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Examining the factor structure of PTSD between male and female veterans in primary care

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Abstract

The present study assessed potential gender differences between the two prevailing PTSD models – the emotional numbing (King et al., 1998) and dysphoria (Simms et al., 2002) models – in order to establish whether one model is superior with regard to its cross-gender generalizability. The sample included 188 female and 690 male trauma-exposed United States Veterans presenting to Veterans Affairs primary care medical clinics. Multigroup confirmatory factor analyses with covariates (MIMIC models) were conducted using the PTSD Checklist. The covariates included were socio-demographic variables and the type of traumatic event experienced. The emotional numbing model was statistically superior for men, but no difference between models was noted for females. After controlling for model covariates, men reported higher item-level severity and women had larger residual error variances and larger factor variances and covariances in the emotional numbing model. These results suggest partial generalizability of the emotional numbing model across gender.

Keywords

PTSD; gender differences; confirmatory factor analysis

1.1. Introduction

Posttraumatic stress disorder (PTSD) is a mental disorder defined in the *Diagnostic and Statistical Manual of Mental Disorders, 4th edition* (American Psychiatric Association, 1994) as being comprised of 17 symptoms that are subsumed by three diagnostic clusters: Reexperiencing (Criteria B1 – B5), Effortful Avoidance and Emotional Numbing (C1 – C7), and Hyperarousal (D1 – D5). However, this three-factor model of PTSD is rarely empirically supported (Asmundson, Stapleton, & Taylor, 2004). Recent meta-analytic results obtained from 40 confirmatory factor analysis (CFA) studies investigating the factor

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structure of PTSD demonstrated that two alternative four-factor models best account for the PTSD factor structure (Yufik & Simms, 2010). These two models are referred to as the *emotional numbing PTSD model* (King, Leskin, King, & Weathers, 1998) and the *dysphoria PTSD model* (Simms, Watson, & Doebbeling, 2002). These two models have garnered the most empirical support in demonstrating the latent structure of PTSD, without overwhelming statistical support to favor one over the other. Less examined is the role of gender to explain which model will fit best.

The *emotional numbing PTSD model* (King et al., 1998) allocates five items to a Reexperiencing factor (B1 – B5), two items to an Avoidance factor (C1 – C2), four items to an Emotional Numbing factor (C3 – C7), and five items to an Arousal factor (D1 – D5). The difference between this model and the three-factor *DSM-IV* (American Psychiatric Association, 1994) model is that it splits Avoidance and Emotional Numbing into two separate factors. This is based on evidence that in contrast to Avoidance, Emotional Numbing is more strongly related to depression, impaired attention, and lower psychotherapy treatment response (Asmundson et al., 2004). This model has been shown in many studies to adequately account for the factor structure of PTSD. For example, this model has been supported in military samples (Mansfield, Williams, Hourani,& Babeu, 2010), the general population (Elhai, Ford, Ruggiero, & Frueh, 2009), medical patients (Naifeh, Elhai, Kashdan, & Grubaugh, 2008), refugees (Palmieri, Marshall, & Schell, 2007), the elderly (Schinka, Brown, Borenstein & Mortimer, 2007) and other traumatized populations (see Elhai & Palmieri, 2011, for a review of the support for the *emotional numbing* and *dysphoria* models).

The *dysphoria PTSD model* (Simms et al., 2002) allocates five items to a Reexperiencing factor (B1 – B5), two items to an Avoidance factor (C1 – C2), eight items to a Dysphoria factor (C3 – C7 and D1 – D3), and two items to an Arousal factor (D4 –D5). This arrangement of symptoms is grounded in the theory that dysphoria is transdiagnostic as it relates to other mood and anxiety disorders, and is therefore a general, but not specific feature of PTSD (Watson, 2005; Simms et al., 2002). Studies have found empirical support for this theory demonstrating that the strength of the association between the Dysphoria factor is weaker than the other three PTSD factors (Armour, McBride, Shevlin, & Adamson, in press; Armour & Shevlin, 2010; Elklit, Armour & Shevlin, 2009). The *dysphoria PTSD model* has also received significant empirical support in the literature in military veterans (Pietrzak, Goldstein, Malley, Rivers, & Southwick, 2010), the general population (Armour & Shevlin, 2010), bereaved individuals (Boelen, van den Hout, & van den Bout, 2008) accident victims (Elklit & Shevlin, 2007), disaster workers (Palmieri, Weathers, Difede, & King, 2007), and survivors of rape (Elklit, et al., 2009).

Neither of the two prevailing four-factor models have consistently demonstrated superiority to the other and recent investigations have begun to assess whether the fit of these models is moderated by administration methods or population differences (e.g., mode of assessment comparing clinician administered versus self-report; Palmieri et al., 2007); anchoring symptoms to a worst traumatic event versus global trauma history (Elhai, Engdahl, Palmieri, Naifeh, Schweinle, & Jacobs, 2009); and, military deployment status comparing deployed or non-deployed soldiers (Engdahl, Elhai, Richardson, Frueh, 2011). One important potential moderator that has not received much empirical attention is gender. This is important since women and men differ with regard to demographic characteristics found to be related to PTSD, prevalence of exposure to potentially traumatic events (PTEs), and the types of PTEs most likely experienced. These factors may account for potential variation by gender in the underlying factor structure of PTSD.

Findings from the National Comorbidity Survey (NCS; Kessler et al., 1995) demonstrated that traumatic event exposure, although common across both genders, is more prevalent among men (60.7% of men and 51.2% of women). Despite reporting fewer PTE exposures, lifetime prevalence for PTSD is higher in women than in men. For example, the prevalence of PTSD in the NCS was 10.4% for women, and 5.0% for men. This result was replicated in the 1996 Detroit Area Catchment study, which reported a PTSD point prevalence of 11.3% for women and 6% for men (Breslau, Davis, Andreski, Peterson, & Schultz, 1997). However, the relationship between gender and PTSD prevalence may not be related to gender itself, but may be accounted for by other socio-demographic factors that may interact with gender. For example, in a study of Vietnam era veterans, men showed a higher prevalence of PTSD compared to women (15.2% versus 8.5%; Kulka et al., 1990). However, a re-analysis of this data accounting for age, race/ethnicity, and education indicated that gender was not an important predictor of PTSD diagnosis (Turner, Turse, & Dohrenwend, 2007). Another study conducted with female sexual assault survivors showed that lower education and ethnic minority status were each uniquely associated with a greater odds of a current PTSD diagnosis and that the factor structure of PTSD varied by race and educational status in this group (Ullman & Brecklin, 2002).

The prevalence of different types of trauma exposure differs between women and men. In a meta-analytic review of gender differences in PTSD, women were more likely to have experienced childhood sexual abuse or adult sexual assault and men were more likely to have experienced nonsexual assault, combat, war, and terrorism (Tolin & Foa, 2008). However, women reported greater PTSD symptom severity than men when both genders confronted disaster or fire, accidents, nonsexual assault, combat, war and terrorism. Therefore, while the type of exposure is important, it does not fully account for gender differences in the PTSD phenotype.

The majority of PTSD factor analytic studies have been conducted in predominately male samples or have not included a sufficient number of both men and women to make valid gender comparisons. There have been a few exceptions that focused entirely on women, or had samples that consisted almost entirely of women (Naifeh et al., 2008; Palmieri & Fitzgerald, 2005; Ullman & Long, 2008). Results of two of these studies found support for the emotional numbing model (Naifeh et al., 2008; Palmieri & Fitzgerald, 2005). The third found support for the four-factor dysphoria model; however, the authors did not test the emotional numbing model so the relative superiority of these models cannot be evaluated (Ullman & Long, 2008).

The diagnostic criteria for PTSD are currently being refined for the *DSM-5*. It is important and timely to establish which of the two prevailing PTSD models is superior with regard to cross-gender generalizability. Despite being recognized as a research priority (Yufik & Simms, 2010), only two previous studies have evaluated the PTSD factor structure across gender. The first was conducted within a sample of male and female veterans using the Mississippi Scale for Combat-related PTSD (King, Orcutt, King, 2002). Invariance analysis of the four subscales of this instrument demonstrated that the pattern of factor loadings and the strength of those loadings were invariant, but the mean score of the items and the covariance between the factors was different as a function of gender.

The second study evaluated the two prevailing four factor models within a war-exposed adolescent sample and found that the emotional numbing model was best fitting for both genders (Armour et al., 2011). Configural and metric invariance was found between boys and girls but further invariance testing indicated that the girls had higher observed intercepts, larger residual error variances, and larger factor variances and covariances. Given that this study was conducted with adolescents, it is unclear whether the results will generalize to adult populations.

The purpose of the current study was to identify the best fitting model for PTSD between the two most empirically supported four-factor models for female and male adults. We also tested measurement invariance to establish which parameters were equivalent between groups. Measurement invariance is important to assess given that non-equivalence could potentially bias diagnostic screening, the measurement of treatment outcomes, and the conduct of gender comparisons by PTSD severity. We modeled sociodemographic covariates and the type of PTE reported, thereby accounting for variables that may moderate measurement differences in PTSD. Given that very few studies have examined the PTSD factor structure in all female samples, and no prior study has examined gender differences in these four-factor models using an adult sample, we did not hypothesize which of the two models would be superior to the other.

1.2 Method

1.2.1 Participants

Patients were identified from a total number of 229,780 veterans who made a health care visit during Fiscal Year 1999. Patients were excluded from data collection for this study that had known dementia, or were over the age of 80, due to concerns over their ability to recall critical study information. A total of 1,474 randomly identified veterans in primary care were contacted for participation in this study. Of this group, a total sample of 1076 were consented for study participation (253 women and 821 men; 73% of those contacted). Of this number, 188 women and 690 men reported experiencing a PTE and were therefore included in the current study.

1.2.3 Procedure

Data were collected from four primary care clinics in Veterans Affair Medical Centers (VAMCs) in the southeastern region of the United States (Charleston and Columbia, South Carolina; Tuscaloosa and Birmingham, Alabama; see Magruder et al., 2005). In order to achieve a representative sample of male and female veterans balanced across the four VAMCs, data from two random stratified study samples were collected (see Grubaugh, Monnier, Magruder, Knapp, & Frueh, 2006; Magruder et al., 2005; and, Yeager, Magruder, Knapp, Nicholas, & Frueh, 2007, for a comprehensive review of the stratification and sampling methods). During a clinic visit, participants were informed that this was a study on stress-related disorders in primary care. Written informed consent was obtained from each patient before the study began. Socio-demographic data sheets were collected and PTSD screenings were administered in person. Participants who were identified as having experienced a PTE were administered the PCL.

1.2.4 Measures

Demographic information was obtained on sex, age, ethnicity, educational attainment, and marital status.

Trauma Assessment for Adults-Self Report Version (TAA)—The TAA (Resnick, Falsetti, Kilpatrick, & Freedy, 1996) measured exposure to 14 lifetime incidents of civilian and military potentially traumatic events. This instrument has been widely used to screen community and medical populations for trauma history (Kilpatrick, Acierno, Saunders, Resnick, Best, & Schnurr, 2000; Resnick et al., 1996), and has been shown to be a reliable and valid screening measure of trauma exposure within clinical populations (Gray, Elhai, Owen, & Monroe, 2009). Example items include being exposed to combat, being sexually abused as a minor or being sexually assaulted as an adult.

PTSD Checklist-Military version (PCL-M)—The PCL-M (Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item self-report measure that assesses symptom severity across the 17 symptoms of PTSD found in the *DSM–IV*, as they are related to military experiences. It is the most commonly used screening instrument for PTSD (McDonald & Calhoun, 2010). The PCL-M demonstrated excellent internal consistency (above .95) in male (Keen, Kutter, Niles, and Krinsley, 2008) and female (Lang, Laffaye, Satz, Dresselhaus, and Stein, 2003) veteran samples. Test re-test reliability (1-week) was shown to be adequate ($r = .88$, Ruggiero, Del Ben, Scotti, Rabalais, 2003). The PCL-M evidences high correlation with other self-report PTSD measures in veteran samples (e.g., Mississippi Scale for Combat Related PTSD $r = .85$ and .93; Weathers et al., 1993). The PCL-M has also shown to correlate highly with structured interview-based PTSD diagnoses using the clinician-administered PTSD scale (CAPS) in military veterans ($r = .80$; Keen et al., 2008; Forbes, Creamer, & Biddle, 2001).

1.3 Results

1.3.1 Data Analysis

Univariate skewness ranged from 0.73 to 2.45, and kurtosis ranged from −1.03 to 4.85 indicating significant univariate and multivariate nonnormality. Therefore, maximum likelihood estimation with robust standard errors was used for the CFAs, using the Yuan-Bentler chi-square statistic, which is robust to nonnormality (Zhong & Yuan, 2011). Missing data were found among 108 of the study participants. The SPSS Missing Value Analysis program (IBM, SPSS version 17, 2009) was used to create 10 data sets using Markov chain Monte Carlo method multiple imputation using Gibb's Sampler algorithm (van Buuren, 2007). CFAs were conducted on the 10 datasets and the estimates obtained from each of these analyses were combined and averaged by M*plus* version 6.1 (Muthén & Muthén, 2010a). The current sample size for men and women exceeds the minimum of 132 participants per group recommended in order to have adequate statistical power to test the models included in the present study (Elhai & Palmieri, 2011). The PTSD items were scaled continuously and a Pearson covariance matrix was used in the analyses.

To determine the best four-factor model of PTSD, we examined the emotional numbing and dysphoria models separately in males and females. Model goodness of fit was evaluated using the comparative fit index (CFI; Bentler, 1990), the Tucker Lewis Index (TLI; Bentler & Bonett, 1980; Tucker & Lewis, 1973), the root mean square of approximation (RMSEA; Steiger, 1990), and the standardized root mean square residual (SRMR). Values equal to, or greater than, .95 for the CFI and TLI indicate excellent fit, and values ranging from .90 to .94 are considered adequate fit. Values lower than .06 for the RMSEA indicate excellent fit, and values of .07 or .08 are considered adequate. Values of .08 or less for SRMR indicate excellent fit, and values ranging from .09 – .10 signify adequate fit (Browne & Cudeck, 1993; Hu & Bentler, 1999).

In order to compare the emotional numbing and dysphoria models within each group, we examined the difference in Bayesian information criterion (BIC) values between the two tested models. The BIC value can be used to test nonnested models, as in our case. A 10-point BIC difference represents a 150:1 likelihood ($p < .05$) that the model with the lower BIC value fits best; a difference in the 6- to 10-point range indicates strong support, and a difference greater than 10 indicates very strong support (Raftery, 1995).

We first conducted bivariate analyses to identify demographic characteristics and types of PTE exposure that have differed between women and men in previous studies, in order to subsequently include them as covariates in the CFA models. After we established a base model for each gender, we included covariates utilizing a Multiple Indicator Multiple Cause framework (MIMIC; Muthén & Muthén, 2010b) and then proceeded to test measurement invariance using multigroup CFAs. We tested invariance/non-invariance across groups on factor loadings, observed variable intercepts, observed variable measurement errors, factor variances and covariances, and factor means, following established procedures (Meredith, 1993; Meredith & Teresi, 2006).

The first model we tested, Model 1, included male and female groups and all model parameters were allowed to vary between groups (i.e., testing configural invariance). Subsequent models imposed progressively more conservative restrictions, with particular parameter estimates constrained to be equal across groups, tested against the prior step's model (except where noted below). Model 2 constrained factor loadings across groups (to test metric invariance). Model 3 additionally constrained observed variable intercepts (to test strong or scalar factorial invariance). Model 4 additionally constrained residual error variances (to test strict factorial invariance). We conducted further analyses to evaluate structural invariance. Model 5 constrained factor variances and covariances (but not residual variances), and this model was tested against Model 3. The final model we tested was Model 6 - factor means (but not residual variances) were constrained and tested against Model 5. Tests of statistical significance between models were assessed using a correction factor since Yuan-Bentler chisquare values are not distributed normally on a chi-square distribution (Muthén & Muthén, 2010b; Zhong &Yuan, 2011).

1.3.2 Sample Characteristics

The sample characteristics are shown in Table 1. Men were significantly older ($M = 62.45$; $SD = 11.07$) than women ($M = 49.54$; $SD = 12.54$; $F(1{,}792) = 168.09$, $p < .001$; Cohen's $d = 1.09$), and were more likely to be married or cohabitating ($\chi^2(1) = 52.79$, $p < .001$; phi = .25). Women were more likely to be racial/ethnic minority members ($\chi^2(1) = 8.10$, $p = .004$; phi = −.09) and to be more and highly educated ($\chi^2(4) = 68.70$, $p < .001$; phi = .29). The mean level for PTSD severity was 26.56 (SD=14.13) for men and 32.69 (SD=15.99) for women. The range in PTSD severity was similar for both groups (17–85 for men and 17–83 for women) as was the variance (256.20 in men and 214.15 in women) and neither group evidenced non-normality in the distribution of PTSD severity.

1.3.3 Exposure to Potentially Traumatic Events

Exposure to a single PTE was reported by 21.4% of the sample, 27.5% reported two events, 20.4% reported three, and 30.7% reported experiencing more than three events. No differences were observed regarding the mean number of events women ($M = 3.07$, $SD = 1.75$) and men reported ($M = 2.85$, $SD = 1.61$; $F(1{,}792) = 2.49$, $p = .115$; Cohen's $d = .13$). However, we tested for differences in the likelihood of having experienced specific types of traumatic events. Consistent with previous research, men were more likely than women to report combat exposure, and women were more likely than men to report greater medical illness of a friend, childhood sexual abuse (occurring before age 13), childhood rape (occurring between age 13 to 18), rape in adulthood, and a physical attack without weapons (results available from authors).

The following covariates were included in MIMIC models: age, education, race/ethnic minority status, marital status, combat exposure, medical illness of a friend, childhood sexual abuse, childhood sexual assault, adult sexual assault, and physical attacks without weapons. These variables were included in our CFA models as they may confound the relationship between gender the PTSD factor structure.

1.3.4 Results of multigroup MIMIC models

Results of the initial CFAs demonstrated that the emotional numbing and dysphoria models provided evidence for an adequate fit for both genders. In the male group however, the emotional numbing model provided a superior fit (on the basis of smaller BIC values). There was no difference in model fit for the two models tested within the female group. Fit indices can be found in Table 1, and the unstandardized and standardized factor loadings for each model are presented in Table 2. Given that the emotional numbing model was superior for the men in the study, and that women did not differ with regard to the best fitting model, further analyses were conducted using the emotional numbing model. Factor intercorrelations are shown in Table 3.

For the emotional numbing model, the only significant covariate for women was adult sexual assault in predicting Reexperiencing ($\beta = .31$, $p < .001$), Avoidance ($\beta = .22$, $p = .027$), Numbing ($\beta = .20$, $p = .02$), and Arousal ($\beta = .26$, $p = .002$). For men, the significant covariates for Reexperiencing were being younger ($\beta = -.29$, $p < .001$), being a racial/ethnic minority ($\beta = .09$, $p = .02$), combat exposure ($\beta = .26$, $p < .0001$), and being attacked with a weapon ($\beta = .14$, $p = .003$). Predictors of Avoidance were being younger ($\beta = -.29$, $p < .001$), combat exposure ($\beta = .20$, $p < .001$), and being attacked with a weapon ($\beta = .15$, $p = .004$). Predictors of Emotional Numbing were being younger ($\beta = -.34$, $p = .001$), and combat exposure ($\beta = .23$, $p < .001$). Predictors of Arousal were being younger ($\beta = -.32$, p = .001), being an ethnic minority ($\beta = .10$, $p = .01$), combat exposure ($\beta = .27$, $p < .001$), and being attacked with a weapon ($\beta = .17$, $p < .001$).

Measurement invariance testing results (Table 4) revealed that three of the five model comparisons were significantly different between groups, suggesting partial between-group invariance for men and women. We first tested configural invariance which suggested that the overall pattern of factor loadings was consistent between groups. Next we tested metric invariance, which demonstrated that the strength of the factor loadings was equivalent between the two groups. We then tested intercept, residual error and variance and covariance invariance, and all three were non-invariant across groups. Examination of the results indicated that on average, the intercepts were higher for men, and the residual error variances and factor variances and covariances were higher for women. The final test of the factor means was invariant across groups.

In order to better understand the source of intercept, residual error and variance-covariance non-invariance, we conducted follow-up analysis testing invariance across each of the symptom clusters separately. The avoidance and hyperarousal clusters demonstrated intercept invariance between groups ($df = 2$, $\Delta\chi^2 = 1.54$ and $df = 5$, $\Delta\chi^2 = 9.30$ respectively). The reexperiencing and the numbing symptom clusters were non-invariant on item-level intercepts ($df = 4$, $\Delta\chi^2 = 11.19$ and $df = 5$, $\Delta\chi^2 = 16.04$, respectively). No further differences were found by symptom cluster with regard to the remaining invariance testing.

1.4 Discussion

We evaluated gender as a moderator of the factor structure of PTSD in a large sample of 878 male and female veterans. We included covariates in MIMIC models that have been shown to distinguish between females and males in previous studies and that were related to PTSD in our sample. The results indicated that the emotional numbing (King et al., 1998) model was significantly superior to the dysphoria (Simms et al., 2002) model for men. For women neither the emotional numbing nor the dysphoria model was found to be superior for this group. To the best of our knowledge, this is the second study to evaluate gender as a moderator of the PTSD factor structure in an adult sample and the first to include covariates that may help to explain potential model differences. This study extends previous findings of gender differences in the PTSD factor structure (Armour et al., 2011; King et al., 2002).

The present study provides support for the King et al., 1998 emotional numbing model. This model was a better fit for the men sampled and an adequate fit for the women sampled, and therefore it was the most appropriate model for cross-gender comparisons. These findings support other data that suggest that the emotional numbing model is one of the two most widely supported models of PTSD (Armour et al., 2011; Elhai & Palmieri, 2011; Naifeh et al., 2008; Palmieri et al., 2007; Palmieri, Weathers et al., 2007; Schinka et al., 2007).

1.4.2 The role of model covariates

Several covariates emerged as significant predictors of the PTSD latent factors. Modeling these covariates enabled us to account for potential confounding effects of certain socio-demographic characteristics and trauma type in our analyses. Consistent with previous studies on veterans, women in this study were significantly younger than their male counterparts. Younger age was a significant predictor of PTSD for men, which may suggest that younger males have less time since their deployment, and may therefore be more symptomatic. Ethnic minority status appeared as a significant predictor of reexperiencing and arousal symptoms in males. This is consistent with previous studies showing a link between ethnicity and PTSD (Pole, Gone, & Kulkarni, 2008). It may be possible that minority veterans experience unique stressors that may exacerbate symptoms of reexperiencing and arousal, but this is speculative. Further investigation into the role of ethnicity and the PTSD factor structure is warranted.

Women and men reported a similar frequency of exposures to PTEs. However, women were more likely than men to have experienced childhood sexual abuse and adult sexual assault. They were also more likely to report physical assault without a weapon and medical illness of a friend. Men had a much higher likelihood of being exposed to combat and being directly involved in a warzone. This presents a fairly stable pattern of differential exposure to interpersonal versus combat-related events in female and male veteran samples (Tolin & Foa, 2008). Earlier studies of Vietnam era veterans also suggested that men experienced a greater number of mission-related stressors compared to women (e.g., King, King, Gudanowski, & Vreven, 1995).

When all covariates were simultaneously considered in the MIMIC models, adult sexual assault was the single significant covariate predictor for the PTSD factors for females. This supports the importance of this type of trauma exposure and its role in leading to PTSD symptoms among females (Tolin & Foa, 2008). Exposure to combat and physical violence were the most important PTE exposure predictors for PTSD among the males in the sample. However, this is not to suggest that men do not also experience military sexual trauma (MST) or that women are not exposed to combat-related stressors. Indeed, as the VA increases their efforts in identifying MST and as women increase their combat-related duties (Yano et al., 2006) continued assessment and monitoring of PTE exposure among veterans will be essential in order to appropriately address the mental health needs of this population.

Significant differences were observed in the PTSD factor structure between men and women in this sample. After taking into consideration the model covariates, men had higher mean item-level intercepts and women had higher residual error and higher factor variances and covariances. These results indicated that partial invariance was observed; the PTSD factor structure differed between these two groups in important ways. Intercept non-invariance in the observed scores for the reexperiencing and numbing symptom clusters suggests that individual PTSD items do not accurately reflect differences in true PTSD scores by gender. This type of bias can cause observed means to be larger or smaller than they are, and may mask mean differences between groups, should they exist. In the present case, it appears that males endorsed higher PTSD symptom ratings than their female counterparts, which indicates that direct mean comparisons between these groups may not be ideal.

On a broader level, this finding challenges a gender-role ideology that suggests women report higher levels of distress than men (Vogt, Barry, & King, 2008). Indeed, without considering the demographic and trauma-related factors we included in this study, the rate of women's PTSD symptoms can be *overestimated*. We reanalyzed the models without adding covariates and the female sample reported higher item-level intercepts than men. Therefore, it is recommended that when mean comparisons are made between men and women on PTSD symptoms, additional socio-demographic information and trauma-type should be considered. Without such consideration, rates of PTSD based on clinical cut-off scores may incorrectly classify females as having higher symptom levels than males.

The higher level of residual error and factor variance and covariances in the female sample is consistent to what was recently found in a sample of adolescent girls exposed to war trauma (Armour et al., 2011). As was suggested by Armour and colleagues, the issue of measurement error may be related to the original development of these four-factor models in predominantly male veteran samples. In this regard, it may be possible that the current diagnostic conceptualization of PTSD is not adequately accounting for the symptoms of PTSD in women. It may also suggest that current conceptualizations of PTSD in adolescents may be inadequate given that contrary to their findings, in our adult sample, and in the King and colleagues (2002) study, metric invariance was supported.

1.4.2 Strengths and Limitations

Our study has several notable strengths. To the best of our knowledge, this is the first study to assess gender differences in the PTSD factor structure in adults while modeling potential covariates that may account for gender differences. The study design purposefully included a sufficient number of females, which allowed for between group gender comparisons. We included socio-demographic and trauma exposure covariates in the CFA models which allowed us to account for other possible reasons for gender differences in the PTSD factor structure. The inclusion of a variety of trauma types is especially important since trauma type has been linked to specific gender differences in rates of PTSD and treatment course (Tolin & Foa, 2008).

Despite these strengths, the current study also has some weaknesses worth noting. First, our study was composed exclusively of veterans, so generalizability to other populations is unknown. Second, although there are a significant number of African Americans in the study, other minority groups, such as Latinos and Asian-Americans, are not adequately represented in the sample. Third, this study is cross-sectional in nature, so the stability of the factor estimates over time could not be evaluated. Forth, our study utilized a self-report measure, rather than a clinician based measure (e.g., the CAPS) to assess PTSD symptom severity. We do however note that sensitivity and specificity was high for the PCL when compared to the CAPS in this study population (Yeager et al., 2005), minimizing concern that the items did not accurately assess PTSD. Finally, certain potentially useful traumatic event data was not collected (i.e., data on military sexual trauma, time since traumatic event exposure).

Highlights

- Potential gender differences in the PTSD factor structure were evaluated using the PCL-M.
- The sample consisted of 690 male and 188 female trauma-exposed United States Veterans.
- A CFA was conducted, controlling for covariates that may confound the effect of gender on the PTSD factor structure.
- The four-factor numbing model of PTSD provided the best fit for males and females.
- Invariance testing indicated that this model was partially equivalent between groups.

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Table 1

Sample characteristics.

	Male		Female	
	Mean (SD)	**%**	**Mean (SD)**	**%**
Age	62.20 (11.25)		49.69 (13.19)	
Race/Ethnicity				
White		65.2		53.8
African American		32.2		44.1
Other		2.6		2.1
Education				
College		15.5		26.1
Some college		32.5		55.9
High school		29.1		16.0
Less than high school		22.9		2.0
Marital status				
Married/cohabitating		71.7		42.6
Single		7.0		17.0
Divorced		12.7		25.5
Separated		2.8		6.4
Widowed		5.8		8.5

Table 2

Results of confirmatory factor analysis

Models tested	Y-B χ^2	df	CFI	TLI	RMSEA	SRMR	BIC	ΔBIC	(df) Y-B $\Delta\chi^2$
Establishing best fitting models									
Emotional numbing (male)	225.92	113	.97	.96	.04	.04	27062.18	--	
Dysphoria (male)	248.907	113	.96	.96	.04	.04	27107.70	45.52 (D>EN)**	
Emotional Numbing (female)	234.87	113	.90	.88	.08	.06	9036.25	--	
Dysphoria (female)	232.44	113	.90	.89	.08	.06	9032.07	4.18 (D<EN)	
Invariance testing									
Model 1 (configural)	861.12	486	.95	.94	.04	.03	48653.95		--
Model 2 (metric)	865.56	499	.95	.94	.04	.04	48576.27		(13) 4.45
Model 3 (intercept)	898.69	512	.95	.94	.04	.04	48526.21		(13) 33.13**
Model 4 (residual)	1065.69	529	.93	.92	.05	.04	48684.85		(17) 166.10**
Model 5 (variance and covariance)	939.59	522	.94	.93	.04	.04	48507.50		(10) 40.90**
Model 6 (factor mean)	943.29	526	.94	.93	.04	.04	48484.21		(4) 3.71

Note. Y-B = Yuen-Bentler. CFI = comparative fit index. TLI = Tucker Lewis Index. RMSEA = root mean square of approximation. SRMR = standardized root mean square residual. BIC = Bayesian information criterion. Y-B $\Delta\chi^2$ = Yuen-Bentler χ^2 difference test. Model 5 is compared to model 3. D = Dysphoria. EN = Emotional numbing.

** $p < .001$.

Table 3

Factor loadings for each model by gender.

	Emotional numbing model		Dysphoria model	
Posttraumatic stress disorder checklist	**Female**	**Male**	**Female**	**Male**
B1: Intrusive thoughts	1.00 (0.85)	1.00 (0.90)	1.00 (0.85)	1.00 (0.90)
B2: Nightmares	0.91 (0.84)	0.92 (0.87)	0.91 (0.85)	0.92 (0.87)
B3: Reliving trauma	0.78 (0.77)	0.83 (0.83)	0.78 (0.76)	0.83 (0.83)
B4: Emotional cued reactivity	1.09 (0.87)	1.02 (0.87)	1.08 (0.87)	1.02 (0.87)
B5: Physiologically cued reactivity	0.49 (0.52)	0.50 (0.52)	0.49 (0.52)	0.51 (0.53)
C1: Avoidance of thoughts	1.00 (0.81)	1.00 (0.75)	1.00 (0.81)	1.00 (0.75)
C2: Avoidance of reminders	0.99 (0.84)	1.04 (0.81)	0.98 (0.84)	1.05 (0.81)
C3: Trauma-related amnesia	1.00 (0.69)	1.00 (0.81)	1.00 (0.67)	1.00 (0.79)
C4: Loss of interest	1.05 (0.68)	1.01 (0.73)	1.06 (0.67)	1.02 (0.72)
C5: Feeling detached	1.35 (0.72)	1.20 (0.67)	1.38 (0.71)	1.22 (0.66)
C6: Feeling numb	1.23 (0.73)	1.07 (0.79)	1.27 (0.72)	1.09 (0.79)
C7: Hopelessness	1.24 (0.77)	1.07 (0.79)	1.24 (0.74)	1.07 (0.74)
D1: Difficulty sleeping	1.00 (0.64)	1.00 (0.71)	1.05 (0.65)	1.07 (0.71)
D2: Irritability	1.25 (0.79)	1.05 (0.80)	1.31 (0.81)	1.13 (0.80)
D3: Difficulty concentrating	1.07 (0.78)	0.85 (0.82)	1.02 (0.71)	0.88 (0.79)
D4: Overly alert	1.30 (0.81)	1.08 (0.76)	1.00 (0.89)	1.00 (0.83)
D5: Easily startled	1.17 (0.79)	1.07 (0.81)	0.88 (0.85)	0.99 (0.88)

Note. Standardized loadings appear in parentheses.

Table 4

Factor intercorrelations for the emotional numbing model.

	Reexperiencing	Avoidance	Emotional Numbing	Arousal
Reexperiencing	--	.77	.85	.96
Avoidance	.58	--	.97	.85
Emotional numbing	.73	.94	--	.92
Arousal	.87	.78	.88	--

Note. Values on lower diagonal are for females, values in the upper diagonal are for men.