trauma sample for greater generalizability, and linking PTSD symptom ratings to participants' "most distressing" traumatic event. We also tested for multivariate non-normality and used appropriately robust model estimation procedures. Finally, we attempted to further validate the best-fitting model by examining its factors' relationships with external variables. To our knowledge, no previous PTSD CFA study has incorporated all of these elements.

Despite this study's greater generalizability relative to PTSD CFAs using homogeneous trauma samples (e.g., combat veterans), our medical patient sample may not be representative of the general population due to the strong association between PTSD and physical health problems (Schnurr & Green, 2004). We were also unable to evaluate model fit across different trauma types due to sample size limitations. The four-factor King et al. (1998) model has provided adequate fit among a variety of trauma-exposed populations, but, to our knowledge, has yet to be cross-validated on different trauma populations within the same study. Additionally, it is not known how our findings were impacted by the greater proportion of women in our sample, a potentially important factor given that women are more likely to endorse PTSD symptomatology (Kessler et al., 1995). It is also unclear how the small number of racial and ethnic minority participants may have affected our findings, including the degree to which cultural factors may have impacted participants' willingness to disclose trauma-related information. Similarly, there were no data available on those who refused to participate, precluding the detection of any systematic differences between respondents and nonrespondents. Regarding our use of the traditional correlation/covariance matrix for the CFA analyses, it has been recently suggested that use of a polychoric matrix may be more appropriate when analyzing items that are based on a four-point scale, such as those on the PSS (Wirth & Edwards, 2007). Finally, since depression and functional impairment ratings were not obtained from both cohorts that constitute our sample, it is unclear whether our findings fully represent the relationship between these variables and the four PTSD factors.

3.2. Conclusions and future directions

The latent structure of PTSD has yet to be conclusively defined. However, the results of the current study, as well as previous CFAs, make three things clear: (1) the current *DSM-IV* three-factor conceptualization of PTSD is insufficient, limiting our understanding of the PTSD construct insofar as it is measured by instruments such as the PSS, (2) avoidance and numbing should be regarded as distinct constructs, and (3) assessment methodology should be carefully considered in PTSD CFA studies, and further (especially experimental) research may clarify whether methodological differences account for different best-fitting factor structures.

The growing literature in support of King et al.'s (1998) four-factor model has significant implications for the future of PTSD research. At the very least, it suggests that avoidance and numbing symptoms should be examined separately in order to partial out their distinct roles in etiology and treatment outcome. This would enable researchers to identify aspects of PTSD that may have previously been masked by evaluating avoidance and numbing as a single symptom cluster. Toward this end, Asmundson et al. (2004) has suggested that such efforts would be aided by separating the two broad effortful avoidance symptoms into multiple, specific components. Additionally, emotional numbing symptoms deserve greater empirical attention. Despite being the least well-defined or understood component of PTSD (Litz & Gray, 2002), the emerging evidence suggests that numbing plays an important role in both PTSD-related and non-PTSD-related emotional disturbance.

Finally, further investigation of the King et al. (1998) and Simms et al. (2002) four-factor models is warranted. Specifically, clear empirical evidence is needed to distinguish under which circumstances each model is supported, including comparisons across different assessment measures and trauma populations. Such research would illuminate not only the latent structure of PTSD, but also its place within the broader *DSM* nosology. Without a strong grasp of PTSD's factor structure, attaining a thorough and sufficient understanding of PTSD as a construct will be limited. As such, researchers and clinicians will be limited in their ability to optimally assess and treat this disorder.

References

Amdur, R. L., & Liberzon, I. (2001). The structure of posttraumatic stress disorder symptoms in combat veterans: a confirmatory factor analysis of the impact of event scale. *Anxiety Disorders, 15*, 345–357.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th Text Revised ed.). Washington, DC: American Psychiatric Press.

Andrews, L., Joseph, S., Shevlin, M., & Troop, N. (2006). Confirmatory factor analysis of posttraumatic stress symptoms in emergency personnel: an examination of seven alternative models. *Personality and Individual Differences, 41*, 213–224.

Anthony, J. L., Lonigan, C. J., & Hecht, S. A. (1999). Dimensionality of posttraumatic stress disorder symptoms in children exposed to disaster: results from confirmatory factor analysis. *Journal of Abnormal Psychology, 108*, 326–336.

Anthony, J. L., Lonigan, C. J., Vernberg, E. M., La Greca, A. M., Silverman, W. K., & Prinstein, M. J. (2005). Multisample cross-validation of a model of childhood posttraumatic stress disorder symptomatology. *Journal of Traumatic Stress, 18*, 667–676.

Asmundson, G. J. G., Frombach, I., McQuaid, J., Pedrelli, P., Lenox, R., & Stein, M. B. (2000). Dimensionality of posttraumatic stress symptoms: a confirmatory factor analysis of DSM-IV symptom clusters and other symptom models. *Behaviour Research and Therapy, 38*, 203–214.

Asmundson, G. J. G., Stapleton, J. A., & Taylor, S. (2004). Are avoidance and numbing distinct PTSD symptom clusters? *Journal of Traumatic Stress, 17*, 467–475.

Asmundson, G. J. G., Wright, K. D., McCreary, D. R., & Pedlar, D. (2003). Post-traumatic stress disorder symptoms in United Nations peacekeepers: an examination of factor structure in peacekeepers with and without chronic pain. *Cognitive Behaviour Therapy, 32*(1), 26–37.

Baschnagel, J. S., O'Connor, R. M., Colder, C. R., & Hawk, J. L. W. (2005). Factor structure of posttraumatic stress among western New York undergraduates following the September 11th terrorist attack on the World Trade Center. *Journal of Traumatic Stress, 18*, 677–684.

Blake, D. D., Weathers, F. W., Nagy, L. N., Kaloupek, D. G., Klauminser, G., Charney, D. S., et al. (1990). A clinician rating scale for assessing current and lifetime PTSD: the CAPS-1. *Behavior Therapist, 18*, 187–188.

Bradley, R., Greene, J., Russ, E., Dutra, L., & Westen, D. (2005). A multidimensional meta-analysis of psychotherapy for PTSD. *American Journal of Psychiatry, 162*, 214–227.

Breslau, N., Reboussin, B. A., Anthony, J. C., & Storr, C. L. (2005). The structure of posttraumatic stress disorder. *Archives of General Psychiatry, 62*, 1343–1351.

Buckley, T. C., Blanchard, E. B., & Hickling, E. J. (1998). A confirmatory factor analysis of posttraumatic stress symptoms. *Behaviour Research and Therapy, 36*, 1091–1099.

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 100*, 316–336.

Cook, J. M., Riggs, D. S., Thompson, R., Coyne, J. C., & Sheikh, J. I. (2004). Posttraumatic stress disorder and current relationship functioning among World War II ex-prisoners of war. *Journal of Family Psychology, 18*, 36–45.

Cordova, M. J., Studts, J. L., Hann, D. M., Jacobsen, P. B., & Andrykowski, M. A. (2000). Symptom structure of PTSD following breast cancer. *Journal of Traumatic Stress, 13*, 301–319.

Creamer, M., Bell, R., & Failla, S. (2003). Psychometric properties of the Impact of Event Scale-Revised. *Behaviour Research and Therapy, 41*, 1489–1496.

Cuevas, C. A., Bollinger, A. R., Vielhauer, M. J., Morgan, E. E., Sohler, N. L., Brief, D. J., et al. (2006). HIV/AIDS Cost Study: construct validity and factor structure of the PTSD Checklist in dually diagnosed HIV-seropositive adults. *Journal of Trauma Practice, 5*(4), 29–51.

DuHamel, K. N., Ostroff, J., Ashman, T., Winkel, G., Mundy, E. A., Keane, T. M., et al. (2004). Construct validity of the Posttraumatic Stress Disorder Checklist in cancer survivors: analyses based on two samples. *Psychological Assessment, 16*, 255–266.

Elhai, J. D., Gray, M. J., Docherty, A. R., Kashdan, T. B., & Kose, S. (2007). Structural validity of the Posttraumatic Stress Disorder Checklist among college students with a trauma history. *Journal of Interpersonal Violence, 22*, 1471–1478.

Elhai, J. D., North, T. C., & Frueh, B. C. (2005). Health service use predictors among trauma survivors: a critical review. *Psychological Services, 2*, 3–19.

Elhai, J. D., Schweinle, W., & Anderson, S. M. (in press). Reliability and validity of the Attitudes Toward Seeking Professional Psychological Help Scale-Short Form. *Psychiatry Research*.

Foa, E. B., Riggs, D. S., Dancu, C. V., & Rothbaum, B. O. (1993). Reliability and validity of a brief instrument for assessing post-traumatic stress disorder. *Journal of Traumatic Stress, 6*, 459–473.

Foa, E. B., & Tolin, D. F. (2000). Comparison of the PTSD Symptom Scale-Interview version and the Clinician-Administered PTSD Scale. *Journal of Traumatic Stress, 13*, 181–191.

Foa, E. B., Zinbarg, R., & Rothbaum, B. O. (1992). Uncontrollability and unpredictability in post-traumatic stress disorder: an animal model. *Psychological Bulletin, 112*, 218–238.

Foy, D. W., Wood, J. L., King, D. W., King, L. A., & Resnick, H. S. (1997). Los Angeles Symptom Checklist: psychometric evidence with an adolescent sample. *Assessment, 4*, 377–384.

Frueh, B. C., Elhai, J. D., & Kaloupek, D. G. (2004). Unresolved issues in the assessment of trauma exposure and posttraumatic reactions. In: G. M. Rosen (Ed.), *Posttraumatic stress disorder: issues and controversies* (pp. 63–84). New York: New York: Wiley

Goodman, L., Corcoran, C., Turner, K., Yuan, N., & Green, B. L. (1998). Assessing traumatic event exposure: general issues and preliminary findings for the Stressful Life Events Screening Questionnaire. *Journal of Traumatic Stress, 11*, 521–542.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55.

Johnson, D. M., Palmieri, P. A., Jackson, A. P., & Hobfoll, S. E. (2007). Emotional numbing weakens abused inner-city women's resiliency resources. *Journal of Traumatic Stress, 20*, 197–206.

Kashdan, T. B., Elhai, J. D., & Frueh, C. B. (2006). Anhedonia and emotional numbing in combat veterans with PTSD. *Behaviour Research and Therapy, 44*, 457–467.

Kessler, R. C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry, 52*(12), 1048–1060.

King, D. W., Leskin, G. A., King, L. A., & Weathers, F. W. (1998). Confirmatory factor analysis of the Clinician-Administered PTSD Scale: evidence for the dimensionality of posttraumatic stress disorder. *Psychological Assessment, 10*, 90–96.

Kline, R. B. (2004). *Principles and practice of structural equation modeling* (2nd ed.). New York, NY: Guilford Press.

Knight, R. G., Williams, S., McGee, R., & Olaman, S. (1997). Psychometric properties of the Center for Epidemiologic Studies Depression Scale (CES-D) in a sample of women in middle life. *Behaviour Research and Therapy, 35*, 373–380.

Krause, E. D., Kaltman, S., Goodman, L., & Dutton, M. A. (2006). Role of distinct PTSD symptoms in intimate partner reabuse: a prospective study. *Journal of Traumatic Stress, 19*, 507–516.

Krause, E. D., Kaltman, S., Goodman, L. A., & Dutton, M. A. (2007). Longitudinal factor structure of posttraumatic stress symptoms related to intimate partner violence. *Psychological Assessment, 19*, 165–175.

Kuhn, E., Blanchard, E. B., & Hickling, E. J. (2003). Posttraumatic stress disorder and psychosocial functioning within two samples of MVA survivors. *Behaviour Research and Therapy, 41*, 1105–1112.

Litz, B. T., & Gray, M. J. (2002). Emotional numbing in posttraumatic stress disorder: current and future research directions. *Australian and New Zealand Journal of Psychiatry, 36*, 198–204.

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods, 1*, 130–149.

Maes, M., Delmeire, L., Schotte, C., Janca, A., Creten, T., Mylle, J., et al. (1998). The two-factorial symptom structure of post-traumatic stress disorder: depression-avoidance and arousal-anxiety. *Psychiatry Research, 81*, 195–210.

Marshall, G. N. (2004). Posttraumatic Stress Disorder Symptom Checklist: factor structure and English-Spanish measurement invariance. *Journal of Traumatic Stress, 17*, 223–230.

McWilliams, L. A., Cox, B. J., & Asmundson, G. J. G. (2005). Symptom structure of posttraumatic stress disorder in a nationally representative sample. *Anxiety Disorders, 19*, 626–641.

Mittal, D., Fortney, J. C., Pyne, J. M., Edlund, M. J., & Wetherell, J. L. (2006). Impact of comorbid anxiety disorders on health-related quality of life among patients with major depressive disorder. *Psychiatric Services, 57*, 1731–1737.

Muthén, B. O., & Muthén, L. (2006a). Chi-square difference testing using the Satorra-Bentler scaled chi-square. Retrieved January 1, 2007, from http://statmodel.com/chidiff.shtml

Muthén, B. O., & Muthén, L. (2006b). Mplus (Version 4). Los Angeles, California.

Palmieri, P. A., & Fitzgerald, L. F. (2005). Confirmatory factor analysis of posttraumatic stress symptoms in sexually harassed women. *Journal of Traumatic Stress, 18*, 657–666.

Palmieri, P. A., Marshall, G. N., & Schell, T. L. (2007a). Confirmatory factor analysis of posttraumatic stress symptoms in Cambodian refugees. *Journal of Traumatic Stress, 20*, 207–216.

Palmieri, P. A., Weathers, F. W., Difede, J., & King, D. W. (2007b). Confirmatory factor analysis of the PTSD Checklist and the Clinician-Administered PTSD Scale in disaster workers exposed to the World Trade Center ground zero. *Journal of Abnormal Psychology, 116*, 329–341.

Radloff, L. S. (1977). The CES-D Scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385–401.

Ruscio, A. M., Weathers, F. W., King, L. A., & King, D. W. (2002). Male war-zone veterans' perceived relationships with their children: the importance of emotional numbing. *Journal of Traumatic Stress, 15*, 351–357.

Sack, W. H., Seeley, J. R., & Clarke, G. N. (1997). Does PTSD transcend cultural barriers? A study from the Khmer Adolescent Refugee Project. *Journal of the American Academy of Child and Adolescent Psychiatry, 36*, 49–54.

Satorra, A., & Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika, 66*, 507–514.

Schafer, J. L., & Graham, J. W. (2002). Missing data: our view of the state of the art. *Psychological Methods, 7*, 147–177.

Schinka, J. A., Brown, L. M., Borenstein, A. R., & Mortimer, J. A. (2007). Confirmatory factor analysis of the PTSD Checklist in the elderly. *Journal of Traumatic Stress, 20*, 281–289.

Schnurr, P. P., & Green, B. L. (Eds.). (2004). *Trauma and health: physical health consequences of exposure to extreme stress*. Washington, DC: American Psychological Association.

Simms, L. J., Watson, D., & Doebbeling, B. N. (2002). Confirmatory factor analyses of posttraumatic stress symptoms in deployed and nondeployed veterans of the Gulf War. *Journal of Abnormal Psychology, 111*, 637–647.

Taylor, S., Fedoroff, I. C., Koch, W. J., Thordarson, D. S., Fecteau, G., & Nicki, R. M. (2001). Posttraumatic stress disorder arising after road traffic collisions: patterns of response to cognitive-behavior therapy. *Journal of Consulting and Clinical Psychology, 69*, 541–551.

Taylor, S., Thordarson, D. S., Maxfield, L., Fedoroff, I. C., Lovell, K., & Ogrodniczuk, J. (2003). Comparative efficacy, speed, and adverse effects of three PTSD treatments: exposure therapy, EMDR, and relaxation training. *Journal of Consulting and Clinical Psychology, 71*, 330–338.

U.S. Census Bureau. (2002, January). *United States Census 2000*. Washington, DC: U.S. Census Bureau (available at www.census.gov/main/www/cen2000.html).

Ware, J. E., Kosinski, M., & Keller, S. D. (1996). A 12-item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical Care, 34*, 220–233.

Watson, D. (2005). Rethinking the mood and anxiety disorders: a quantitative hierarchical model for DSM-V. *Journal of Abnormal Psychology, 114*, 522–536.

Weathers, F. W., Litz, B. T., Herman, D. S., Huska, J. A., & Keane, T. M. (1993, October). *The PTSD checklist: reliability, validity, & diagnostic utility.* Paper presented at the annual meeting of the International Society for Traumatic Stress Studies, San Antonio, Texas.

Wirth, R. J., & Edwards, M. C. (2007). Item factor analysis: current approaches and future directions. *Psychological Methods, 12*, 58–79.