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An Examination of Family Adjustment Among Operation Desert Storm Veterans

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This study examined interrelationships among combat exposure, symptoms of posttraumatic stress disorder (PTSD), and family adjustment in a sample of male and female Operation Desert Storm veterans ($N = 1{,}512$). In structural equation models for both male and female veterans, higher combat exposure was associated with higher PTSD symptoms, which in turn were associated with poorer family adjustment, although these indirect effects did not reach statistical significance. The model for female veterans evidenced a significant direct negative association between combat exposure and family adjustment when it statistically accounted for PTSD symptoms. When the relative impacts of separate PTSD symptom groupings were examined, those reflecting withdrawal/numbing symptoms and arousal/lack of control symptoms significantly and indirectly accounted for the negative effects of combat exposure on family adjustment. Study findings indicate a number of possible pathways through which war-zone deployments negatively impact military families and suggest several avenues for future research.

Keywords: combat, posttraumatic stress disorder, family, veterans

War-zone deployments place considerable stress on military families (Peebles-Kleiger & Kleiger, 1994), and returning veterans often report family adjustment problems as their primary concern (Rosenheck et al., 1992). Studies of military families have shown that war-zone deployments are associated with less family cohesion and nurturance, more spousal emotional distress and depression, and more child behavior problems (Jensen, Martin, & Watanabe, 1996; Kelley, 1994; Medway, Davis, Cafferty, Chappell, & O'Hearn, 1995; Pierce, Vinokur, & Buck, 1998). Family problems experienced by active duty personnel may lead to other problems, such as more lost workdays due to physical and emotional problems and higher rates of disability (Raschmann, Patterson, & Schofield, 1990; Segal, Rohall, Jones, & Manos, 1999). Aside from the documentation of family adjustment problems among returning active duty military veterans, there has been little investigation into the interrelationships among factors that may lead to poor family adjustment among these individuals. Therefore, in the current study, we tested several models for family problems among a cohort of returning 1991 Operation Desert Storm (ODS) veterans.

Evidence from studies of veterans suggests that higher exposure to combat during deployments confers risk for marital and family maladjustment and instability (Gimbel & Booth, 1994; Kulka et al., 1990; Stellman, Stellman, & Sommer, 1988). Findings have consistently indicated that symptoms of posttraumatic stress disorder (PTSD) largely account for these relationships (Gimbel & Booth, 1994; Orcutt, King, & King, 2003). In an initial study that attempted to explicate the relationship between combat exposure and family adjustment, Gimbel and Booth (1994) found that PTSD symptoms and antisocial behavior fully accounted for the effects of combat on marital adversity (indexed by divorce, separation, infidelity, and intimate partner violence) among a large, representative sample of Vietnam veterans. Findings were such that PTSD symptoms led to higher psychopathology and the psychopathology variables led to more marital adversity. Using structural equation modeling (SEM) on data from the National Vietnam Veterans Readjustment Study (Kulka et al., 1990), Orcutt et al. (2003) similarly found that PTSD symptoms mediated the effects of combat exposure on intimate partner physical aggression.

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Several other studies of military veterans have demonstrated that those with PTSD evidence poorer family adjustment, more relationship problems, more problems with intimacy, higher relationship distress, more parental problems, lower family cohesiveness, and less constructive communication behaviors than do veterans without the disorder and that veterans with PTSD are more likely to take steps toward separation and divorce (Cook, Riggs, Thompson, Coyne, & Sheikh, 2004; Jordan et al., 1992; Riggs, Byrne, Weathers, & Litz, 1998; Solomon, Mikulincer, Freid, & Wosner, 1987). High levels of psychological distress have also been reported among the female partners of PTSD-positive male veterans (Dekel, Solomon, & Bleich, 2005; Manguno-Mire et al., 2007), with higher distress and caregiver burden reported among partners of veterans with PTSD relative to partners of veterans without the disorder (Calhoun, Beckham, & Bosworth, 2002). Studies have further found that veterans without PTSD evidence levels of marital satisfaction that are comparable with population means (Cook et al., 2004; Riggs et al., 1998). This finding suggests that PTSD may largely determine whether combat exposure leads to poorer relationship adjustment.

An exclusive focus on PTSD as a singular construct may obscure differential relationships among specific components of the disorder (Schell, Marshall, & Jaycox, 2004). Researchers have recently begun to explicate the nature of the associations between PTSD symptoms and family adjustment difficulties through examination of the unique associations of individual symptom groupings. Taken together, the limited available evidence, all of which has been derived from samples of male veterans, suggests that emotional numbing symptoms are a particularly robust predictor of poorer relationship adjustment (Cook et al., 2004; Riggs et al., 1998) and that hyperarousal symptoms are a relatively stronger predictor of intimate partner violence (L. A. King & King, 2004). Regarding general family adjustment, initial evidence indicates that both avoidance/numbing and hyperarousal symptoms are associated with poorer adjustment (Evans, McHugh, Hopwood, & Watt, 2003; Hendrix, Erdmann, & Briggs, 1998).

All previous studies of the impact of combat exposure and PTSD symptomatology on family-related factors have used cross-sectional designs, which limit one's ability to establish directionality among variables. These studies often have used reports of combat and exposure to other war-zone stressors obtained several years after the actual deployment, although such reports have a high potential for unreliability (D. W. King & King, 1991). Reports of remote events may be influenced by one's current psychological state, and this might potentially detract from the validity of obtained findings. In the current study, we attempted to address these issues by incorporating a prospective design in which combat exposure and PTSD symptomatology were assessed immediately upon the soldier's return from the deployment, prior to joining with family (Time 1), and family adjustment was assessed between 18 and 24 months later (Time 2).

No published study has examined the interrelationships among combat exposure, PTSD symptoms, and family functioning among ODS veterans or individuals involved in more recent deployments. It is important to examine whether prior findings generalize to more contemporary deployments, as the nature and severity of stressor exposure, the political and social environment, and the structure of the military itself have changed substantially across conflicts. One of the largest such changes has been the rapid entry of women in the modern military. As of 2006, 201,575 women served on active duty, accounting for 14.6% of all active duty personnel, and another 142,170 women were in the reserves and National Guard, accounting for 20.7% and 14.3% of these populations, respectively (Department of Defense, 2006). In contrast, at the close of the Vietnam War, women constituted less than 3% of the active duty military (Center for Women Veterans, 2007). Women have recently been included in war-zone deployments in large numbers. Over 40,000 women served in key combat-support positions in ODS (Department of Defense, 2006).

Given these statistics, it is important that researchers examine women veterans' family adjustment upon returning from war-zone deployments and determine possible gender-specific reactions to such deployments. Some early evidence from this cohort of ODS soldiers suggests that, controlling for combat exposure, women's PTSD rates are twice those of men and that this result may be attributable to higher childhood trauma or other forms of war-zone stressors (Wolfe, Erickson, Sharkansky, King, & King, 1999). Given these findings, the central role that PTSD appears to play with respect to family functioning among men, and some preliminary evidence documenting associations between PTSD symptoms and indices of family functioning among women Vietnam veterans (Gold et al., 2007), there was reason to expect that combat exposure and PTSD symptoms would have a deleterious impact on family adjustment for women in the current sample, as was expected for men.

In the current study, we used a SEM framework to examine the impacts of combat exposure and PTSD symptoms on family adjustment among a relatively large sample of male and female ODS veterans. Previous work has typically used modest samples that did not allow for the simultaneous examination of the interrelationships among multiple latent variables. Study hypotheses were as follows: (a) combat exposure would evidence a direct negative association with family adjustment; (b) combat exposure would exhibit an indirect negative association with family adjustment via higher PTSD symptoms; and (c) when we examined separate groupings of PTSD symptoms, those symptoms reflecting withdrawal/numbing and arousal/lack of control would evidence the strongest relative associations with poorer family adjustment. We explored potential gender differences in the proposed models. No gender-specific hypotheses were made, given the lack of previous research in this area among women.

Method

Participants

Participants were drawn from a sample of U.S. Army soldiers who represented approximately 60% of all personnel deployed from Fort Devens, Massachusetts, to the Persian Gulf region during ODS. Soldiers who did not participate were unavailable to complete the assessment, due chiefly to administrative reasons. Participants completed self-report questionnaires within 5 days after their return from the Gulf, prior to rejoining their families (Time 1), and again 18–24 months later (Time 2). The Devens cohort included a total of 2,949 people who had completed the Time 1 assessment. For the current study, a total of 1,512 individuals (1,407 men and 105 women) indicated that they were residing with family members and completed the family adjustment mea-

sure as part of the Time 2 assessment (i.e., members of the Devens cohort who were not residing with a family member at the time of the second assessment were not included in the present investigation). Approved informed consent procedures were followed with all participants at each time point, and the study was conducted in compliance with internal review board at the Veterans Affairs Boston Healthcare System.

Participants included enlisted soldiers (28.6%), noncommissioned officers (63.0%), and commissioned officers (8.4%). Over half (56.6%) of participants were National Guard personnel, 21.5% were active duty personnel, and 21.9% were reservists. Men and women did not differ regarding personnel status, $\chi^2(2, N = 1{,}512) = 5.62$, *ns*. Of those sampled, 15% reported combat experience prior to their Persian Gulf deployment. Participants were predominantly male (93.1%). On average, participants were 31.6 years old ($SD = 8.9$ years) at baseline and had completed 13.2 years of formal education ($SD = 1.9$ years). With regard to race, 87.4% were Caucasian, 5.5% were African American, 3.3% were Hispanic or Latino, 2.3% were Native American, and 0.5% were Asian American; 1.0% reported that their race or ethnicity fit none of the above categories. With regard to marital status at the time of the second assessment, 71.4% were married, 22.6% were single and had never married, 3.8% were divorced, and 1.9% were separated.

All Time 1 assessments were completed during face-to-face unit meetings. Time 2 assessments were conducted during unit meetings when possible, and 44% of participants completed the assessment in this manner. It was not feasible for 56% of the participants to complete the assessment in person (e.g., the participant was stationed abroad or was separated from the military); thus, their questionnaires were completed via postal mail. For further sample details, see Wolfe et al. (1999).

Measures

Combat exposure was measured at Time 1 with the Laufer Combat Scale (Gallops, Laufer, & Yager, 1981). Additional items were added to reflect combat-related experiences unique to ODS (e.g., being on alert for a SCUD missile or biochemical attack). Response options for each of 33 stressors were *never, once or twice,* or *three or more times*, and item scores were summed to arrive at a total score. The internal consistency reliability estimate of this measure in the current study was .73.

PTSD symptoms were assessed at Time 1 with the Mississippi Scale for Combat-Related PTSD (Keane, Caddell, & Taylor, 1988). The Mississippi Scale consists of 35 items that measure the reexperiencing, avoidance/numbing, and hyperarousal symptoms of PTSD, as well as features commonly associated with PTSD (e.g., substance abuse, suicidality). The wording for some items was slightly modified to reflect ODS-specific experiences. This measure possesses excellent internal consistency and test–retest reliability, as well as convergent validity with other measures of PTSD and combat exposure (Keane et al., 1988; McFall, Smith, Mackay, & Tarver, 1990; McFall, Smith, Roszell, Tarver, & Malas, 1990). Previous studies have supported four factor analytically derived subscales among veteran samples: Reexperiencing/Avoidance (11 items), Withdrawal/Numbing (11 items), Arousal/Lack of Control (8 items), and Self-Persecution (5 items; L. A. King & King, 1994). In the present study, these four subscales were examined. The internal consistency reliability estimates were .78, .75, .69, and .48 for the Reexperiencing/Avoidance, Withdrawal/Numbing, Arousal/Lack of Control, and Self-Persecution factors, respectively.[1]

Family adjustment was measured at Time 2 with the Family Adaptability and Cohesion Evaluation Scale (FACES II; Olson, Bell, & Portner, 1978; Olson et al., 1983). The FACES II includes two subscales: an 11-item Adaptability subscale, which examines flexibility in family roles and operation, and a 13-item Cohesion subscale, which examines closeness among family members. Participants respond to each item, with respect to family members whom they are living with, using a scale ranging from 1 (*almost never*) to 5 (*almost always*). Thus, veterans did not complete this measure if they were not living with family members at the time of the assessment. Participant responses are summed within these subscales. The FACES has good convergent validity with other family adjustment measures; has successfully discriminated between family cohesion, adaptability, and other aspects of family functioning; and has shown good internal consistency reliability (Edman, Cole, & Howard, 1990; Olson, Portner, & Lavee, 1985). In the current study, the internal consistency estimates for the FACES II Adaptability and Cohesion subscales were .72 and .91, respectively.

Analyses

For all analyses, raw data were submitted to the Mplus program, Version 4.1 (Muthén & Muthén, 2006). Prior to computing structural models, we computed measurement models to test the adequacy of the hypothesized latent variable models in explaining the observed data. To test whether differences existed between men and women with regard to measurement models, we computed models in which factor loadings were constrained as being equal between genders. These models were then compared with models in which the factor loadings were unconstrained and were freely estimated across genders. Structural models were then specified and evaluated stepwise to examine whether (a) combat exposure directly predicted poorer family adjustment; (b) combat exposure indirectly predicted poorer family adjustment through the effects of PTSD symptoms; and (c) the Mississippi Scale Reexperiencing/Avoidance and Withdrawal/Numbing subscales evidenced the strongest relative associations with poorer family adjustment when the relative effects of the PTSD symptom subscales were examined. In the structural models, factor loadings and model pathways were constrained to be equal between genders. These constrained structural models were then compared with unconstrained structural models in which the factor loadings and model pathways were freed to vary across genders. We used the full information maximum likelihood method to account for missing data and used the maximum likelihood method as the estimator in all analyses. Indirect effects estimates and corresponding indirect effects z-score values to determine statistical significance were specified in the model and calculated by the Mplus program.

[1] The relatively low internal consistency reliability estimate for the Self-Persecution factor may derive in part from the low number of items (5) in the scale. Total scores on the Self-Persecution items were maintained in SEM analyses.

Observed statistical power was generally adequate for the models tested in the current study. There was adequate observed power for finding medium effect size differences between the freed and the constrained between-gender-nested models (power ≥.97 for all models tested; MacCallum, Browne, & Cai, 2006; Preacher and Coffman, 2006). Observed power (.76) was less adequate for finding small effect size differences between the freed and the constrained nested models that tested the direct effects of combat exposure on family adjustment. However, there was adequate observed power for finding small effect size differences in the nested models for combat exposure, PTSD symptoms, and family adjustment (power ≥.99 for all models tested). Although these power analyses revealed adequate observed power for testing between-gender differences via nested SEM analyses, it is important to note that this adequate observed power was mostly a function of the large sample of male veterans (n = 1,407). In fact, due to the low number of female veterans (n = 105), independent tests of the SEM analyses with female veterans only would have resulted in inadequate statistical power (<.34 for all models). Hence, tests of nested between-gender-model differences afforded the strongest observed power, due to the high number of male veterans.

Results

Direct Effects of Combat Exposure on Family Adjustment

We used SEM to examine whether combat exposure would directly predict poorer family adjustment for men and for women. First, we calculated a measurement model in which the factor loadings to family adjustment were constrained to be equivalent between men and women. Combat exposure was an observed variable, and family adjustment was modeled as a latent variable indicated by observed scores on the FACES Adaptability and Cohesion subscales. This model produced an acceptable model fit, as indicated by a nonsignificant chi-square test, $\chi^2(2, N = 1{,}512) = 2.46$, a comparative fit index (CFI) above .95 (1.00; Bentler, 1990), a root-mean-square error of approximation (RMSEA) below .08 (.02), and a 90% confidence interval (CI) of .00–.08 (Browne & Cudeck, 1993; Hu & Bentler, 1998). We computed an alternative measurement model, in which the factor loadings of the observed factor indicators to family adjustment were allowed to vary freely between genders. This model also produced an acceptable model fit, $\chi^2(1, N = 1{,}512) = 0.16$, CFI = 1.00, RMSEA = .00, CI = .00–.07. To examine whether these measurement models exhibited significant differences with regard to model fit, we performed a chi-square test. Results from the chi-square difference test revealed that freeing the factor loadings and residual variances between genders did not significantly improve the measurement model fit, $\Delta\chi^2(1, N = 1{,}512) = 2.3$, *ns*. Therefore, measurement invariance between genders with regard to the measurement model could be assumed.

Next, we computed a structural model using the assumption of factor loading and path model equivalency across genders. Model fit indices suggested that the overall hypothesized model was consistent with the observed data, $\chi^2(2, N = 1{,}512) = 2.46$, CFI = 1.00, RMSEA = .02, CI = .00–.08. We calculated a second structural model, in which the factor loadings and path models were permitted to vary freely across genders. This second structural model also produced an acceptable model fit, $\chi^2(1, N = 1{,}512) = 0.01$, CFI = 1.00, RMSEA = .02, CI = .00–.04. A comparison of the constrained and unconstrained models revealed that allowing the parameters to vary freely across genders did not significantly improve the structural model fit to the data, $\Delta\chi^2(1, N = 1{,}512) = 2.45$, *ns*. Given the equivalency of the structural model across genders, the model collapsing across men and women is presented (see Figure 1). Although the negative relationship between combat exposure and family adjustment was in the hypothesized direction, this association was nonsignificant.

Indirect Effects of Combat Exposure on Family Adjustment Through Total PTSD Symptoms

We used SEM to examine whether the effects of combat exposure on family adjustment would be indirect through PTSD symptoms. Again, we calculated an initial measurement model, in which the factor loadings of observed indicators to latent factors were constrained to be equivalent between men and women. Combat exposure was an observed variable, and PTSD symptoms and family adjustment were latent variables. Family adjustment was indicated by the FACES Adaptability and Cohesion subscales. The PTSD symptom variable was indicated by the four subscales of the Mississippi Scale for Combat-Related PTSD. To improve chances at model convergence, we fixed starting values for the Mississippi Scale for Combat-Related PTSD Reexperiencing/Avoidance subscale and the FACES Cohesion subscale equal to 1. This measurement model produced an acceptable model fit, $\chi^2(32, N = 1{,}512) = 136.06$, $p < .001$, CFI = .97, RMSEA = .07, CI = .05–.08. To test for measurement variance, we computed an alternative measurement model in which the factor loadings were allowed to vary freely between genders. This model also produced an acceptable model fit, $\chi^2(28, N = 1{,}512) = 120.99$, $p < .001$, CFI = .97, RMSEA = .07, CI = .05–.08. Although both measurement models produced an acceptable fit, results from the chi-square difference test revealed that freeing the factor loadings between genders significantly improved the measurement model fit to the data, $\Delta\chi^2(1, N = 1{,}512) = 15.07$, $p < .01$.

To determine which, if any, specific factor loadings differed between men and women, we compared the constrained measurement model with a nested measurement model in which the factor loading of a single observed variable was allowed to vary freely across groups while all other model variable relationships were constrained across groups. Then, chi-square difference tests com-

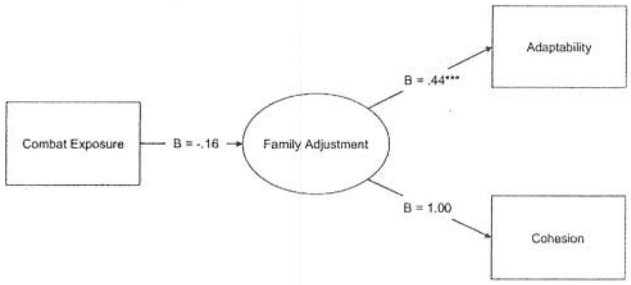

Figure 1. Unstandardized structural model of Time 1 combat exposure predicting Time 2 family adjustment for men and women combined. ***$p < .001$.

pared the constrained model to each nested model in which a single factor loading was freed to vary across genders. Model comparisons suggested equivalency between men and women with regard to factor loadings from Reexperiencing/Avoidance to latent PTSD symptoms, $\Delta\chi^2(1, N = 1{,}512) = .04$, *ns*. However, factor loading differences between men and women were found for Withdrawal/Numbing to latent PTSD symptoms, $\Delta\chi^2(1, N = 1{,}512) = 8.67$, $p < .01$; from Arousal/Lack of Control to latent PTSD symptoms, $\Delta\chi^2(1, N = 1{,}512) = 6.99$, $p < .01$; and from Self-Persecution to latent PTSD symptoms, $\Delta\chi^2(1, N = 1{,}512) = 4.30$, $p < .05$. Evidence for between gender equivalency was found from Adaptability to latent family adjustment, $\Delta\chi^2(1, N = 1{,}512) = 1.50$, *ns*, and from Cohesion to latent family adjustment, $\Delta\chi^2(1, N = 1{,}512) = 1.50$, *ns*. In summary, these results supported gender differences with regard to the factor loadings from Withdrawal/Numbing, Arousal/Lack of Control, and Self-Persecution to PTSD symptoms.

Next, structural models were computed and compared. A structural model constraining all model pathways as being equivalent across groups was computed first. This model produced an acceptable model fit to the data, $\chi^2(32, N = 1{,}512) = 136.06$, $p < .001$, CFI = .97, RMSEA = .07, CI = .05–.08. We calculated a second structural model, in which the factor loadings and path models were permitted to vary freely across genders. This second structural model also produced an acceptable model fit, $\chi^2(28, N = 1{,}512) = 110.79$, $p < .001$, CFI = .97, RMSEA = .06, CI = .05–.08. The chi-square difference test revealed that freeing the model pathways between genders significantly improved the overall model fit to the data, $\Delta\chi^2(4, N = 1{,}512) = 25.27$, $p < .001$. Therefore, nested structural models were computed, and path values are presented separately for men and for women. Between-gender group differences were found with regard to the relationship between combat exposure and family adjustment, such that combat exposure significantly and negatively predicted family adjustment for women but not for men. Thus, in these analyses, the hypothesis that combat exposure would exhibit a direct negative association with family adjustment was supported for women but not for men. Although combat exposure positively predicted PTSD symptoms and PTSD symptoms, in turn, negatively predicted family adjustment for both men and women (see Figures 2 and 3), tests of the indirect effects of these model pathways were nonsignificant (unstandardized indirect effects for men = .01, *ns*; unstandardized indirect effects for women = .10, *ns*). Therefore, although the model pathways from combat exposure to PTSD to family adjustment were significant and in the hypothesized direction, a significant indirect effect of combat exposure through latent PTSD was not supported.

Indirect Effects of Combat Exposure on Family Adjustment Through the Separate PTSD Symptom Subscales

Next, we examined whether the indirect effects of combat exposure on family adjustment would be strongest through the Mississippi Scale Withdrawal/Numbing and Arousal/Lack of Control subscales. We computed an initial measurement model in which combat exposure and the four Mississippi subscale scores were observed variables. Family adjustment was modeled as a latent variable indicated by the FACES Adaptability and Cohesion

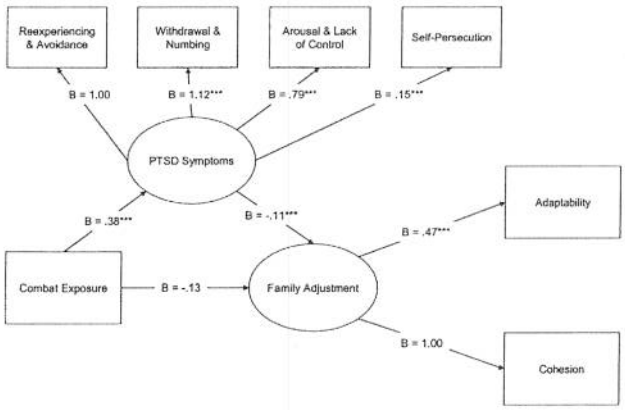

Figure 2. Unstandardized structural model of Time 1 combat exposure and Time 2 PTSD symptoms predicting Time 2 family adjustment for men. PTSD = posttraumatic stress disorder. $^{***}p < .001$.

subscales. To test for measurement invariance, we fixed the factor loadings for Adaptability and Cohesion to be equivalent across groups. This measurement model produced an acceptable model fit, $\chi^2(10, N = 1{,}512) = 13.23$, *ns*, CFI = 1.00, RMSEA = .02, CI = .00–.05. An alternative measurement model in which the factor loadings for Adaptability and Cohesion were permitted to freely vary across groups also produced an acceptable fit to the data, $\chi^2(9, N = 1{,}512) = 12.46$, *ns*, CFI = 1.00, RMSEA = .02, CI = .00–.05. A chi-square test comparison of these two models indicated that freeing the factor loadings did not significantly improve the overall model, $\Delta\chi^2(1, N = 1{,}512) = 0.77$, *ns*. Therefore, measurement invariance across genders was found.

To test for measurement invariance across genders in the structural model, we computed and compared two separate structural models. The constrained structural model examining the separate indirect effects of the PTSD subscales produced an acceptable overall fit to the data, $\chi^2(10, N = 1{,}512) = 13.23$, *ns*, CFI = 1.00, RMSEA = .01, CI = .00–.05. The unconstrained structural model also produced an acceptable fit to the data, $\chi^2(9, N = 1{,}512) = 13.03$, *ns*, CFI = 1.00, RMSEA = .02, CI = .00–.05. The chi-square difference test comparing these two models suggested that freeing the factor loadings and model pathways did not improve the overall model, $\Delta\chi^2(1, N = 1{,}512) = 0.2$, *ns*. Because between-gender equivalency could be assumed, men and women were examined together in the structural model that tested direct and indirect effects of individual PTSD symptom subscales. Results of the structural model supported the hypothesis that the indirect effects of combat exposure on family adjustment would be strongest through the Mississippi Scale Withdrawal/Numbing and Arousal/Lack of Control subscales (see Figure 4). Specifically, significant indirect effects of combat exposure on family adjustment were found through Withdrawal/Numbing (unstandardized indirect effects = −.18, $p < .001$) and Arousal/Lack of Control (unstandardized indirect effects = −.06, $p < .05$) but not through Reexperiencing/Avoidance (unstandardized indirect effects = −.01, $p = .76$) or Self-Persecution (unstandardized indirect effects = −.02, $p = .59$).

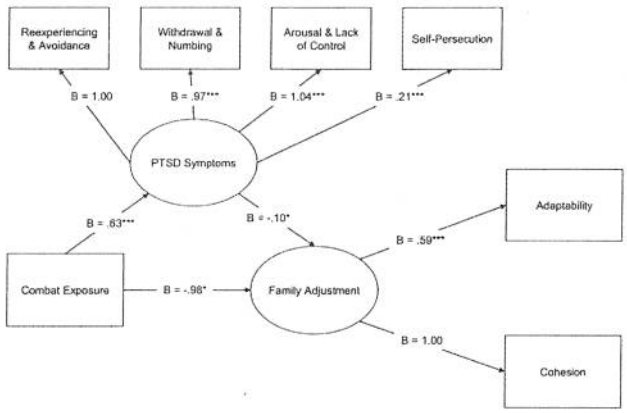

Figure 3. Unstandardized structural model of Time 1 combat exposure and Time 2 PTSD symptoms predicting Time 2 family adjustment for women. PTSD = posttraumatic stress disorder. $^{*}p < .05$. $^{***}p < .001$.

Discussion

This investigation of ODS veterans highlights the salience of PTSD symptoms with respect to the negative impact of exposure to combat on family functioning. For male and female veterans, combat exposure was associated with higher PTSD symptoms, which in turn were associated with poorer family adjustment. Also, for female veterans and consistent with expectations, combat exposure was directly associated with poorer family adjustment when we accounted for the effects of PTSD symptoms. Tests of the indirect effects of combat exposure on family adjustment through the conglomerate, latent measure of PTSD symptoms were nonsignificant for men and for women. However, when the PTSD symptom subscales were examined, Withdrawal/Numbing symptoms and Arousal/Lack of Control indirectly accounted for the impacts of combat exposure on family adjustment, whereas neither Reexperiencing/Avoidance nor Self-Persecution was significantly related to family adjustment.

Findings across genders indicating that combat exposure leads to poorer family adjustment through its positive relationship with PTSD symptoms are consistent with a growing body of evidence among samples of male Vietnam veterans (Gimbel & Booth, 1994; Orcutt et al., 2003). Current findings generalize and extend this previous work to a more contemporary cohort of military veterans, to female veterans in addition to male veterans, and to the examination of general family adjustment and not just intimate relationship functioning. Thus, it is becoming increasingly clear that psychopathological effects of combat are what place veterans at risk for family functioning difficulties.

It is important to note that combat exposure negatively predicted family adjustment in light of PTSD symptoms for women but not for men. These findings indicate the importance of examining potential pathways whereby combat may lead to family adjustment difficulties for women in particular. Very little research has examined variables other than PTSD symptoms among samples of veterans, and no previous research in this regard has been conducted among female veterans. A number of other possible indirect effects variables deserve investigation, in particular, other forms of psychological and emotional disturbance (e.g., depression and substance abuse problems, which often result from exposure to combat; Fiedler et al., 2006; Koenen, Stellman, Stellman, & Sommer, 2003) that tend to be highly comorbid with PTSD (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Kulka et al., 1990) and that tend to be associated with family-related difficulties (Locke & Newcomb, 2003; Taft et al., 2005; Weinstock, Keitner, Ryan, Solomon, & Miller, 2006). Research in this area is especially warranted, given the rapid increase of women in the military and their increased exposure to combat (Department of Defense, 2006).

It was interesting to find that the PTSD subscales had differential measurement structures for men and for women. Specifically, a higher factor loading from Withdrawal/Numbing to latent PTSD symptoms was found among men, whereas higher factor loadings were found from Arousal/Lack of Control and Self-Persecution to latent PTSD symptoms among women. These findings suggest that PTSD symptoms may be manifested by higher levels of withdrawal/numbing symptoms among men and by higher levels of arousal/lack of control and self-persecution among women. These differences not only have important implications for the assessment of PTSD symptoms but have treatment implications for ODS veterans. Although interventions should ideally address all facets of PTSD, findings suggest that symptom-focused interventions for male ODS veterans should especially emphasize reducing withdrawal/numbing symptoms and that interventions for female ODS veterans should emphasize reducing arousal/lack of control and self-persecution symptoms.

Examination of the separate PTSD symptom subscales produced findings consistent with some research among samples of Vietnam veterans that indicated symptoms from the avoidance/numbing and hyperarousal PTSD symptom clusters were associated with poorer general family adjustment (Evans et al., 2003; Hendrix et al., 1998). Feelings of detachment and blunted emotions are likely to hinder family intimacy and cohesion, as emotional expression is thought to be critical to the development and maintenance of positive relationships (Greenberg & Johnson, 1988; Riggs et al.,

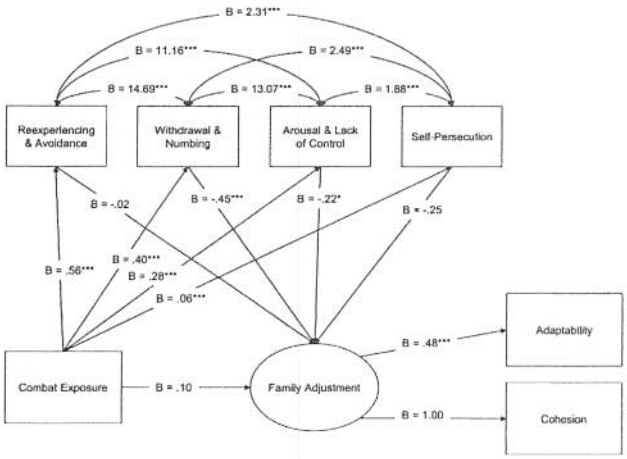

Figure 4. Unstandardized structural model of Time 1 combat exposure and Time 2 PTSD symptom subscales predicting Time 2 family adjustment for men and women combined. PTSD = posttraumatic stress disorder. $^{*}p < .05$. $^{***}p < .001$.

1998). Family conflict, distress, ambiguity regarding role expectations, and an inability to resolve problems are likely to be other negative outcomes stemming from a lack of interpersonal warmth and positive expression of emotions among family members (Galovski & Lyons, 2004). Findings for withdrawal and emotional numbing appear to indicate the potential utility of family-based interventions for veterans that are aimed at reducing avoidance of trauma-related cues and difficult family situations and that facilitate conflict management through the constructive expression of emotions (Monson, Stevens, & Schnurr, 2005).

Symptoms of increased arousal, such as irritability and concentration difficulties, may lead to increased family conflict through their deleterious impact on attention, cognitive processing, and inhibitory control (Eckhardt & Jamison, 2002; Gross, 1998; Thase, 2005). These cognitive processes are likely to contribute to deficits in social information processing, which have consistently been associated with negative intimate relationship conflict behaviors among civilian samples (Eckhardt, Barbour, & Davison, 1998; Holtzworth-Munroe, Meehan, Herron, Rehman, & Stuart, 2000). Some evidence suggests that mothers with PTSD tend to be more reactive and impulsive in their actions with their children, which may be a manifestation of hyperarousal symptoms in particular (Chemtob & Carlson, 2004). Such reactions may lead to increased child behavior problems and poorer family adjustment. Associations for hyperarousal symptoms suggest that enhanced family functioning is a possible benefit of stress management and relaxation-based approaches for those suffering from PTSD-related symptomatology.

The current investigation represents an innovation over previous research through its examination of a more contemporary cohort of veterans than those studied in previous investigations of PTSD and family functioning, inclusion of both male and female veterans, employment of a prospective design in which combat exposure was assessed immediately upon the veterans' return from deployment, and examination of separate PTSD symptom groupings. However, this study was not without its limitations, and a number of questions remain unanswered. Given the large number of male participants, the current study was adequately powered to detect a small difference in nested model fit and overall model deviation from the data (MacCallum et al., 2006; MacCallum, Browne, & Sugawara, 1996). However, power analyses indicate that if one were to examine female participants separately in the model depicted in Figure 3, a minimal sample size of 367 would be required to adequately test a close fitting model with a power of estimate of .8 and a Cronbach's alpha of .05 (MacCallum et al., 1996; Preacher & Coffman, 2006). Hence, future research on the impact of combat exposure and PTSD symptoms would benefit from inclusion of a larger number of women.

Despite the examination of data across two separate time points, a lack of information on predeployment family functioning prevented us from examining change in family adjustment over time. Moreover, the recruitment strategy did not allow us to examine those who had experienced family dissolution or divorce following the first assessment point and who thus did not report on family adjustment at Time 2. Further, no data were collected with respect to the experience of nonmilitary stressors. In addition to deployment-related stressors, predeployment family vulnerabilities and nonmilitary-related stressors likely represent factors key to understanding those who may have more difficulty in the postdeployment period (see Karney & Crown, 2007). Future work that more fully captures trajectories of family problems and the military- and nonmilitary-related factors across the deployment phases that predict such trajectories will likely prove important to understanding the functioning of this population and to highlighting targets for intervention efforts.

Future investigations should incorporate a wider array of family adjustment measures obtained from multiple reporters to limit inflation of associations due to mono-reporter bias, to mitigate against the possible underreporting of family adjustment difficulties, and to more fully capture the specificity of associations among the variables of interest. A more comprehensive assessment of family functioning is particularly important in light of studies indicating that the FACES may discriminate between different patterns of family adjustment, as opposed to adaptive or maladaptive functioning (Pelcovitz et al., 2000; Place, Hulsmeier, Brownrigg, & Soulsby, 2005). Future research should investigate cohort differences in addition to gender that could moderate the effects of deployment on family adjustment. For example, active duty families may display more resilience against military deployment than may reservist and National Guard families, as active duty families may be more readily anticipating the possibility of deployment and have more resources available to cope with loved ones being deployed (Darwin, 2007). Finally, the degree to which findings obtained from the current sample of ODS veterans apply to current military veterans or veterans from other eras is not known.

Our data highlight the need to better understand the interrelationships among combat exposure, PTSD symptoms, and family adjustment so as to inform intervention and prevention efforts for the families of military veterans. Results indicate the salience of PTSD symptoms, particularly those tapping withdrawal/numbing and increased arousal/lack of control, with respect to family adjustment difficulties among this population and suggest the value of family-based interventions that target these symptoms. It is hoped that this study will assist in focusing increased attention on the associations of interest for male and female veterans.

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