2014

Examining the role of unit cohesion as a moderator of the relationship between warfare exposure and PTSD

Shaina Gulin
Virginia Commonwealth University

Follow this and additional works at: https://scholarscompass.vcu.edu/etd

Part of the Clinical Psychology Commons

© The Author

Downloaded from
https://scholarscompass.vcu.edu/etd/3506

This Thesis is brought to you for free and open access by the Graduate School at VCU Scholars Compass. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of VCU Scholars Compass. For more information, please contact libcompass@vcu.edu.
EXAMINING THE ROLE OF UNIT COHESION AS A MODERATOR OF THE RELATIONSHIP BETWEEN WARFARE EXPOSURE AND PTSD

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at Virginia Commonwealth University

By: SHAINA LAUREN GULIN
Bachelor of Arts, University of Maryland College Park, May 2009

Director: Scott R. Vrana, Ph.D.
Professor, Departments of Psychology and Psychiatry

Virginia Commonwealth University
Richmond, VA
June, 2014
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>iv</td>
</tr>
<tr>
<td>List of Figures</td>
<td>v</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>vi</td>
</tr>
<tr>
<td>Abstract</td>
<td>vii</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Literature Review</td>
<td>5</td>
</tr>
<tr>
<td>National Guard and Reserve (NGR) Troops</td>
<td>5</td>
</tr>
<tr>
<td>Exposure to Combat</td>
<td>8</td>
</tr>
<tr>
<td>PTSD in Female Service Members</td>
<td>12</td>
</tr>
<tr>
<td>Unit Cohesion and PTSD</td>
<td>17</td>
</tr>
<tr>
<td>Problem Statement</td>
<td>25</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>26</td>
</tr>
<tr>
<td>Method</td>
<td>27</td>
</tr>
<tr>
<td>Participants</td>
<td>27</td>
</tr>
<tr>
<td>Procedures</td>
<td>28</td>
</tr>
<tr>
<td>Measures</td>
<td>29</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>33</td>
</tr>
<tr>
<td>Results</td>
<td>36</td>
</tr>
<tr>
<td>Preliminary Analyses</td>
<td>36</td>
</tr>
<tr>
<td>Descriptive Results</td>
<td>37</td>
</tr>
<tr>
<td>Exploratory Analyses</td>
<td>42</td>
</tr>
<tr>
<td>Warfare Exposure &amp; PTSD: Hypothesis 1</td>
<td>43</td>
</tr>
<tr>
<td>Combat Experiences &amp; PTSD: Hypothesis 2</td>
<td>44</td>
</tr>
<tr>
<td>Gender Differences in Unit Cohesion: Hypothesis 3a</td>
<td>52</td>
</tr>
<tr>
<td>Unit Cohesion &amp; PTSD: Hypothesis 3b</td>
<td>52</td>
</tr>
<tr>
<td>Unit Cohesion Buffering Hypothesis: Hypothesis 4</td>
<td>53</td>
</tr>
<tr>
<td>Discussion</td>
<td>56</td>
</tr>
<tr>
<td>Prediction of PTSD: Warfare Exposure</td>
<td>56</td>
</tr>
<tr>
<td>Gender Differences in PTSD</td>
<td>60</td>
</tr>
<tr>
<td>Unit Cohesion</td>
<td>63</td>
</tr>
<tr>
<td>Unit Cohesion Buffering Hypothesis</td>
<td>65</td>
</tr>
<tr>
<td>Clinical Implications</td>
<td>67</td>
</tr>
<tr>
<td>Limitations</td>
<td>70</td>
</tr>
</tbody>
</table>
List of References ................................................................. 72
Appendix: Review of Social Support Literature ...................... 84
Vita ............................................................................. 90
List of Tables

1. Sociodemographic Characteristics of Participants with Phase 1 Data Only vs. Participants with Phase 1 & Phase 2 Data .......................... 38
2. Correlation Matrix of Study Variables .................................................. 40
3. Mean and SD for Primary Study Variables, and Statistical Comparison between Men and Women .................................................. 42
4. Summary of Hierarchical Regression Analysis: Hypothesis 1 ............... 44
5. DRRI-CE Item Correlations ................................................................. 46
6. PCL-M Means for Participants Who Did vs. Did Not Endorse Experiencing Each DRRI-CE Item, and Statistical Comparisons between the Groups ...... 47
7. Item Loadings for Hypothesis 2 DRRI-CE Factor Analysis ................. 50
8. Summary of Hierarchical Regression Analysis: Hypothesis 2 ............... 51
10. Summary of Hierarchical Regression Analysis: Hypothesis 4 ......... 54
**List of Figures**

<table>
<thead>
<tr>
<th>Figure Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scree Plot for Hypothesis 2 Factor Analysis</td>
<td>49</td>
</tr>
</tbody>
</table>
Acknowledgements

I would like to thank my advisor, Dr. Scott Vrana, for his encouragement and guidance with my thesis and his mentorship throughout my graduate training. I would also like to thank my graduate student colleagues for supporting me throughout this project. Finally, I would like to acknowledge the support of my family and friends.
Abstract

EXAMINING THE ROLE OF UNIT COHESION AS A MODERATOR OF THE RELATIONSHIP BETWEEN WARFARE EXPOSURE AND PTSD

By Shaina L. Gulin, B.A.

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at Virginia Commonwealth University.

Virginia Commonwealth University, 2014.

Major Director: Scott R. Vrana, Ph.D.
Professor, Departments of Psychology and Psychiatry

The purpose of the current study was to examine the effects of warfare exposure and unit cohesion on posttraumatic stress disorder (PTSD) symptomatology among male and female National Guard and Reserve service members deployed to Iraq or Afghanistan. National Guard and Reserve soldiers and female service members have been shown to be at greatest risk of psychological distress, and thus identification of resiliency factors among this population is worthy of further study. An emerging body of research has identified unit cohesion as a potentially modifiable protective factor against the deleterious effects of warfare exposure; however, such research is in its early stages, with female service members consistently reporting less unit cohesion than male service members. National Guard and Reserve soldiers (N = 463; 418 men and 45 women) age 19 to 59 were assessed on measures of warfare exposure, PTSD symptomatology, and degree of unit cohesion immediately following deployment to Iraq or Afghanistan.

Results demonstrated that greater exposure to warfare was associated with more severe PTSD symptoms for both men and women. Specifically, combat experiences involving the threat
of direct attack or personal injury tended to occur together and were the most significant risk factors for increased PTSD symptomatology. In addition, female service members in our sample reported significantly lower levels of unit cohesion than male service members, a finding that is consistent with the nascent research on gender differences in cohesion. Although the current study did not find greater unit cohesion to be a buffer against the effects of warfare exposure on PTSD severity, there was a direct effect: greater unit cohesion was associated with less PTSD symptomatology above and beyond the effects of demographic control variables. This relationship held for both male and female service members. Future research should aim to establish causality by examining these constructs longitudinally, with a focus on uncovering the mechanisms by which unit cohesion may lead to fewer PTSD symptoms.
Examining the Role of Unit Cohesion as a Moderator of the Relationship between Warfare Exposure and PTSD

Rates of posttraumatic stress disorder (PTSD) are considered to be on the rise in service members who have served in the Iraq and Afghanistan conflicts (Atkinson, Guetz, & Wein, 2009). A 2004 anonymous survey of U.S. troops returning from combat duty in Iraq or Afghanistan revealed that 12.2 to 12.9% of Iraq-deployed and 6.2% of Afghanistan-deployed troops met diagnostic criteria for PTSD (Hoge, Castro, Messer, McGurk, Cotting, & Koffman, 2004). In 2008, the RAND Corporation’s Center for Military Health Policy research reported a current PTSD prevalence rate of 13.8% among previously deployed Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) service members (Tanielian & Jaycox, 2008). Although the full impact of the OIF/OEF conflicts on veterans’ mental health is not yet known, some researchers anticipate that up to 35% of OIF/OEF service members are likely to develop PTSD (Atkinson, Guetz, & Wein, 2009).

PTSD has become a growing public health concern due to the massive cost exacted upon the U.S. Department of Veterans Affairs and American society (Miller, Wolf, Martin, Kaloupek, & Keane, 2008). The number of veterans receiving PTSD disability compensation is growing, such that the total number of PTSD cases increased between 1999 and 2004 by 79.5% (Department of Veterans Affairs Office of Inspector General, 2005). Further, PTSD benefits payments increased 148.8 percent from $1.7 billion to $4.3 billion (Department of Veterans Affairs Office of Inspector General, 2005).

The current conflicts are unique in that these soldiers often experience longer and more frequent deployments than in previous conflicts, with the tempo of deployment cycles in OIF higher than for any war since World War II (OSMB, 2006). Multiple deployments are becoming
increasingly more common (Miller et al., 2008), which is alarming because combat exposure is considered one of the most frequently demonstrated predictors of PTSD in soldiers (Hoge et al., 2004; Miller et al., 2008; Orcutt, Erickson, & Wolfe, 2004; Sharkansky et al., 2000). Three decades of research has demonstrated that severity of trauma exposure robustly predicts mental health outcomes (Ozer, Best, Lipsey, & Weiss, 2003).

Reservist service members may also face a unique set of challenges when compared to active duty service members. Studies have shown that following deployment, reservists report higher rates of PTSD and related symptoms when compared to active duty personnel (Hoge, Aucinterlonie, & Milliken, 2006; Hourani et al., 2007). These findings are especially true for reservists experiencing stressful conditions after deployment (Jacobson, Ryan, Hooper, Smith, Amoroso, Boyko, et al., 2008). Longitudinal studies of deployed military personnel have found that post-deployment, reserve service members report higher rates of PTSD and related symptoms both three to six months later (Milliken, Aucinterlonie, & Hoge, 2007) and even up to four years later (Jacobson et al., 2008).

Given the likelihood of service members deployed to Iraq or Afghanistan experiencing a traumatic event during combat (Hoge et al., 2004), it appears worthwhile to identify factors that may protect against the development of PTSD. A growing body of research has attempted to uncover such factors, with social support commonly identified in the literature as having protective effects (Cohen & Wills, 1985). However, many of these studies tend to focus on interpersonal support following deployment, rather than in the war-zone itself.

One deployment-related variable that has been given recent attention is unit cohesion, or the degree to which soldiers feel committed to and supported by their military units (Armistead-Jehle, Johnston, Wade, & Ecklund, 2011). This construct has emerged in the literature as a
potentially promising buffer against the development of PTSD. According to Griffith (2002), greater unit cohesion is expected to provide soldiers with social support, acceptance, opportunities for reality testing, and the comfort of not being alone in one’s suffering, ultimately mitigating the negative effects of trauma exposure. Although the general consensus is that unit cohesion serves a protective purpose for service members, much of this understanding appears to stem from theory rather than unequivocal empirical support.

Further, the literature that does exist on this topic has predominantly involved male service members, given their historical involvement in combat and availability for research. Women may face a unique set of challenges during deployment, yet the association between gender and PTSD is under-researched, particularly among women in the OIF conflict (Street, Vogt, & Dutra, 2009). Research has shown that in general, men and women respond to traumatic events in different ways (Tolin & Foa, 2006), and female service members are at an increased risk of developing PTSD when compared to male service members (Wolfe, Erickson, Sharkansky, King, & King, 1999). In fact, deployment stressors and their impact on veteran mental health may differ for males and females. For example, while women and men report exposure to both mission-related and interpersonal stressors, women report more interpersonal stressors (Vogt, Pless, King, & King, 2005). This has clear implications for an appropriate conceptualization of unit cohesion for women.

A primary goal of the current project is to determine whether unit cohesion moderates the relationship between warfare exposure and PTSD symptomatology in a sample of Army National Guard and Reservists. More specifically, the relationship will be examined to assess whether a buffering effect emerges. As a potentially modifiable construct, unit cohesion could be integrated into preventive military mental health policy (Brailey, Vasterling, Proctor, Constans, &
Friedman, 2007). However, the scant research on the topic has yielded ambiguous results.

While two studies have found support for cohesion’s protective effects against warfare exposure (Armistead-Jehle, Johnston, Wade, & Ecklund, 2011; Dickstein et al., 2010), other authors have pointed to potentially harmful, counterintuitive outcomes (Fontana, Rosenheck, & Horvath, 1997). Further, the studies that confirmed the buffering hypothesis were limited in their generalizability. While Armistead-Jehle et al. (2011) offered promising results, for instance, their sample was composed entirely of active duty U.S. Marine men. It is therefore unclear whether similar results would be found among reservist service members, or just as importantly, among women. Thus, a secondary goal of our study is to examine whether the buffering effect extends to female service members.

A final goal of this project, in addition to assessing the direct overall relationship between combat exposure and PTSD, is to determine whether specific combat experiences are differentially associated with PTSD severity. Although many combat experiences have revealed strong associations with PTSD, there are certain war-zone circumstances that appear to be especially traumatic (Pietrzak, Whealin, Stotzer, Goldstein, & Southwick, 2011).
Literature Review

In the following review of the literature, posttraumatic stress disorder (PTSD) amongst National Guard and Reserve (NGR) troops will be explored. In particular, a review of the literature will highlight differences in PTSD rates between NGR and active duty troops. Then, the combat exposure literature will be reviewed, with a particular emphasis on the direct relationship between combat exposure and PTSD prevalence and severity. Also, specific combat experiences will be examined, such that relationships can differentially be drawn between particular war-zone stressors and the likelihood of developing PTSD.

Next, the research on PTSD in women will serve as a foundation for examining PTSD among women in the military. Explanations will be described that account for differences in PTSD between men and female service members. Through an integration of the literature on PTSD in both genders, the construct of social support will be highlighted as a widely researched and potentially promising buffer against the development of PTSD.

In light of the extant research on social support, the current project will examine the related but lesser-known construct of unit cohesion. The review of the literature will describe unit cohesion’s direct relation to PTSD, and more specifically, its interaction with warfare exposure in predicting PTSD symptomatology.

National Guard and Reserve (NGR) Troops

Although the U.S. military has increasingly relied on large numbers of National Guard and Reserve (NGR) troops to deploy in support of OEF/OIF, NGR troops are at an increased risk for post-deployment psychiatric distress. When compared to regular active duty troops, NGR service members have a heightened risk for PTSD symptomatology (Hoge et al., 2006).
Hoge and colleagues’ (2006) population-based descriptive study examined responses of all Army and Marine soldiers who completed a routine post-deployment health assessment between May 1, 2003 and April 30, 2004. Mental health items included screening questions for depression, PTSD, suicidal ideation, interpersonal conflicts, interpersonal aggressive ideation, or other. The authors found that 18.4% of active component service members screened positive for one of the mental health concerns, compared to 21.0% of National Guard members and 20.8% of Reserve component members (Hoge et al., 2006).

Similarly, Browne and colleagues’ (2007) cross-sectional study of UK troops deployed to Iraq found worse outcomes for reserve forces, as compared to active personnel, across a number of domains. While reservists were more likely to report their families feeling proud of their contribution, they also experienced less marital satisfaction upon return. Reserve units also reported slightly lower levels of unit cohesion and effective leadership, which is concerning given the relationship of both lower unit cohesion and less effective leadership to poorer psychological health (Malone, Paige-Dobson, Ohl, DiGiovanni, Cunnion, & Roy, 1996). Reservists also felt less informed than regular active duty component troops and believed their chain of command was less interested in what they did and thought (Browne et al., 2007).

In explicating their results, the authors noted that the majority of reservists deployed to Iraq as individuals; that is, not with their parent unit (Browne et al., 2007). As unit cohesion is often considered a sustaining and motivating force among troops (Rielly, 2000), perhaps reservists do not have the opportunity to form these critical bonds. Caution should be taken in drawing conclusions from Browne and colleagues’ (2007) results, however, given that their sample was comprised of service members from the United Kingdom, and United Kingdom service members may be less likely to train with their home units compared to soldiers in the
Browne and colleagues (2007) also found that compared to active duty members, reserve personnel reported a higher level of potentially traumatizing exposures while deployed and more symptoms of PTSD. Specifically, reservists were more likely to report coming under artillery fire or feeling like they might be killed. The authors noted that while these findings may reflect the true front-line duties of reservists (e.g., medical personnel who are often supporting combat units), it is also possible that perception of risk may be different. Perhaps due to their lack of previous deployment experience, reservists perceive greater exposure to traumatic events (Browne et al., 2007).

The heightened risk for PTSD extends even beyond the immediate return home, and has been shown to increase in the months and years post-deployment (Wolfe et al., 1999). Milliken and colleagues (2007) demonstrated that rates of positive screening for PTSD symptoms more than doubled among NGR service members from their immediate post-deployment screening (12.7%) compared to their re-evaluation six months later (24.5%). In regular active duty troops during the same time frame, however, the PTSD screening rate increased by only 4.9% (a prevalence of 11.8% immediately post-deployment to 16.7% six months later) (Milliken et al., 2007). It should be noted that because these data were obtained from the Post-Deployment Health Assessment (PDHA) and Post-Deployment Health Re-Assessment (PDHRA), however, findings are not independent from the military; thus, there is the potential for bias to have been introduced into results.

In explaining discrepancies in mental health outcomes between NGR and active duty troops, researchers have suggested that combat deployment is particularly stressful for NGR service members who may be unaccustomed to prolonged separations from family members and
friends. These ‘civilian soldiers’ may also experience unintended or harmful career disruptions in their employment (Polusny, Erbes, Murdoch, Arbisi, Thuras, & Rath, 2010). Reserve members often experience rapid mobilization, leaving them little time to process fears and put their civilian affairs in order (Malone et al., 1996). Further, reservists are more likely than active duty personnel to report relationship difficulties and problems at home post-deployment (Browne et al., 2007), which likely contribute to deleterious mental health outcomes. Other research has suggested that higher PTSD symptomatology among National Guard soldiers, when compared with active duty soldiers, may reflect more restricted access to health care services upon return from deployment (Thomas et al., 2010).

Although the higher risk for PTSD and related problems has been well documented among NGR troops, the majority of research on military-related PTSD focuses on active duty branch service members (Polusny et al., 2010). The unfortunate consequence, then, is that less is known about resiliency factors in the NGR population.

**Exposure to Combat**

Studies that have examined the direct relationship between combat exposure and PTSD have tended to demonstrate converging results. Hoge and colleagues (2004), in a sample of OIF/OEF service members, found a strong relationship between combat experiences (such as being shot at, handling dead bodies, or killing enemy combatants) and the prevalence of PTSD. In particular, among soldiers and Marines who had been deployed to Iraq, the prevalence of PTSD increased in a linear manner with the number of firefights during deployment: 4.5 percent for no firefights, 9.3 percent for one to two firefights, 12.7 percent for three to five firefights, and 19.3 percent for more than five firefights (Hoge et al., 2004).
The National Vietnam Veterans Readjustment Study (NVVRS) of a representative sample of 1200 veterans (Kulka et al., 1990) found a strong dose-response relationship between retrospective reports of combat exposure and PTSD occurrence. As combat exposure increased, so did the prevalence of PTSD. Some critics argued, however, that those results could have been influenced by recall bias and other flaws. Thus, investigators in 2006 examined the military records, constructed a new exposure measure, and “cross-checked” exposure reports in diagnoses of 260 NWRS veterans. Besides finding little evidence of falsification, an even stronger dose-response relationship emerged (Dohrenwend et al., 2006).

Miller and colleagues (2008), in their study of 315 male combat veterans predominantly from the Vietnam War, also found that an increase in combat exposure showed a linear relationship to the severity of PTSD symptoms. An examination of the four PTSD symptom factors (re-experiencing, avoidance, emotional numbing, and arousal) revealed that combat exposure had the most significant association with re-experiencing symptoms (Miller et al., 2008).

Recent research has suggested that severity of combat exposure may be even more predictive of PTSD than other known risk factors such as pre-war personal vulnerability (Dohrenwend, Yager, Wall, & Adams, 2013). In a subsample of men with PTSD diagnoses from the National Vietnam Veterans Readjustment Study, Dohrenwend and colleagues (2013) found support for the assumption that Criterion A combat stressors are necessary for the occurrence of war-related PTSD. Severity of combat exposure was more important than pre-war personal vulnerability factors (i.e., childhood abuse, pre-Vietnam psychiatric conditions) in predicting PTSD onset, although vulnerability was at least as important in long-term persistence of the disorder (Dohrenwend et al., 2013).
An increase in PTSD symptomatology as a function of increased combat exposure was also seen in a study examining the course of PTSD symptoms among Gulf War veterans (Orcutt et al., 2004). Based on their scores on the Mississippi Scale for Combat-Related PTSD (M-PTSD) or the PTSD Checklist (PCL), veterans were categorized into “more symptomatic” and “less symptomatic” groups. As expected, those veterans who reported greater exposure to combat had a higher probability of being categorized in the “more symptomatic” group; this group (which accounted for 43% of the sample) reported higher levels of initial symptoms and steeper increases in symptoms over time. The anticipated trajectory for most veterans with war-related PTSD is often thought to be toward amelioration or complete remission (Dohrenwend et al., 2006). Orcutt and colleagues’ (2004) results, however, parallel a number of other findings indicating that PTSD symptoms may, in fact, not decrease across time (Southwick et al., 1995).

Given the well-established relationship between combat exposure and PTSD, several recent studies have begun to examine the relationship between PTSD and specific combat experiences. For example, a study of U.S. Marine OIF/OEF veterans found that feeling in great danger of death, being shot or seriously injured, and seeing someone wounded or killed were independently associated with PTSD symptomatology (Phillips, Leardmann, Gumbs, & Smith, 2010).

Other findings have pointed to PTSD as resulting from one’s own actions during war. A prospective longitudinal study of U.S. National Guard soldiers deployed to Iraq revealed that among specific aspects of combat stressors, killing (e.g., “killed or believed to have killed enem[ies] during combat”) was an important predictor of new-onset probable PTSD (Polusny et al., 2010). Of course, one explanation for the association between soldiers’ reports of killing and PTSD is that killing reflects intense combat exposure and threat to one’s own life due to being in
close contact with the enemy. Maguen and colleagues’ (2010) research with 2,797 soldiers returning from Iraq, however, revealed that direct or indirect killing was a significant predictor of PTSD symptoms even after controlling for combat exposure. Thus, killing appears to be a particularly salient war-zone stressor that has unique implications for the development of PTSD.

Another study of 285 National Guard/Reservist OIF/OEF veterans examined the differential association of specific combat experiences with PTSD and found that personally witnessing someone from one’s unit or an ally unit being seriously wounded or killed was especially strongly related to PTSD (Pietrzak, Whealin, Stotzer, Goldstein, & Southwick, 2011). This combat experience was related to all four of their confirmatory factor analysis-derived PTSD symptom clusters of re-experiencing, avoidance, dysphoria, and hyperarousal, suggesting the relationship is particularly robust. Exposure to “friendly” fire was also independently associated with severity of PTSD; and specifically, to the re-experiencing and dysphoria symptom clusters. Finally, killing in combat was directly related to re-experiencing symptoms only (Pietrzak et al., 2011).

There also appears to be differences in the course of PTSD based on the combat exposure to PTSD relationship. Green, Grace, Lindy, and Gleser (1990) found that whereas a higher amount of combat exposure is related to the development of PTSD, particularly horrifying and life-threatening atrocities are related to the disorder’s chronicity. Further, a study of 1,058 Gulf War Army personnel revealed that soldiers who reported higher levels of combat exposure also tended to report more life stressors occurring after their homecoming (Sharkansky et al., 2000). This finding lends support for the widely-researched assertion that “trauma leads to more trauma” (Bremner, Southwick, & Charney, 1995; King, King, Fairbank, Keane, & Adams, 1998). These results are alarming because they suggest that exposure to combat may place
soldiers at even greater risk for developing PTSD from unrelated future stressors.

**PTSD in Female Service Members**

In general, there is a dearth of empirical research on female service members. This is unfortunate given numerous findings that women are more likely than men to have a PTSD diagnosis at some point in their lifetime (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). A meta-analytic review of PTSD studies, both military and civilian, showed a nearly twofold increase in PTSD frequency among female participants than among male participants (Tolin & Foa, 2006). Further, these results could not be attributed to a higher risk of traumatic experience among female participants; on the contrary, male, rather than female, individuals were more likely to report a history of potentially traumatic events (Tolin & Foa, 2006). Thus, gender differences in risk of exposure can only partially account for the differential PTSD risk in men and women.

In examining exposure rates by gender, Tolin & Foa (2006) found that men are more likely than women to report experiencing combat, war, or terrorism. However, the overall risk for post-deployment PTSD has consistently been shown to be higher among female service members. Skopp and colleagues (2011), in their sample of 3,265 OIF active duty soldiers, showed that the risk for post-deployment PTSD was nearly 2.5 times greater for female service members than for male service members. The reasons underlying this discrepancy are under-researched (Tolin & Foa, 2006).

Research on gender differences in combat-related PTSD has provided equivocal results (Turner, Turse, & Dohrenwend, 2007). For example, one study of Persian Gulf War veterans found that female service members showed greater PTSD symptomatology than did male veterans (Engel et al., 1993). In this study, gender differences in PTSD after controlling for
combat exposure were not examined. In another sample of U.S. active duty military personnel deployed to Somalia, men reported significantly more combat exposure; however, men and women had approximately equal rates of PTSD (Litz et al., 1997).

In the mid-1980s, a few researchers began to investigate the unique war-zone stressors that were encountered by women in Vietnam (e.g., Paul, 1985; Schnaier, 1986). Although female Vietnam veterans were mostly registered nurses and did not engage in traditional combat activities, they often experienced a significant amount of general perceived threat and harsh day-to-day living (King et al., 1995). As was to be expected given customary gender military roles in Vietnam, one investigation using data from National Vietnam Veterans Readjustment Study (NVVRS) showed that women reported significantly lower levels of exposure to traditional combat events. However, exposure to combat had a markedly stronger effect on PTSD for women than for men (King et al., 1999).

In order to develop a wartime stressor scale for women, Wolfe, Brown, Furey, and Levin (1993) examined war-related stressors specific to the experiences of 202 female veterans and civilians who served in Vietnam. A link was revealed between women’s total wartime exposure and self-reported symptoms of PTSD. Further, while studies of men’s wartime exposure had typically demonstrated the existence of a single combat exposure factor, this study’s data suggested multiple factors of wartime exposure in women: vocational role, physical context, and social milieu (i.e., interpersonal difficulties) were all additional significant components of wartime participation (Wolfe et al., 1993). These results suggested the potential for differential relationships between war zone experiences and mental health outcomes for men and women.

McTeague, McNally, and Litz (2004) used data from the National Vietnam Veterans Readjustment Study database to explore predictors of PTSD symptom severity in 373 female
Vietnam veteran health care providers. The authors drew upon previous findings suggesting that experience as a war-zone health care provider affects PTSD separately from other military trauma. One study, for instance, found elevated physiological reactivity among female Vietnam nurse veterans with PTSD, compared to those without, only during imagery of Vietnam nursing-related trauma. No differences were seen between the groups during imagery of Vietnam military trauma unrelated to nursing (Carson et al., 2000).

Interpreted as aggregate chronological time periods, McTeague and colleagues (2004) studied PTSD symptom severity as it related to prewar, war-zone, and post-war characteristics. Results showed that war-zone characteristics (deprivation, dilemmas for health care providers, purposelessness) accounted for the most variance in current PTSD symptom endorsement. This was followed by post-war characteristics (emotional and structural support, stressful life events). Finally, none of the pre-war characteristics was a significant predictor of PTSD symptoms in the overall model (e.g., pre-war traumatic life events, pre-war education attainment; McTeague et al., 2004). These results imply the importance of stressors experienced within the war-zone as predictors of PTSD in women. A significant limitation of this study, however, was that because data were obtained via self-report 10 to 20 years after the return from war, significant biases (such as forgetting and distortion) may exist. Due to greater immediacy, accounts of post-war experiences may have been more easily recalled and/or more accurate than reports of prewar and war-zone experiences.

An interesting finding from McTeague and colleagues (2004) was that among war-zone characteristics, PTSD symptom severity was significantly related to war-zone deprivation, dilemmas for health care providers, and purposelessness. In contrast, there was no direct effect for war-zone stressors more typically characterized as Criterion A traumatic exposure (for
instance, exposure to casualties). Further analyses showed, in fact, that the effect of exposure to wounded and dead individuals was entirely mediated by health care dilemmas (McTeague et al., 2004). Thus, it appears that at least in this sample of female Vietnam veterans, traumatic exposure to casualties was salient primarily via duty-specific health care responsibilities and dilemmas. These results, while informative, should be generalized to female OIF/OEF military personnel with caution due to recent changes in women’s military roles and proximity to combat.

With more women entering the military since Vietnam, there has been an increasing interest in women’s war-zone experiences (Bell, Roth, & Weed, 1998). Still, while the deleterious effects of combat exposure have been widely researched in men, the unique deployment stressors experienced by women are less understood. In an elucidating study of both male and female Gulf War I military personnel, Vogt, Pless, King, and King (2005) identified several gender-based differential war-zone stressors. Results showed that while women and men were exposed to both mission-related and interpersonal stressors and both stressor categories were similarly associated with mental health outcomes, women endorsed more interpersonal stressors. Further, these stressors generally had a stronger impact on the mental health of women than of men.

This study also found that women reported being exposed to more frequent incidents of sexual harassment and receiving less social support during deployment from supervisors and peers. They also expressed more significant concerns about family/relationship disruptions. The only stressor that men experienced at a significantly higher rate than women was combat exposure, which was to be expected given traditional military role differences between women and men. Regarding mental health outcomes, men and women reported similar levels of PTSD symptom severity and depression, but women reported more anxiety (Vogt et al., 2005).
Women and men, however, endorsed similar levels of exposure to the other deployment stressors (e.g., perceived threat, difficult living environment). These results are consistent with other findings that suggest that military roles for the genders may be becoming more similar (Fontana, Litz, & Rosenheck, 2000). As a whole, though, gender is likely to be more salient when stressors are of an interpersonal nature than when they are mission-related (Vogt et al., 2005). In explaining this finding, the authors suggested that women may be more likely to play a primary caregiving role within the family, and therefore their concerns about disruption to family life may have greater relevance. Similarly, a lack of social support during deployment may be more damaging to women, who tend to place a greater value on interpersonal relationships (Vogt et al., 2005). These results parallel a number of other findings showing that social support is a stronger buffer against stress and trauma exposure for women than for men (e.g., King, King, Foy, Keane, & Fairbank, 1999).

Although combat exposure has similar associations with PTSD for both women and men, risk and resiliency factors may differ. King and colleagues (1999), for example, demonstrated that salient pre-war factors for women included instability within the family of origin and early trauma history (e.g., accidents, assaults, and natural disasters). Significant pre-war predictors for men were family instability, childhood antisocial behavior, and younger age of entry to Vietnam. Further, for high combat-exposed male veterans (but not female veterans), early trauma history interacted with war-zone stressor level to exacerbate PTSD symptoms. In contrast, PTSD in female veterans may be better explained by post-war factors such as negative life events following deployment or a lack of social support (King, King, Fairbank, Keane, & Adams, 1998).

An integration of these findings reveals that war-zone and post-war characteristics, as
opposed to pre-war characteristics, have the greatest influence on the development of PTSD in female veterans (King et al., 1998; McTeague et al., 2004). Further, the scant research on women service members indicates that women value interpersonal relationships during deployment as much as, if not more than, men (Kline et al., 2013). In light of these findings, it seems that interpersonal factors within the war-zone (e.g., a high degree of unit cohesion) should have strong protective influences against PTSD.

There is a great need for future studies on combat-related PTSD in women, with a focus on the interaction between gender and combat exposure (Skopp et al., 2011). More than ever, women are being deployed to combat zones where they are vulnerable to direct attacks and where their duties parallel those of men (Skopp et al., 2011). While preliminary research suggests that gender differences in trauma appraisals may, in part, account for increased PTSD susceptibility among women (Simmons & Granvold, 2005), there is little understanding of military-related protective factors for female service members.

**Unit Cohesion & PTSD**

Given the likelihood of OIF/OEF service members experiencing a traumatic event during combat, combined with the robust association between combat exposure and PTSD, it is noteworthy that many soldiers do not develop PTSD (Duke & Vasterling, 2005). Hoge and colleagues (2004), for example, found that over 80% of returning OEF/OIF veterans did not meet screening criteria for a mental health disorder. Even individuals who experience high levels of combat will not always acquire significant PTSD symptomatology (Frye & Stockton, 1982; Dohrenwend et al., 2006). Thus, there appear to be protective factors operating to reduce vulnerability. The identification of these factors has become of increasing interest to researchers, with the goal of informing the development of prevention and early intervention strategies (Duke
& Vasterling, 2005). A growing body of research has attempted to uncover such factors, with social support commonly identified in the literature as having significant protective influence (Griffith, 2012; see Appendix for a more complete review of this literature).

Although unit cohesion is similar to social support, it is a conceptually different construct that has emerged in recent years in the PTSD resiliency literature. Whereas social support is typically viewed as support received by friends and family following deployment, unit cohesion is described as the degree to which soldiers feel committed to and supported by their military units (Armistead-Jehle et al., 2011). Theoretical models of unit cohesion assert that high levels of unit cohesion should constitute a major source of resilience for military-related stressors (Bliese, 2006). Unit cohesion is an important resiliency factor to study because as a malleable construct, it could be incorporated into preventive military mental health care policy (Brailey et al, 2007).

Many of the positive outcomes expected in military culture stem from a substantial amount of research on the power of group cohesion and group dynamics (Armistead-Jehle, 2011). A positive relationship exists between cohesion and performance, such that highly cohesive groups frequently out-perform groups with lower cohesion. A meta-analysis of 27 studies by Evans and Dion (1991), for example, found that the average cohesive group performed significantly better than the average non-cohesive group. These findings have clear implications for the military, as strong performance is of utmost importance in the war-zone.

Group cohesion has been shown to be a robust predictor of satisfaction and enjoyment with a group (Hogg, 2012), which theoretically could be expected to lead to better mental health outcomes. Perhaps even more significantly, group cohesion moderates the effects of stress on performance, such that groups with a greater degree of cohesion are able to function well even under substantial stress (Bowers, Weaver, & Morgan, 1996). The construct of group cohesion
has also been emphasized as one of the most important therapeutic factors in group therapy (Yalom & Leszcz, 2005). Joyce, Piper, and Ogrodniczuk (2007), for example, found a positive association between group cohesion and therapy outcome in a group psychotherapy program for complicated grief.

In taking these findings as a basis for military cohesion, many have recognized that unit cohesion should serve a positive purpose for service members (Shay, 1994; Bliese & Halverson, 1996). The majority of studies on the construct have provided empirical support for this assertion, suggesting that a high degree of unit cohesion is associated with more adaptive outcomes (Oliver, Harman, Hoover, Hayes, & Pandhi, 1999). Indeed, a meta-analysis of the military cohesion literature found that cohesion was positively related to job/military satisfaction ($r = .47$), group performance ($r = .40$), readiness ($r = .30$), well-being ($r = .24$), retention ($r = .22$), and individual performance ($r = .20$). Based on these findings, the authors concluded that group cohesion results in desirable outcomes for the military (Oliver et al., 1999).

Similarly, Rom and Mikulincer’s (2003) study of Israeli soldiers during training showed that in groups with greater unit cohesion, individuals reported higher instrumental and socio-emotional functioning during specific missions as well as less anxious and avoidant attachment to their troops. Moreover, Iverson and colleagues (2008), in their retrospective cohort study of U.K. military personnel deployed to Iraq, demonstrated that low social support and low morale within the unit was associated with greater risk of PTSD symptomatology.

In another study of 611 male and female British military personnel, weaker unit cohesion was found to be associated with a higher risk of overall psychological distress and symptoms of PTSD (Mulligan et al., 2010). Interestingly, higher risk of psychological distress was associated with female gender, a finding consistent with much of the literature addressing mental health
outcomes in female service members (e.g., Orcutt et al., 2004; Skopp et al., 2011).

One of the few studies to look at cohesion exclusively among women was McTeague and colleagues’ (2004) examination of PTSD amongst female healthcare providers from the NVVRS. In addition to finding a number of post-war protective factors for PTSD (e.g. social support), the authors demonstrated an inverse relationship between war-zone unit cohesion and PTSD symptom severity. Greater cohesion was related to fewer reported PTSD symptoms. Thus, it appears the relationship between unit cohesion and PTSD holds for female veterans (McTeague et al., 2004). These results are promising; however, these women were serving solely in a healthcare role in a qualitatively different war than the one occurring today (i.e., OIF/OEF).

Although women in the current conflicts are still precluded from traditional frontline combat, they may be more likely to experience war-zone challenges that differ markedly from the healthcare demands described in the study by McTeague and colleagues. Further, whereas the women in that study probably had many other women (e.g., other nurses) to rely on, women in OIF/OEF are more likely to be embedded within predominantly male units. Thus, the construct of unit cohesion itself may be different for women in Vietnam versus women in Iraq and Afghanistan.

To address these shortcomings, Kline and colleagues (2013) examined gender differences in risk factors among male and female National Guard and Reserve service members upon return from deployment to Iraq. They found that women had higher levels of post-deployment PTSD and unit cohesion, but that after controlling for unit cohesion, the gender difference in PTSD was substantially reduced (Kline et al., 2013). This is the first study of its kind to address unit cohesion among women in the National Guard and Reserve, and is also the first to suggest that
perhaps unit cohesion has stronger protective effects for female service members, compared to male service members, while deployed.

Although the direct link between unit cohesion and PTSD has been clearly demonstrated, only a few studies have examined the assumption that high levels of unit cohesion buffer against the effects of stress. In a sample of 1,579 U.S. Army soldiers who had not yet been deployed as part of OIF/OEF, Brailey and colleagues (2007) found that both prior life experiences and unit cohesion independently predicted PTSD symptoms. Further, unit cohesion attenuated the impact of life experiences on PTSD, such that greater unit cohesion weakened the relationship between prior life stressors and PTSD. Because these pre-deployment PTSD symptoms were likely to serve as vulnerabilities that could potentially be activated by subsequent war-zone deployment, identification of unit cohesion as a protective factor was particularly promising (Brailey et al., 2007). The sample was composed of 10% women, and the authors found no gender differences in unit cohesion or PTSD; however, they did not analyze for gender differences in the protective effect of unit cohesion. These findings suggest the beneficial role of unit cohesion for both men and women exposed to stressful life events prior to their military careers.

The unit cohesion resiliency hypothesis has also been confirmed in service members with reported exposure to combat. In a sample of U.S. Marines that had just completed a seven-month deployment to Iraq, Armistead-Jehle and colleagues (2011) found that both unit cohesion and combat exposure predicted PTSD, depression, and anger. These effects were found above and beyond demographic and unit information (such as rank, age, number of previous deployments, and type of unit). The noteworthy finding of this study was that for both PTSD and depression, greater unit cohesion was associated with a weaker relationship between combat exposure and mental health outcome (although this was not true for anger, where unit cohesion did not
moderate the relationship) (Armistead-Jehle et al., 2011). Accordingly, unit cohesion appears to be an important buffer against deleterious mental health outcomes.

Unfortunately, given the nature of the sample as a Marine infantry unit, only men were included in this study (Armistead-Jehle et al., 2011). Although certainly the results have potential implications for augmenting levels of unit cohesion in the military, less is understood regarding the effect that greater levels of unit cohesion have on PTSD symptomatology in women. Thus, any efforts to modify unit cohesion at the policy level may be misguided without further research relevant to female service members.

Providing contrasting results to the buffering hypothesis, however, is a study derived from data from the National Vietnam Veterans Readjustment Study (Fontana, Rosenheck, & Horvath, 1997). A sample of 1198 male Vietnam theater veterans were assessed ten years following their active duty deployment. The authors found no main effect of unit cohesion on either PTSD or other psychopathology. Further, while unit cohesion acted protectively at low levels of exposure, high unit cohesion in combination with high war zone stress was actually associated with the highest levels of PTSD. The authors attributed their findings to a theory put forth by Milgram and Hobfoll (1986), who suggested that there is a downside to high unit cohesion. When members of one’s unit are killed or wounded, perhaps the sense of loss and survivor guilt is heightened.

Another explanation provided by the authors relates to timing of measurement, in that the immediacy of data collection to combat experience may be an important consideration when conceptualizing the phenomenon (Fontana et al., 1997). Greater unit cohesion, although helpful in the short term, may be detrimental in coping with the long-term aftermath of war. Further, as Vietnam veterans were asked to recall degree of unit cohesion ten years following their active
duty, recollection might have been influenced by both positive and negative post-war experiences (Fontana et al., 1997). Similarly, perhaps the extensive time lag influenced the veterans’ ability to accurately recall cohesion in their units, resulting in an under- or over-reporting of the “true” level of cohesion (Armistead-Jehle et al., 2011).

Despite Fontana and colleagues’ (1997) results, most researchers maintain that at least in the current conflicts, unit cohesion has an inverse and linear relationship with PTSD symptomatology (McAndrew et al., in preparation). Dickstein and colleagues (2010), for example, aimed to test Fontana and colleagues’ (1997) theory that unit cohesion becomes a liability at high levels of stress exposure. The authors studied 705 male and female Air Force medical personnel while deployed in Iraq. Because participants were medical providers, “stress” was defined not only by combat experiences, but also by a measure comprised of numerous military healthcare stressors. As expected, both healthcare-related stress exposure (e.g., treating severely injured victims of war) and combat-related stress exposure were significantly related to PTSD symptom severity. Results did not demonstrate support for the curvilinear interaction hypothesis; rather, unit cohesion was associated with less severe PTSD regardless of level of stress exposure (Dickstein et al., 2010).

This study was unique in that an almost equal number of male and female service members were included (48.4% and 51.6%, respectively) (Dickstein et al., 2010). Although unit cohesion did not differ by race, military rank, or education level, unit cohesion did differ by gender: men reported greater unit cohesion than did women, although this difference was small (Dickstein et al., 2010). The authors did not examine, however, whether the relationship between unit cohesion and PTSD differed by gender. As this one of the few studies of its kind to look at the relationship between gender and unit cohesion, further research is needed to determine if the
protective effects of cohesion extend to female service members serving in other military components (e.g., beyond Air Force medical personnel).

While the examination of gender was a strength of Dickstein and colleagues’ (2010) study, a noteworthy limitation was that the average participant may not have experienced war-zone stress to the magnitude typically experienced by soldiers in the OIF/OEF conflict. Similarly, the length of deployment at the time of assessment (only 80.2 days on average) may have limited the range of stressors endured. Again, it would be beneficial to examine unit cohesion’s effects on PTSD amongst men and women in another military branch.

Research has shown that a high level of unit cohesion is predictive of favorable mental health outcomes (e.g., Rom & Mikulincer, 2003; Iverson et al., 2008; Brailey et al., 2007); importantly, its benefits also appear to extend to attitudes about mental health treatment (Wright et al., 2009). Some researchers believe that stigma associated with mental health treatment is more pronounced in the military than in civilian culture, because soldiers are expected to function consistently at a high level of readiness and the safety of the unit is dependent on this readiness. Individuals who seek out mental health services may be formally admitting a problem that could be perceived by others as a sign of compromised readiness (Greene-Shortridge, Britt, & Castro, 2007). This is particularly problematic given findings that soldiers with the highest levels of mental health problems have the greatest stigma-related concerns; thus, those who need treatment the most are least likely to seek services (Britt, Greene, Castro, & Hoge, 2006).

Wright and colleagues (2009) aimed to explore this issue and surveyed 680 soldiers three months after their return from combat operations in Iraq. The authors found that individuals who endorsed greater unit cohesion reported less stigma and fewer perceived barriers to mental health care. These findings point to the importance of a positive unit climate as an environment where
soldiers feel comfortable seeking treatment for mental health concerns (Wright et al., 2009). While unit cohesion has shown promise as a protective construct in and of itself, these results suggest its critical role in reducing stigma and barriers to seeking mental health care.

**Problem Statement**

Posttraumatic stress disorder (PTSD) exacts an enormous toll on the mental health of our nation’s service members. Soldiers often return from the current conflicts in Iraq and Afghanistan with significant PTSD symptomatology and related problems (Hoge et al., 2004), which is concerning given the longer and more frequent deployments characteristic of OIF/OEF (Miller et al., 2008). PTSD is particularly problematic for Army National Guard and Reservists (NGR), who may be unaccustomed to prolonged separations from friends and family and/or overwhelmed by the horrific nature of combat. Further, although higher rates of PTSD are seen in NGR troops, much of the military-related PTSD research is conducted with active duty troops (Milliken, Auchterlonie, & Hoge, 2007).

Frequency and severity of combat exposure robustly predicts mental health outcomes (Hoge et al., 2004). Although research has shown that many men and women will develop PTSD following exposure to combat, a substantial number of them will not (Dohrenwend et al., 2006). Thus, identifying the factors that buffer against the development of PTSD (or aid in recovery) is a worthwhile area of research. While much is known about the protective quality of social support following deployment, it is less clear which protective factors may be operating within the warzone. Unit cohesion shows promise because as a modifiable construct, it has the potential for integration into military training programs (Greenberg & Jones, 2011; Brailey et al., 2007).

The few studies that have investigated unit cohesion as a buffer against the effects of combat exposure have provided equivocal results (Armistead-Jehle et al., 2011; Fontana et al.,
Therefore, further examination of the interaction between combat exposure and unit cohesion is warranted. Also unfortunate is the lack of research on female service members, who may be at a greater risk of developing PTSD than are men (Skopp et al., 2011). Because female service members place a substantial emphasis on interpersonal support during deployment (Vogt et al., 2005), it follows that unit cohesion would be a particularly effective buffer against PTSD. However, women may perceive lower unit cohesion than do men (Dickstein et al., 2010), and lower unit cohesion is associated with deleterious mental health outcomes (Mulligan et al., 2010). Further research into this disconnect should be an integral part of improving the mental health of our nation’s female service members.

**Hypotheses**

**Warfare Exposure and PTSD**

1. Greater exposure to warfare will predict higher levels of PTSD symptomatology for both men and women.

2. Specific combat experiences will predict the highest levels of PTSD symptomatology: witnessing someone from one’s own unit or an ally unit being seriously wounded or killed; receiving “friendly” incoming fire; being wounded or injured in combat; and killing (or believing to have killed) someone in combat. This relationship will hold for both men and women.

**Unit Cohesion and PTSD**

3a. Men will report higher levels of unit cohesion than women.

3b. Higher levels of cohesion will be associated with fewer PTSD symptoms for both men and women.

4. Unit cohesion will moderate the relationship between warfare exposure and PTSD, such that the relationship will be weaker amongst soldiers reporting a high degree of unit cohesion.
Buffering effects will be seen for both men and women.

Method

Data on participants are from a larger prospective longitudinal observational cohort study that was designed to assess soldiers’ pre-deployment and deployment-related psychosocial and physiological predictors of physical health and health care utilization rates (Quigley et al., 2012). Data collection occurred between November 2005 and January 2011. Measures were administered at four time points: Phase 1 (pre-deployment), Phase 2 (immediately post-deployment), Phase 3 (three months post-return from deployment), and Phase 4 (one year post-return). Deployments typically lasted 12-13 months. Our study will cross-sectionally examine the relationships between warfare exposure, PTSD symptomatology, and unit cohesion at Phase 2 (immediately post-deployment).

Participants

A total of 805 enlisted Army National Guard and Reserve soldiers were recruited from Fort Dix, New Jersey, or Camp Shelby, Mississippi prior to combat zone deployment in Iraq or Afghanistan. For inclusion in the study, soldiers must have been aged 18 to 60 years. A total of 795 individuals initially agreed to participate; of these, 23 were officers, were killed in action, or did not mobilize and thus were not included in analyses. The remaining 767 soldiers included in Phase 1 analyses were primarily Army National Guard and Reserve members. To screen for volunteer bias, individuals who declined to participate in the study (n = 410) were asked to anonymously report their gender; there was no significant difference in the proportion of males and females in the participant and non-participant groups, ($\chi^2 (1, n=320) = 2.30, p = .13$) (McAndrew et al., in preparation). The sample was generally representative of the U.S. reservist
component at the time of data collection, although those who agreed to participate in the study were more likely to be White than of other races (McAndrew et al., in press).

Study exclusion criteria included being an officer; having currently diagnosed depression, schizophrenia, or bipolar disorder (self-reported); having a chronic disease such as cancer or high blood pressure (self-reported); and being pregnant. Individuals were also excluded if they were taking medicine for high blood pressure or cardiac arrhythmias, steroids for asthma, benzodiazepines, tricyclic antidepressants, selective serotonin reuptake inhibitors at antidepressant doses (the investigators did not exclude those using lower doses such as those prescribed to aid sleep), stimulants (e.g., Ritalin), anticonvulsants, and narcotic analgesics.

Of the 767 participants eligible to be followed, only 23 declined to participate at Phase 2, and 463 soldiers (60.3%) were successfully contacted for participation at Phase 2. In general, those soldiers who completed Phase 2 had returned to their original deploying base (e.g., Fort Dix or Camp Shelby) rather than to another base where it was more difficult to contact them. Those soldiers who returned to another base were contacted at home, but these efforts were only partly successful due to delays in receiving information about participants’ return stateside. Those who were successfully reached at home completed the measures via mailed surveys and follow-up telephone calls.

Procedures

Soldiers were approached and asked to volunteer typically while waiting for, or after completing, their pre-deployment medical processing. As part of the informed consent process, those who were interested were given an initial verbal briefing about the study, either individually or in groups. They were then given another verbal briefing in the testing space, asked to sign one informed consent document for the Department of Defense and one informed
consent document for the Department of Veterans Affairs, and answered questions indicating they understood the study. The informed consent process typically lasted 15 to 20 minutes per participant. The protocol was approved by Institutional Review Boards of the Department of Veterans Affairs (VA New Jersey Healthcare System and the G.V Montgomery VA Medical Center), and by the Walter Reed Department of Clinical Investigation. At any time, soldiers with responses to individual survey items that suggested the possibility of severe depression or anxiety were provided referral sources as needed (McAndrew et al., in press). Participants could not be paid for participation while on active duty (e.g., at Phases 1 and 2) but were compensated $30 at Phase 3 and $45 at Phase 4 as long as they were not on active duty.

Measures

Demographic Information. Participants completed researcher-created self-report questionnaires about demographic information such as gender, racial and ethnic identity, age, education status, and height and weight. Soldiers were also asked to indicate their military component (Army National Guard, Army Reserve, or Army active duty) and their number of prior deployments. These questionnaires were administered at Phases 1 and 2.

Pre-Deployment Life Events Scale of the Deployment Risk and Resilience Inventory (PDLE-DRRI). To assess for exposure to traumatic events before deployment, soldiers completed the PDLE-DRRI (King, King, & Vogt, 2003). The scale, consisting of 15 items with a dichotomous “yes/no” response format, was administered at Phase 1 (prior to deployment). Sample items include “Before I was deployed, I experienced a natural disaster”; “Before I was deployed, I witnessed someone being assaulted or violently killed”; and “Before I was deployed, I had been robbed or had my home broken into.” A “yes” response is assigned a score of 1 and a “no” response is assigned a score of 0, with total scores ranging from 0 to 15. Higher scores
indicate greater exposure to traumatic life events (King et al., 2003) and the PDLE-DRRI has been validated for use among OIF veterans (Vogt et al., 2008). In the current study, the total exposure score of the PDLE-DRRI at Phase 1 was used as a control variable and reflected level of soldiers’ pre-deployment trauma exposure.

**Combat Experiences Scale of the Deployment Risk and Resilience Inventory (CES-DRRI).** Participants’ deployment experiences were measured with the CES-DRRI (King et al., 2003). This scale consists of 15 items reflecting exposure to typical warfare experiences such as firing a weapon, being fired on, and witnessing injury and death. Items include statements such as “My unit engaged in battle in which it suffered casualties”; “I was in a vehicle (for example, a truck, tank, APC, helicopter, plane, or boat) that was under fire”; and “I killed or think I killed someone in combat.” The scale’s original response options were 0 = never, 1 = a few times over the entire deployment, 2 = a few times each month, 3 = a few times each week, and 4 = daily or almost daily, yielding a total possible score of 60. Greater scores indicate more frequent exposure to combat. For purposes of the current study, however, responses were recoded onto a dichotomous “yes/no” scale: all responses that were originally coded 0 were assigned a new score of “0” to indicate “never experienced while deployed”, while original scores of 1, 2, 3, and 4 were recoded to “1” to indicate “did experience while deployed.” Thus, the new, recoded version of the scale consists of scores ranging from 0 to 15.

Items reflect objective events and situations rather than personal interpretations or subjective judgments of the events (King et al., 2003) and the scale is valid for use with OIF veterans (Vogt, Proctor, King, & Vasterling, 2008.) Internal consistency is good for the current sample (Cronbach’s alpha = 0.85). In the military literature, the CES-DRRI is a commonly used measure of combat exposure (Pietrzak, Goldstein, Malley, Rivers, & Southwick, 2010). It has
also demonstrated a significant dose-response relationship between degree of exposure and several behavioral health symptoms such as PTSD, depression, physical health, and cognitive functioning (Vogt et al., 2008). The scale was administered at Phases 2, 3, and 4. For purposes of the current study, the total recoded exposure score of the CES-DRRI at Phase 2 reflected level of combat exposure.

**Aftermath of Battle Scale of the Deployment Risk and Resilience Inventory (DES-DRRI).** The Aftermath of Battle Scale was used as a measure of exposure to the consequences of war; the items reflect experiences that occur within the deployment theater but not during direct combat (King et al., 2003). The scale is considered a useful addition to the CES-DRRI because many service members may never engage in combat activities but are nonetheless responsible for aftermath of battle assignments (e.g., caring for the dead or dying) that may also be highly distressing (King, King, Vogt, Knight, & Samper, 2006). Soldiers were asked to respond to 15 items such as seeing dead or dying people, handling human remains, interacting with prisoners of war, and observing refugees and devastated communities. The scale uses a dichotomous “yes/no” response format; all “yes” responses are assigned a score of 1 and all “no” responses are assigned a score of 0. Total scores range from 0 to 15, with higher scores indicating more deployment-related exposures. Like the CES-DRRI, the scale has been validated among a large sample of OIF veterans (Vogt et al., 2008). In the current sample, Cronbach’s alpha was 0.88. Although the DES-DRRI was administered at Phases 2, 3, and 4, the current study used the total score from the DES-DRRI at Phase 2 as a measure of deployment-related exposure.

**Posttraumatic Stress Disorder Checklist – Military Version (PCL-M).** The PCL-M is a 17-item self-report scale that assesses for each of the Diagnostic and Statistical Manual – Fourth Edition (DSM-IV) symptoms of PTSD. Participants are asked to answer the degree to which they
were bothered in the past month by feelings about military-specific traumatic events. Items include statements such as “Repeated, disturbing dreams of a stressful military experience”; “Being super alert or watchful or on guard”; and “Feeling irritable or having angry outbursts”. Response options follow a Likert-style format ranging from 1 “Not at all bothered” to 5 “Extremely bothered” (Weathers, Litz, Herman, Huska, & Keane, 1993). The scores are summed to create a total symptom severity score (range = 17-85) with higher scores indicating more severe PTSD symptomatology. Among military personnel, a PCL cutoff score of 50 is recommended to best discriminate between those with and without PTSD (McDonald & Calhoun, 2010). The PCL-M has demonstrated excellent internal consistency (Cronbach’s alpha=.94) and test-retest reliability (.96) (Blanchard et al., 1996) and is commonly used in military population studies (Kim, Thomas, Wilk, Castro, & Hoge, 2010). In the current sample, internal consistency was excellent (Cronbach’s alpha = .93). The PCL-M has a kappa of .64 for diagnosis of PTSD from the Structured Clinical Interview for DSM-III-R (Blanchard et al., 1996). The PCL-M was administered at Phases 2, 3, and 4. For purposes of the current study, PTSD symptomatology was derived from the total symptom severity score of the PCL-M at Phase 2.

**Unit Cohesion.** To assess soldiers’ perceptions of unit cohesion, a three-item scale was used that had been developed from a larger set of cohesion items (Podsakoff & McKenzie, 1994). Although originally developed to assess organizational climate, the scale was modified to be applicable to military samples. The three items are: “The members of the unit I deployed with are cooperative with each other,” “The members of the unit I deployed with know that they can depend on each other,” and “The members of the unit I deployed with stand up for each other.” Response options range from 1 (“Strongly disagree”) to 5 (“Strongly agree”). Total scores range
from 3 to 15, with higher scores indicating stronger perceived unit cohesion. The scale has been used to predict stigma and barriers to mental health care among OIF service members (Wright et al., 2009), as well as to predict military morale (Britt, Dickinson, Moore, Castro, & Adler, 2007), intention to leave the military (Wright, Kim, Wilk, & Thomas, 2012), and work-family conflict (Britt & Dawson, 2005). The measure’s internal consistency was good (Cronbach’s alpha = 0.89) in the current sample. The unit cohesion measure was administered at Phase 2, and the total cohesion score was used to reflect perceived level of unit cohesion.

Data Analysis

Prior to running analyses, a “minority status” variable was created to indicate participants’ racial identity (0 = White, 1= non-White). Also, before performing analyses for hypotheses, the Combat Experiences Scale of the Deployment Risk and Resilience Inventory will be summed with the Aftermath of Battle Scale of the Deployment Risk and Resilience Inventory to form a new variable called “Warfare Exposure.” This composite variable, created to capture the full range of potential exposures a service member may experience while deployed, has been previously used in two studies to our knowledge (Vogt & Tanner, 2007; Vogt, Smith, Elwy, Martin, Schultz, Drainoni, & Eisen, 2011). However, descriptive information from those studies cannot be directly compared with current study results because the authors used frequency-based, continuous (rather than dichotomous) versions of the scales. In the current study, total Warfare Exposure scores can range from 0 to 30, with higher scores indicative of greater overall exposure. Cronbach’s alpha for our sample was excellent at .92.

Hypothesis 1: Greater warfare exposure will predict higher levels of PTSD symptomatology for both men and women.
Pre-deployment life events, minority status, age, and number of previous deployments will be entered into the hierarchical regression model first as covariates. Mean-centered warfare exposure and gender (0 = male, 1 = female) will be entered in the second block, and the interaction between gender and warfare exposure will be entered in the third block. PTSD symptomatology will be the outcome variable.

**Hypothesis 2: Specific combat experiences will predict the highest levels of PTSD symptomatology:** receiving “friendly” incoming fire; witnessing someone from one’s own unit or an ally unit being seriously wounded or killed; being wounded or injured in combat; and killing (or believing to have killed) someone in combat. This relationship will hold for both men and women.

First, in order to ascertain whether combat experience items from the CES-DRRI will form a cluster of related items to reduce the number of variables being analyzed for this hypothesis, an exploratory factor analysis will be performed. The factors that emerge will be examined qualitatively for inclusion of the specific combat experiences hypothesized to predict PTSD symptoms. They will then be used as separate independent variables within the following hierarchical regression analysis: in the first block, minority status, age, number of previous deployments, and pre-deployment life events will be entered as covariates. The second block will contain the aforementioned variables from the factor analysis and the gender variable. In the third block, the interactions between gender and each combat exposure factor will be entered.

**Hypothesis 3a: Men will report higher levels of unit cohesion than women.**

An independent samples t-test will be conducted to determine if men and women significantly differ on their report of degree of unit cohesion.
Hypothesis 3b: Higher levels of cohesion will be associated with fewer PTSD symptoms for both men and women.

Because soldiers without warfare exposure trauma should theoretically not have PTSD symptoms, it would be difficult to detect a relationship between unit cohesion and PTSD when some individuals have not been exposed to warfare; thus, individuals reporting no warfare exposure will be removed for Hypothesis 3b prior to running the hierarchical regression analysis. In the hierarchical regression analysis, PTSD will be the outcome variable. The first block will contain the four control variables of minority status, age, number of previous deployments, pre-deployment life events, and gender. (Gender will be included in Step 1 so as to be able to attribute any additional change in the variance in Step 2 to the effect of unit cohesion only.) In the second block, mean-centered unit cohesion will be entered. In the third block, the unit cohesion by gender interaction term will be entered.

Hypothesis 4: Unit cohesion will moderate the relationship between warfare exposure and PTSD, such that the relationship will be weaker amongst soldiers reporting a high degree of unit cohesion. Buffering effects will be seen for both men and women.

In the first block of the regression, demographic covariates (minority status, age, number of previous deployments, and pre-deployment life events) will be entered. In the second block, mean-centered unit cohesion, mean-centered warfare exposure, and gender will be entered. In the third block, three two-way interactions (Warfare Exposure x Unit Cohesion, Warfare Exposure x Gender, and Unit Cohesion x Gender) will be entered. Finally, we will enter the three-way Unit Cohesion x Warfare Exposure x Gender interaction term in the fourth block.
Results

Preliminary Analyses

Particularly due to the small number of women in our sample, analyses were performed in order to determine the sample size needed to adequately power the current study. The current study had a total of eight predictor variables, including control variables. Using a minimum of 5:1 cases to predictor ratio, a sample size of 40 would be sufficient for the proposed analyses. Power analyses were further calculated using G*Power 3.1 software. With desired level of power set at .80, alpha level at .05, and a small expected effect size at .3, there will be adequate power with a sample size of 41 (Cohen, 1988). Thus, our overall sample size of 463 is more than sufficient to power the current study.

All variables were assessed for univariate normality and multivariate outliers. None of the continuous predictor variables revealed skewness or kurtosis values above +/- 1.5, and none of the continuous variables had standard values greater than +/- 3.63 (Lomax & Hahs-Vaughn, 2012). Thus, no transformations were performed. Collinearity diagnostics showed no evidence of multicollinearity.

Of the 463 participants who provided any data at Phase 2, two participants were missing the pre-deployment life events scale, 45 participants were missing the PTSD scale, and 40 participants were missing the unit cohesion scale. Due to an administrative error, 80 participants were not administered the combat and deployment experiences measures and 43 more were missing these questionnaires; thus, a total of 123 participants did not complete either scale. A missing value analysis revealed that missing data were missing at random; Little’s MCAR $\chi^2 = 52.65, p = .09$; that is, were not missing in a systematic fashion. Different degrees of freedom in the multiple regression analyses reflect missing data.
Descriptive Results

At Phase 2 ($N = 463$), the mean age of military personnel was 28.79, with a range of 19 to 59. Women comprised 9.7% of the sample. Most participants (77.3%) identified as White, 9.1% identified as Black, 4.7% of the sample identified as American Indian/Asian/Pacific Islander, 6.7% identified as Other, and 2.4% declined or did not respond. In addition, the majority of participants reported Army National Guard status (69.1%), with 28.7% being Army Reserve and 2.1% being Active/Other. A greater proportion of National Guard than Army Reserve soldiers completed Phase 2 ($\chi^2 = 8.53, p < .05$). Table 1 includes demographic characteristics of participants who completed Phase 1 only (e.g., did not complete Phase 2), participants who completed Phase 2, and statistical comparisons between the two groups.
Table 1

**Sociodemographic Characteristics of Participants with Phase 1 Data Only vs. Participants with Phase 1 & Phase 2 Data**

<table>
<thead>
<tr>
<th></th>
<th>Phase 1 Completion Only (No Phase 2 Follow-Up) (n = 304)</th>
<th>Phase 2 Completion (n = 463)</th>
<th>Statistical Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>270 (88.8%)</td>
<td>418 (90.3%)</td>
<td>$\chi^2 = .43, ns$</td>
</tr>
<tr>
<td>Female</td>
<td>34 (11.2%)</td>
<td>45 (9.7%)</td>
<td></td>
</tr>
<tr>
<td>Age – mean years (SD)</td>
<td>27.97 (8.3)</td>
<td>28.79 (8.3)</td>
<td>$t(765) = -73.0, ns$</td>
</tr>
<tr>
<td></td>
<td>Range: 18 - 57</td>
<td>Range: 19 - 59</td>
<td></td>
</tr>
<tr>
<td>Education – mean years (SD)</td>
<td>12.74 (1.8) – Some college</td>
<td>12.94 (1.4) – Some college</td>
<td>$t(765) = 2.84, ns$</td>
</tr>
<tr>
<td>Military Component</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Guard</td>
<td>234 (77.0%)</td>
<td>320 (69.1%)</td>
<td>$\chi^2 = 8.53, p &lt; .05$</td>
</tr>
<tr>
<td>Reserve</td>
<td>69 (26.3%)</td>
<td>133 (28.7%)</td>
<td></td>
</tr>
<tr>
<td>Active/Other</td>
<td>1 (0.3%)</td>
<td>10 (2.1%)</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>234 (77.0%)</td>
<td>358 (77.3%)</td>
<td>$\chi^2 = 16.77, ns$</td>
</tr>
<tr>
<td>Black</td>
<td>27 (8.9%)</td>
<td>42 (9.1%)</td>
<td></td>
</tr>
<tr>
<td>American Indian</td>
<td>12 (3.9%)</td>
<td>9 (2.0%)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>7 (2.3%)</td>
<td>11 (2.4%)</td>
<td></td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>2 (0.7%)</td>
<td>1 (0.3%)</td>
<td></td>
</tr>
<tr>
<td>Mixed race/Other</td>
<td>17 (5.6%)</td>
<td>31 (6.7%)</td>
<td></td>
</tr>
<tr>
<td>Unknown/missing</td>
<td>2 (0.7%)</td>
<td>11 (2.4%)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>39 (12.8%)</td>
<td>56 (12.1%)</td>
<td>$\chi^2 = .09, ns$</td>
</tr>
<tr>
<td>Number of previous deployments – mean (SD)</td>
<td>0.64 (0.78)</td>
<td>0.61 (0.76)</td>
<td>$\chi^2 = .74, ns$</td>
</tr>
</tbody>
</table>
A correlation matrix was created to identify which key study variables were significantly correlated prior to running any regression analyses. Bivariate correlations between all study variables can be found in Table 2.
Table 2

Correlation Matrix of Study Variables

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>1</td>
<td>.10</td>
<td>.44**</td>
<td>.18**</td>
<td>.05</td>
<td>-.07</td>
<td>-.05</td>
<td>-.09</td>
<td>.03</td>
<td>-.07**</td>
</tr>
<tr>
<td>2. Gender</td>
<td>.10</td>
<td>1</td>
<td>-.14**</td>
<td>.01</td>
<td>.10*</td>
<td>-.14*</td>
<td>-.13*</td>
<td>.01</td>
<td>-.17**</td>
<td>-.15**</td>
</tr>
<tr>
<td>3. Number Previous Deployments</td>
<td>.44**</td>
<td>-.14**</td>
<td>1</td>
<td>.27**</td>
<td>.13**</td>
<td>.04</td>
<td>.10</td>
<td>.04</td>
<td>-.04</td>
<td>.08**</td>
</tr>
<tr>
<td>4. Pre-Deployment Life Events</td>
<td>.18**</td>
<td>.01</td>
<td>.27**</td>
<td>1</td>
<td>-.02</td>
<td>.14*</td>
<td>.18**</td>
<td>.21**</td>
<td>-.10*</td>
<td>.19**</td>
</tr>
<tr>
<td>5. Minority Status</td>
<td>.05</td>
<td>.10*</td>
<td>.13**</td>
<td>-.02</td>
<td>1</td>
<td>-.01</td>
<td>.02</td>
<td>.12*</td>
<td>-.05</td>
<td>.01</td>
</tr>
<tr>
<td>6. Combat Exposure</td>
<td>-.07</td>
<td>-.14*</td>
<td>.04</td>
<td>.14*</td>
<td>-.01</td>
<td>1</td>
<td>.72**</td>
<td>.26**</td>
<td>.08</td>
<td>.91**</td>
</tr>
<tr>
<td>7. Deployment Exposure</td>
<td>-.05</td>
<td>-.13*</td>
<td>.10</td>
<td>.18**</td>
<td>.02</td>
<td>.72**</td>
<td>1</td>
<td>.34**</td>
<td>.02</td>
<td>.94**</td>
</tr>
<tr>
<td>8. PCL-M Total Score</td>
<td>-.09</td>
<td>.01</td>
<td>.04</td>
<td>.21**</td>
<td>.12*</td>
<td>.26**</td>
<td>.34**</td>
<td>1</td>
<td>-.21**</td>
<td>.32**</td>
</tr>
<tr>
<td>9. Unit Cohesion</td>
<td>.03</td>
<td>-.17**</td>
<td>-.04</td>
<td>-.10*</td>
<td>-.05</td>
<td>.08</td>
<td>.02</td>
<td>-.21**</td>
<td>1</td>
<td>.06**</td>
</tr>
<tr>
<td>10. Warfare Exposure</td>
<td>-.07**</td>
<td>-.15**</td>
<td>.08**</td>
<td>.19**</td>
<td>.01</td>
<td>.91**</td>
<td>.94**</td>
<td>.32**</td>
<td>.06**</td>
<td>1</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Note: Gender coded 0 = male, 1 = female; Minority Status coded 0 = White, 1 = non-White
PCL-M: Posttraumatic Stress Disorder Checklist – Military Version (range = 17 – 85)

The mean pre-deployment negative life events exposure score was 5.9/15 (SD = 3.5), which is somewhat higher than levels observed in samples of both active duty and National Guard service members deployed to Iraq in other studies (Vogt et al., 2008; Franz, Wolf, MacDonald, Marx, Proctor, & Vasterling, 2013). The mean combat exposure score for our sample was 4.0/15 (SD = 3.1), which is similar to, albeit somewhat lower than, exposure levels seen in other samples of NGR service members deployed to Iraq and Afghanistan (Renshaw, 2010). Our current sample’s deployment exposure mean of 4.3 (SD = 3.8) is lower than the mean score obtained from Renshaw and colleagues’ (2010) study of OIF/OEF NGR service members. Methodological differences between the two studies should be mentioned, however; soldiers in Renshaw and colleagues’ (2010) sample were assessed up to one year following their deployment, and thus their data was collected at a more distal time point related to the trauma compared to the service members in our sample. In our sample, the mean warfare exposure score was 8.2 (SD = 6.4).

The mean PCL-M score in the current sample was 30.7/85 (SD = 11.7); this level of symptomatology is comparable to scores typically observed among OIF/OEF NGR personnel (Renshaw, 2010; Erbes, Polusny, Arbisi, & Koffel, 2012; Biehn et al., 2013). In our sample, 35 service members (7.6%) had a total PCL-M score greater than 50 at immediately post-deployment, which indicates probable PTSD (McDonald & Calhoun, 2010). Of these 35 soldiers in our sample who met the >50 cutoff, 32 were men (7.7% of men) and 3 were women (6.7% of women). Our sample’s 7.6% overall rate of PTSD is similar to the 8.5% PTSD rate observed among a sample of active duty Marines returning from Iraq whose study authors used the same criteria (Armistead-Jehle et al., 2011).
The current study’s mean unit cohesion score of 9.2/15 ($SD = 3.1$) indicated that overall, service members were reporting only a moderate degree of cohesion (e.g., the average response across the 3-item scale was “Neither Agree or Disagree”). Please refer to Table 3 for descriptive results for our primary study variables, as well as statistical comparisons between men and women.

Table 3

*Mean and SD for Primary Study Variables, and Statistical Comparison between Men and Women*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall Mean ($SD$) ($N = 463$)</th>
<th>Mean ($SD$) for men ($n = 421$)</th>
<th>Mean ($SD$) for women ($n = 42$)</th>
<th>Statistical comparison between men and women</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRRI-PDLE</td>
<td>5.9 (3.5)</td>
<td>5.8 (3.5)</td>
<td>6.0 (3.5)</td>
<td>$t(459) = -.27, ns$</td>
<td>-</td>
</tr>
<tr>
<td>DRRI-CE</td>
<td>4.0 (3.1)</td>
<td>4.2 (3.1)</td>
<td>2.6 (2.1)</td>
<td>$t(330) = 2.6, p = .010$</td>
<td>.60</td>
</tr>
<tr>
<td>DRRI-DE</td>
<td>4.2 (3.8)</td>
<td>4.4 (3.9)</td>
<td>2.8 (2.6)</td>
<td>$t(58.5) = 2.8, p = .006$</td>
<td>.48</td>
</tr>
<tr>
<td>Warfare exposure (Combined DRRI-CE &amp; DRRI-DE)</td>
<td>8.2 (6.4)</td>
<td>8.4 (6.5)</td>
<td>5.0 (4.2)</td>
<td>$t(329) = 3.8, p &lt; .001$</td>
<td>.62</td>
</tr>
<tr>
<td>PCL-M</td>
<td>30.7 ($11.7$)</td>
<td>30.7 ($11.8$)</td>
<td>31.1 ($11.5$)</td>
<td>$t(124) = -2.2, ns$</td>
<td>-</td>
</tr>
<tr>
<td>Unit Cohesion</td>
<td>9.2 (3.1)</td>
<td>9.3 (3.1)</td>
<td>7.7 (2.9)</td>
<td>$t(421) = 3.21, p = .001$</td>
<td>.53</td>
</tr>
</tbody>
</table>

*Note: DRRI-PDLE: Pre-Deployment Life Events Scale of the Deployment Risk and Resilience Inventory; DRRI-CE: Combat Experiences Scale of the Deployment Risk and Resilience Inventory; DRRI-DE: Aftermath of Battle Scale of the Deployment Risk and Resilience Inventory; PCL-M: Posttraumatic Stress Disorder Checklist – Military Version*

**Exploratory Analyses**

An aim of the current study is to determine whether male and female service members differ on the key study variables of interest of warfare exposure, unit cohesion, and PTSD. In
order to better understand these potential differences, we first explored other variables on which men and women may differ. Results of a series of independent t-tests (Table 3) showed that men ($M = 5.8, SD = 3.5$) and women ($M = 6.0, SD = 3.5$) did not differ in their amount of pre-deployment trauma exposure; ($t(459) = -0.27, p = .79$). During deployment, men ($M = 8.4, SD = 6.5$) reported significantly higher overall warfare exposure than women ($M = 5.0, SD = 4.2$); ($t(329) = 3.8, p < .001, d = .62$), suggesting a medium effect. Although male service members reported greater warfare exposure, men ($M = 30.7, SD = 11.8$) and women ($M = 31.1, SD = 11.5$) did not differ on level of PTSD symptomatology; ($t(124) = -2.2, p = .83$).

**Hypothesis 1:** Greater warfare exposure will predict higher levels of PTSD symptomatology for both men and women.

Full hierarchical regression results for Hypothesis 1 can be found in Table 4. Demographic variables (pre-deployment life events, minority status, age, and number of previous deployments) were entered into the model first as controls. In total, these four covariates significantly predicted greater PTSD symptomatology ($F(2, 315) = 9.53, p < .001$) and accounted for 10.7% of the variance. Pre-deployment life events ($t(315) = 2.73, \beta = .22, p < .001$), minority status ($t(315) = 3.27, \beta = .18, p < .001$) and age ($t(315) = -2.87, \beta = -.21, p < .001$) were significant independent predictors of greater PTSD symptoms, but number of previous deployments was not ($t(315) = 1.65, \beta = .10, p = .10$). Mean-centered warfare exposure and gender were entered in the second block, and the interaction between gender and warfare exposure was entered in the third block. PTSD was the outcome variable. The addition of the warfare exposure and gender variables significantly improved prediction ($F(2, 315) = 11.78, p < .001, DR^2 = .076$); that is, the addition of these variables explained a total of 18.3% of the variance in PTSD. Greater exposure to warfare predicted higher levels of PTSD symptomatology.
(t(315) = 5.46, β = .29, p < .001); thus, Hypothesis 1 was supported. Gender, however, was not significantly associated with PTSD severity (t(315) = .89, p = .38). Also, the addition of the warfare exposure by gender interaction did not significantly improve prediction (F(1, 314) = 10.27, p = .290, \( \Delta R^2 = .003 \)); therefore, the relationship of warfare exposure with PTSD did not differ between men and women.

Table 4

Summary of Hierarchical Regression Analysis: Hypothesis 1

<table>
<thead>
<tr>
<th>Step 1 Model (Covariates)</th>
<th>F</th>
<th>Standardized Beta</th>
<th>Unstandardized Beta</th>
<th>t</th>
<th>p</th>
<th>R²</th>
<th>( \Delta R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-deployment life events</td>
<td>9.53**</td>
<td>.22</td>
<td>.67</td>
<td>2.73</td>
<td>.001</td>
<td>.107</td>
<td></td>
</tr>
<tr>
<td>Minority status</td>
<td></td>
<td>.18</td>
<td>5.03</td>
<td>3.27</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>-.21</td>
<td>-.29</td>
<td>-2.87</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of previous deployments</td>
<td></td>
<td>.10</td>
<td>1.48</td>
<td>1.65</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2 Model</td>
<td>11.78**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.076**</td>
<td></td>
</tr>
<tr>
<td>Warfare exposure</td>
<td></td>
<td>.29</td>
<td>.51</td>
<td>5.46</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>.05</td>
<td>1.89</td>
<td>.89</td>
<td>.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3 Model</td>
<td>10.27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>Warfare exposure x gender</td>
<td></td>
<td>.07</td>
<td>.51</td>
<td>1.05</td>
<td>.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Model</td>
<td>10.27**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DV = PCL-M (PTSD)
*Significant at the 0.05 level
**Significant at the 0.001 level

Hypothesis 2: Specific combat experiences will predict the highest levels of PTSD symptomatology: receiving “friendly” incoming fire; witnessing someone from one’s own unit or an ally unit being seriously wounded or killed; being wounded or injured in combat; and killing (or believing to have killed) someone in combat. This relationship will hold for both men and women.

Prior to running the regression analyses, bivariate correlations were run for each combat exposure item. All bivariate correlations are shown in Table 5. The majority of items were
significantly correlated with each other, with the highest correlation being .74 between item 14 ("I fired my weapon at the enemy") and item 15 ("I killed or think I killed someone in combat"). The next highest correlation ($r = .53$) was found for items 2 ("I or members of my unit encountered land or water mines and/or booby traps") and 6 ("I or members of my unit were attacked by terrorists or civilians."). There was also a correlation of .53 for items 12 ("I personally witnessed soldiers from enemy troops being seriously wounded or killed") and 14 ("I fired my weapon at the enemy").
Table 5

**DRRI-CE Item Correlations**

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
<th>Q11</th>
<th>Q12</th>
<th>Q13</th>
<th>Q14</th>
<th>Q15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>1</td>
<td>.48**</td>
<td>.23**</td>
<td>.06*</td>
<td>.35**</td>
<td>.36**</td>
<td>.05*</td>
<td>.14**</td>
<td>.14**</td>
<td>.27**</td>
<td>.26**</td>
<td>.28**</td>
<td>.12**</td>
<td>.22**</td>
<td>.19**</td>
</tr>
<tr>
<td>Q2</td>
<td>.48**</td>
<td>1</td>
<td>.31**</td>
<td>.11**</td>
<td>.34**</td>
<td>.53**</td>
<td>.11**</td>
<td>.20**</td>
<td>.18**</td>
<td>.39**</td>
<td>.30**</td>
<td>.39**</td>
<td>.09**</td>
<td>.29**</td>
<td>.24**</td>
</tr>
<tr>
<td>Q3</td>
<td>.23**</td>
<td>.31**</td>
<td>1</td>
<td>.10**</td>
<td>.24**</td>
<td>.39**</td>
<td>.13**</td>
<td>.10**</td>
<td>.20**</td>
<td>.17**</td>
<td>.13**</td>
<td>.03</td>
<td>.18**</td>
<td>.13**</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>.06*</td>
<td>.11**</td>
<td>.10**</td>
<td>1</td>
<td>.03</td>
<td>.05*</td>
<td>.07**</td>
<td>.17**</td>
<td>.25**</td>
<td>.14**</td>
<td>.08**</td>
<td>.16**</td>
<td>.12**</td>
<td>.13**</td>
<td>.14**</td>
</tr>
<tr>
<td>Q5</td>
<td>.35**</td>
<td>.34**</td>
<td>.24**</td>
<td>.03</td>
<td>1</td>
<td>.36**</td>
<td>.18**</td>
<td>.39**</td>
<td>.44**</td>
<td>.32**</td>
<td>.41**</td>
<td>.30**</td>
<td>.45**</td>
<td>.41**</td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>.36**</td>
<td>.53**</td>
<td>.39**</td>
<td>.05*</td>
<td>.36**</td>
<td>1</td>
<td>.16**</td>
<td>.20**</td>
<td>.18**</td>
<td>.41**</td>
<td>.34**</td>
<td>.33**</td>
<td>.12**</td>
<td>.29**</td>
<td>.28**</td>
</tr>
<tr>
<td>Q7</td>
<td>.05*</td>
<td>.11**</td>
<td>.13**</td>
<td>.07**</td>
<td>.18**</td>
<td>.16**</td>
<td>1</td>
<td>.25**</td>
<td>.31**</td>
<td>.14**</td>
<td>.08**</td>
<td>.23**</td>
<td>.09**</td>
<td>.15**</td>
<td>.17**</td>
</tr>
<tr>
<td>Q8</td>
<td>.14**</td>
<td>.20**</td>
<td>.10**</td>
<td>.17**</td>
<td>.39**</td>
<td>.20**</td>
<td>.25**</td>
<td>1</td>
<td>.44**</td>
<td>.40**</td>
<td>.33**</td>
<td>.40**</td>
<td>.27**</td>
<td>.40**</td>
<td>.47**</td>
</tr>
<tr>
<td>Q9</td>
<td>.14**</td>
<td>.18**</td>
<td>.10**</td>
<td>.25**</td>
<td>.30**</td>
<td>.18**</td>
<td>.31**</td>
<td>.44**</td>
<td>1</td>
<td>.26**</td>
<td>.26**</td>
<td>.28**</td>
<td>.32**</td>
<td>.31**</td>
<td>.29**</td>
</tr>
<tr>
<td>Q10</td>
<td>.26**</td>
<td>.39**</td>
<td>.20**</td>
<td>.14**</td>
<td>.44**</td>
<td>.41**</td>
<td>.14**</td>
<td>.40**</td>
<td>.26**</td>
<td>1</td>
<td>.43**</td>
<td>.49**</td>
<td>.27**</td>
<td>.34**</td>
<td>.35**</td>
</tr>
<tr>
<td>Q11</td>
<td>.26**</td>
<td>.30**</td>
<td>.17**</td>
<td>.08**</td>
<td>.32**</td>
<td>.34**</td>
<td>.08**</td>
<td>.33**</td>
<td>.26**</td>
<td>.43**</td>
<td>1</td>
<td>.48**</td>
<td>.27**</td>
<td>.30**</td>
<td>.29**</td>
</tr>
<tr>
<td>Q12</td>
<td>.28**</td>
<td>.39**</td>
<td>.13**</td>
<td>.16**</td>
<td>.41**</td>
<td>.33**</td>
<td>.23**</td>
<td>.40**</td>
<td>.28**</td>
<td>.49**</td>
<td>.48**</td>
<td>1</td>
<td>.31**</td>
<td>.53**</td>
<td>.49**</td>
</tr>
<tr>
<td>Q13</td>
<td>.12**</td>
<td>.09**</td>
<td>.03</td>
<td>.12**</td>
<td>.30**</td>
<td>.12**</td>
<td>.09**</td>
<td>.26**</td>
<td>.32**</td>
<td>.27**</td>
<td>.27**</td>
<td>.31**</td>
<td>1</td>
<td>.32**</td>
<td>.27**</td>
</tr>
<tr>
<td>Q14</td>
<td>.22**</td>
<td>.29**</td>
<td>.18**</td>
<td>.13**</td>
<td>.45**</td>
<td>.29**</td>
<td>.15**</td>
<td>.40**</td>
<td>.31**</td>
<td>.34**</td>
<td>.30**</td>
<td>.53**</td>
<td>.32**</td>
<td>1</td>
<td>.74**</td>
</tr>
<tr>
<td>Q15</td>
<td>.19**</td>
<td>.24**</td>
<td>.13**</td>
<td>.14**</td>
<td>.41**</td>
<td>.28**</td>
<td>.17**</td>
<td>.47**</td>
<td>.29**</td>
<td>.35**</td>
<td>.29**</td>
<td>.49**</td>
<td>.27**</td>
<td>.74**</td>
<td>1</td>
</tr>
</tbody>
</table>

DRRI-CE: Combat Experiences Scale of the Deployment Risk and Resilience Inventory

See Table 6 for the specific item associated with each number.

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).
Next, we explored the mean PCL-M score for those endorsing each DRRI-CE item to determine average PTSD severity for soldiers who did versus did not endorse each type of exposure; please see Table 6 for a listing of all items and their corresponding PCL-M means. The highest PCL-M mean was 43.42, found for those soldiers who responded “yes” to item 15, “I killed or think I killed someone in combat.” Those who answered “no” to this item had a mean PCL-M score of 29.27. The next highest PCL-M mean was 39.70, among soldiers who responded “yes” to item 14, “I fired my weapon at the enemy.”

Table 6

*PCL-M Means for Participants Who Did vs. Did Not Endorse Experiencing Each DRRI-CE Item, and Statistical Comparisons between the Groups*

<table>
<thead>
<tr>
<th>DRRI-CE Item</th>
<th>PCL-M Mean (SD): Did Endorse</th>
<th>PCL-M Mean (SD): Did Not Endorse</th>
<th>Statistical Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. I went on combat patrols or missions.</td>
<td>34.83 (11.67) (n = 242)</td>
<td>27.69 (11.58) (n = 98)</td>
<td>(t(338) = 5.12, p &lt; .0001)</td>
</tr>
<tr>
<td>Q2. I or members of my unit encountered land or water mines and/or booby traps.</td>
<td>35.38 (11.48) (n = 164)</td>
<td>28.67 (11.78) (n = 176)</td>
<td>(t(338) = 5.31, p &lt; .0001)</td>
</tr>
<tr>
<td>Q3. I or members of my unit received hostile incoming fire from small arms, artillery, rockets, mortars, or bombs.</td>
<td>34.32 (12.05) (n = 285)</td>
<td>28.17 (9.80) (n = 55)</td>
<td>(t(338) = 3.56, p = .0004)</td>
</tr>
<tr>
<td>Q4. I or members of my unit received “friendly” incoming fire from small arms, artillery, rockets, mortars, or bombs.</td>
<td>37.95 (12.42) (n = 52)</td>
<td>29.20 (11.21) (n = 283)</td>
<td>(t(333) = 5.09, p &lt; .0001)</td>
</tr>
<tr>
<td>Q5. I was in a vehicle (for example, a truck, tank, APC, helicopter, plane, or boat) that was under fire.</td>
<td>36.49 (11.52) (n = 93)</td>
<td>29.06 (11.65) (n = 247)</td>
<td>(t(338) = 5.26, p &lt; .0001)</td>
</tr>
<tr>
<td>Q6. I or members of my unit were attacked by terrorists or civilians.</td>
<td>34.86 (11.61) (n = 178)</td>
<td>29.03 (11.83) (n = 162)</td>
<td>(t(338) = 4.58, p &lt; .0001)</td>
</tr>
<tr>
<td>Q7. I was part of a land or naval artillery unit that fired on the enemy.</td>
<td>31.72 (13.01) (n = 25)</td>
<td>33.82 (11.57) (n = 315)</td>
<td>(t(338) = 0.87, ns)</td>
</tr>
<tr>
<td>Q8. I was part of an assault on</td>
<td>38.32 (12.19)</td>
<td>33.39</td>
<td>(t(338) = )</td>
</tr>
<tr>
<td>Question</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>t(338)</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>entrench or fortified positions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9. I took part in an invasion that involved naval and/or land forces.</td>
<td>37.19 (12.05)</td>
<td>33.71 (11.63)</td>
<td>1.17</td>
</tr>
<tr>
<td></td>
<td>n = 16</td>
<td>n = 324</td>
<td></td>
</tr>
<tr>
<td>Q10. My unit engaged in battle in which it suffered casualties.</td>
<td>36.07 (11.68)</td>
<td>29.66 (11.70)</td>
<td>3.85</td>
</tr>
<tr>
<td></td>
<td>n = 60</td>
<td>n = 280</td>
<td></td>
</tr>
<tr>
<td>Q11. I personally witnessed someone from my unit or an ally unit being</td>
<td>35.18 (12.56)</td>
<td>33.09 (11.28)</td>
<td>1.28</td>
</tr>
<tr>
<td>seriously wounded or killed.</td>
<td>n = 61</td>
<td>n = 279</td>
<td></td>
</tr>
<tr>
<td>Q12. I personally witnessed soldiers from enemy troops being seriously</td>
<td>37.79 (12.15)</td>
<td>28.87 (11.28)</td>
<td>6.0</td>
</tr>
<tr>
<td>wounded or killed.</td>
<td>n = 77</td>
<td>n = 263</td>
<td></td>
</tr>
<tr>
<td>Q13. I was wounded or injured in combat.</td>
<td>37.83 (11.51)</td>
<td>33.64 (11.62)</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>n = 18</td>
<td>n = 322</td>
<td></td>
</tr>
<tr>
<td>Q14. I fired my weapon at the enemy.</td>
<td>39.70 (11.86)</td>
<td>29.07 (11.36)</td>
<td>5.97</td>
</tr>
<tr>
<td></td>
<td>n = 48</td>
<td>n = 292</td>
<td></td>
</tr>
<tr>
<td>Q15. I killed or think I killed someone in combat.</td>
<td>43.42 (11.22)</td>
<td>29.27 (11.30)</td>
<td>6.24</td>
</tr>
<tr>
<td></td>
<td>n = 27</td>
<td>n = 311</td>
<td></td>
</tr>
</tbody>
</table>

Note: DRRI-CE: Combat Experiences Scale of the Deployment Risk and Resilience Inventory
PCL-M: Posttraumatic Stress Disorder Checklist – Military Version (range = 17 - 85)

In order to reduce the number of variables being analyzed for Hypothesis 2, an exploratory factor analysis assuming no a priori factor structure was performed using principal axis factoring and a promax rotation. A scree plot (Cattell, 1966; Figure 1) revealed a pronounced inflection point at the second-highest eigenvalue. The item loadings for the two factors in this EFA appear in Table 7.
DeVellis (1991) identifies .50 as a general cutoff for determining whether an item loads meaningfully onto a factor, and Worthington and Whittaker (2006) suggest that item cross-loadings should be at least .15 less than the item’s highest factor loading. As a result of these guidelines, an item was chosen to load onto a specific factor if it achieved simple structure, which was defined as the highest loading eigenvalue exceeding an absolute value of .50, with all cross-loadings being at least .15 less than the item’s highest factor loading. The first two factors accounted for 52.10% of the cumulative item variance and for these reasons were retained.

Six items loaded distinctly onto Factor 1, which we named “Direct Attack or Personal Injury”, and five items loaded distinctly onto Factor 2, which we named “Indirect Attack.” The four items that did not achieve simple structure (4, 7, 10, 14) were considered not to be a meaningful part of the factor solution and appear at the bottom of Table 7.
### Table 7

**Item Loadings for Hypothesis 2 DRRI-CE Factor Analysis**

<table>
<thead>
<tr>
<th>Direct Attack or Personal Injury</th>
<th>Indirect Attack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q13. I was wounded or injured in combat. (.91)</td>
<td>Q2. I or members of my unit encountered land or water mines and/or booby traps. (.90)</td>
</tr>
<tr>
<td>Q9. I took part in an invasion that involved naval and/or land forces. (.74)</td>
<td>Q6. I or members of my unit were attacked by terrorists or civilians. (.72)</td>
</tr>
<tr>
<td>Q15. I killed or think I killed someone in combat. (.73)</td>
<td>Q3. I or members of my unit received hostile incoming fire from small arms, artillery, rockets, mortars, or bombs. (.64)</td>
</tr>
<tr>
<td>Q8. I was part of an assault on entrenched or fortified positions. (.69)</td>
<td>Q1. I went on combat patrols or missions. (.57)</td>
</tr>
<tr>
<td>Q11. I personally witnessed someone from my unit or an ally unit being seriously wounded or killed. (.63)</td>
<td>Q5. I was in a vehicle (for example, a truck, tank, APC, helicopter, plane, or boat) that was under fire. (.53)</td>
</tr>
<tr>
<td>Q12. I personally witnessed soldiers from enemy troops being seriously wounded or killed. (.57)</td>
<td></td>
</tr>
</tbody>
</table>

DRRI-CE: Combat Experiences Scale of the Deployment Risk and Resilience Inventory

*Note:* An item was chosen to load onto a specific factor if it achieved simple structure, which was defined as the highest loading eigenvalue exceeding an absolute value of .50, with all cross-loadings being at least .15 less than the item’s highest factor loading.

*Items that did not achieve simple structure:* Q4. I or members of my unit received "friendly" incoming fire from small arms, artillery, rockets, mortars, or bombs; Q7. I was part of a land or naval artillery unit that fired on the enemy; Q10. My unit engaged in battle in which it suffered casualties; Q14. I fired my weapon at the enemy.

Table 8 displays full hierarchical regression results for Hypothesis 2. Individual participant scores for Factor 1 Direct Attack or Personal Injury and Factor 2 Indirect Attack were used as separate independent variables for the following hierarchical regression analysis. In the first block, minority status, age, number of previous deployments, and pre-deployment life events were entered. The second block contained both the Factor 1 Direct Attack or Personal Injury and Factor 2 Indirect Attack combat exposure variables, as well as CES-DRRI item #4 regarding receiving friendly fire (included because we hypothesized it to be related to PTSD but it did not load distinctly onto either factor), and gender. In the third block, the interactions

---

50
between gender and each combat exposure factor, and the interaction between gender and the
friendly fire item were entered.

After controlling for the four demographic covariates, the addition of the Factor 1 Direct
Attack or Personal Injury combat exposure variable and the Factor 2 Indirect Attack combat
exposure variable, as well as the “friendly fire” item #4, significantly improved prediction of
PTSD symptoms \( (F(3, 324) = 10.20, p < .001, \Delta R^2 = .058) \); that is, the addition of these variables
explained a total of 5.8% of the variance in PTSD. Factor 1 Direct Attack or Personal Injury
\( (t(324) = 3.0, \beta = .18, p = .003) \) was a unique significant predictor, such that higher scores on
this factor were associated with more severe levels of PTSD. When gender, the interactions
between gender and each combat exposure factor, and the interaction between gender and
combat exposure item #4, were added, prediction did not significantly improve \( (F(4, 320) = 6.60, p = .78, \Delta R^2 = .005) \), indicating that this positive association between Direct Attack or
Personal Injury exposure and PTSD holds for both men and women.

Table 8

**Summary of Hierarchical Regression Analysis: Hypothesis 2**

<table>
<thead>
<tr>
<th>Step</th>
<th>Model</th>
<th>( F )</th>
<th>Standardized Beta</th>
<th>Unstandardized Beta</th>
<th>( t )</th>
<th>( p )</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Model (Covariates)</td>
<td>11.40**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.107</td>
<td>.122</td>
</tr>
<tr>
<td>Pre-deployment life events</td>
<td></td>
<td>.20</td>
<td>.65</td>
<td>3.7</td>
<td>.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minority status</td>
<td></td>
<td>.16</td>
<td>4.4</td>
<td>3.0</td>
<td>.003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>-.20</td>
<td>-.28</td>
<td>-3.5</td>
<td>.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of previous deployments</td>
<td></td>
<td>.12</td>
<td>1.76</td>
<td>2.0</td>
<td>.050</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2 Model</td>
<td>10.20**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.058</td>
</tr>
<tr>
<td>Factor 1 Direct Attack or Personal Injury</td>
<td></td>
<td>.18</td>
<td>1.07</td>
<td>3.0</td>
<td>.003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2 Indirect Attack</td>
<td></td>
<td>.07</td>
<td>.22</td>
<td>1.2</td>
<td>.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRRI-CE Q4</td>
<td></td>
<td>.07</td>
<td>1.1</td>
<td>1.3</td>
<td>.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3 Model</td>
<td>6.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.78</td>
<td>.005</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>-.30</td>
<td>-12.26</td>
<td>-.61</td>
<td>.54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender x Factor 1 (Direct Attack)</td>
<td>.13</td>
<td>1.00</td>
<td>.29</td>
<td>.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender x Factor 2 (Indirect Attack)</td>
<td>.05</td>
<td>.27</td>
<td>.29</td>
<td>.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender x DRRI-CE Q4</td>
<td>.17</td>
<td>5.16</td>
<td>1.05</td>
<td>.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Full Model</strong></td>
<td>6.60**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DV = PCL-M (PTSD)
DRRI-CE Q4: Question 4 of the Deployment Risk and Resilience Inventory (“I or members of my unit received ‘friendly’ incoming fire from small arms, artillery, rockets, mortars, or bombs.”)

*Significant at the 0.05 level
**Significant at the 0.001 level

**Hypothesis 3a: Men will report higher levels of unit cohesion than women.**

An independent samples t-test was conducted which supported this hypothesis; men ($M = 9.3, SD = 3.1$) reported significantly higher levels of unit cohesion than women ($M = 7.7, SD = 2.9$); $t(421) = 3.21, p = .001$. Cohen’s $d = .53$ indicates a medium effect for this finding.

In general, the overall sample reported only a moderate level of unit cohesion (e.g., the mean score of 9.2/15 indicates an average response of “Neither Agree Or Disagree” across the 3-item scale). Female service members’ mean score was 7.7/15, suggesting that women tended to identify more closely with the side of the scale containing “Disagree” response options.

**Hypothesis 3b: Higher levels of cohesion will be associated with fewer PTSD symptoms for both men and women.**

In order to maximize our ability to detect a relationship between unit cohesion and PTSD symptoms, participants reporting zero warfare trauma exposure (e.g., a 0/30 on the warfare exposure variable) were removed; thus, data from a total of 10 soldiers (8 men and 2 women) were removed prior to running the following hierarchical regression. To test whether unit cohesion is associated with fewer PTSD symptoms for men and women, a hierarchical regression analysis was run with PCL-M as the outcome variable. The first block included minority status, age, number of previous deployments, pre-deployment life events, and gender. In the second
block, mean-centered unit cohesion was entered. In the third block, the unit cohesion by gender interaction term was entered. Full hierarchical regression results for Hypothesis 3b may be found in Table 9.

After controlling for the five demographic variables, unit cohesion still predicted a significant amount of variance (1.6%) in PTSD symptoms, and had a significant negative relationship with PTSD symptoms ($t(304) = -3.23, \beta = -.13, p = .02$); thus, Hypothesis 3b was supported. Also, explanatory power did not improve when the unit cohesion by gender interaction term was entered ($F(1, 303) = 5.67, p = .83$), suggesting that this negative association between unit cohesion and PTSD symptoms did not differ between men and women.

Table 9

*Summary of Hierarchical Regression Analysis: Hypothesis 3b*

<table>
<thead>
<tr>
<th>Step</th>
<th>$F$</th>
<th>Standardized Beta</th>
<th>Unstandardized beta</th>
<th>$t$</th>
<th>$p$</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Model (Covariates)</td>
<td>6.74**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.001</td>
<td>.099</td>
</tr>
<tr>
<td>Pre-deployment life events</td>
<td></td>
<td>.20</td>
<td>.64</td>
<td>3.53</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minority status</td>
<td></td>
<td>.18</td>
<td>5.08</td>
<td>3.29</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>-.17</td>
<td>-.24</td>
<td>-2.7</td>
<td>.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of previous deployments</td>
<td></td>
<td>.09</td>
<td>1.26</td>
<td>1.31</td>
<td>.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>-.01</td>
<td>-.32</td>
<td>-.14</td>
<td>.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2 Model</td>
<td>5.58*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.016</td>
</tr>
<tr>
<td>Unit cohesion</td>
<td></td>
<td>-.13</td>
<td>-.47</td>
<td>-3.23</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3 Model</td>
<td>5.67</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.83</td>
<td>.000</td>
</tr>
<tr>
<td>Unit cohesion x gender</td>
<td></td>
<td>.02</td>
<td>.16</td>
<td>.21</td>
<td>.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Model</td>
<td>5.67**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DV = PCL-M (PTSD)
*Significant at the 0.05 level
**Significant at the 0.001 level

**Hypothesis 4:** Unit cohesion will moderate the relationship between warfare exposure and PTSD, such that the relationship will be weaker amongst soldiers reporting a high degree of unit cohesion. Buffering effects will be seen for both men and women.
In the first block of the regression, demographic covariates (minority status, age, number of previous deployments, and pre-deployment life events) were entered. In the second block, the variables mean-centered unit cohesion, mean-centered warfare exposure, and gender were entered. In the third block, the two-way interactions (Warfare Exposure x Unit Cohesion, Warfare Exposure x Gender, and Unit Cohesion x Gender) were entered. Finally, the three-way Unit Cohesion x Warfare Exposure x Gender interaction term was entered. See Table 10 for a full summary of Hypothesis 4 hierarchical regression findings.

After controlling for the four demographic covariates, the addition of unit cohesion \((t(310) = -3.34, \beta = -.17, p = .001)\) and warfare exposure \((t(310) = 5.65, \beta = .30, p < .001)\), significantly improved prediction; gender did not \((t(310) = .33, \beta = .02, p = .74)\). In total, the addition of these three variables accounted for 10.4\% of the variance in PTSD symptoms. However, explanatory power did not improve when the Warfare Exposure x Unit Cohesion, Warfare Exposure x Gender, and Unit Cohesion x Gender interaction terms were entered \((F(3, 307) = 8.61, p = .64, \Delta R^2 = .004)\), nor did it improve with the addition of the three-way Unit Cohesion x Warfare Exposure x Gender interaction term \((F(1, 306) = 8.00, p = .20, \Delta R^2 = .004)\). Thus, because the relationship between warfare exposure and PTSD was not moderated by unit cohesion, we did not find support for a buffering hypothesis.

Table 10

Summary of Hierarchical Regression Analysis: Hypothesis 4

<table>
<thead>
<tr>
<th>Step 1 Model (Covariates)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F</strong></td>
<td>Standardized Beta</td>
<td>Unstandardized Beta</td>
<td>(t)</td>
<td>(p)</td>
<td>(R^2)</td>
<td>(\Delta R^2)</td>
</tr>
<tr>
<td><strong>Pre-deployment life events</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minority status</td>
<td>.18</td>
<td>5.01</td>
<td>3.32</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-.22</td>
<td>-.29</td>
<td>-3.57</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of previous</td>
<td>.13</td>
<td>1.93</td>
<td>2.10</td>
<td>.036</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2 Model</td>
<td>12.12**</td>
<td></td>
<td></td>
<td>.104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------</td>
<td>-------</td>
<td>-------</td>
<td>------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit cohesion</td>
<td>-.17</td>
<td>-.62</td>
<td>-3.34</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warfare exposure</td>
<td>.30</td>
<td>.52</td>
<td>5.65</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>.02</td>
<td>.70</td>
<td>.33</td>
<td>.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3 Model</td>
<td>8.61</td>
<td></td>
<td></td>
<td>.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit cohesion x warfare exposure</td>
<td>.02</td>
<td>.01</td>
<td>.41</td>
<td>.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit cohesion x gender</td>
<td>.03</td>
<td>.35</td>
<td>.50</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warfare exposure x gender</td>
<td>.07</td>
<td>.54</td>
<td>1.12</td>
<td>.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 4 Model</td>
<td>8.00</td>
<td></td>
<td></td>
<td>.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit cohesion x Warfare exposure x Gender</td>
<td>-.09</td>
<td>-.19</td>
<td>-1.29</td>
<td>.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Model</td>
<td>8.00**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DV = PCL-M (PTSD)

*Significant at the 0.05 level

**Significant at the 0.001 level
Discussion

The purpose of the current study was to examine the relationships between warfare exposure, unit cohesion, and PTSD among male and female National Guard and Reserve service members deployed to Iraq or Afghanistan. These relationships have been investigated primarily among active duty, male service members, despite the fact that National Guard and Reserve soldiers (Hoge et al., 2006) and female service members (Skopp et al., 2011) tend to be at greater risk of psychiatric distress from traumatic combat exposure.

As expected, our results demonstrated that greater exposure to warfare was associated with more severe PTSD symptoms for both men and women. Combat experiences involving threat of direct attack or personal injury were most predictive of greater PTSD symptomatology. These included killing or believing to have killed, witnessing someone from one’s own unit or an ally unit being seriously wounded or killed, and being wounded or injured in combat. In addition, we found that female service members perceived significantly lower unit cohesion than their male counterparts, and that greater cohesion was associated with fewer PTSD symptoms for both men and women. Finally, the current study did not find support for the hypothesis that unit cohesion buffered against the effects of warfare exposure in development of PTSD symptoms.

Prediction of PTSD: Warfare Exposure

Greater exposure to warfare in our sample was associated with higher PTSD symptomatology, and these results held above and beyond the effects of demographic variables known to be related to PTSD including minority status (Brailey et al., 2007), age (Pietrzak et al., 2011), number of previous deployments (Phillips et al., 2010), and prior stressful life events (Brailey et al., 2007). Such a result is consistent with previous research showing higher rates of PTSD following greater exposure to warfare stressors (Hoge et al., 2004; Dohrenwend et al.,
2006) observed across samples of OEF/OIF NGR (Pietrzak et al., 2011), OEF/OIF active duty (Phillips et al., 2010), and Vietnam (Miller et al., 2008) service members.

Based on previous literature identifying certain combat-related experiences as differentially predictive of PTSD symptomatology, we hypothesized that the experiences associated with the most severe PTSD in our sample would be receiving “friendly” incoming fire, witnessing someone from one’s own unit or an ally unit being seriously wounded or killed, being wounded or injured in combat, and killing (or believing to have killed) someone in combat. A factor analysis of the Combat Experiences scale of the Deployment Risk and Resilience Inventory (CES-DRRI) was conducted in order to reduce the number of variables being analyzed, and because combat experiences do not occur in isolation. As can be seen in Table 5, all but two of the 210 correlations between items on the CES-DRRI are significant. The factor analysis revealed two factors: one describing experiences of direct attack or personal injury (i.e., “I was wounded or injured in combat”), and the second encompassing experiences of indirect attack (i.e., “I or members of my unit encountered land or water mines and/or booby traps”).

When these factors were examined as predictors in a regression model, Factor 1 emerged as the stronger predictor of PTSD symptomatology. All hypothesized items (except the friendly fire item) loaded directly onto Factor 1; thus, we found support for our hypothesis. Interestingly, however, soldiers endorsing having witnessed someone from one’s unit being wounded or killed or being personally wounded or injured in combat did not have significantly higher PCL-M means compared to soldiers not endorsing these experiences. This is inconsistent with previous research identifying these warfare experiences to be salient predictors of PTSD (Pietrzak et al., 2011; Phillips et al., 2010). One possible explanation relates to the low number of soldiers
reporting the experience; only 18 individuals in this sample endorsed being wounded or injured in combat. Another possible explanation may be found in the results of Green and colleagues (1990), which showed that whereas a higher amount of combat exposure is related to the development of PTSD symptoms, atrocities that are particularly horrifying and life-threatening are related to PTSD chronicity. Perhaps witnessing the death of a comrade, for instance, would be more strongly predictive of PTSD symptoms at a later time point, pointing to the need for longitudinal studies on combat exposure.

An examination of specific combat experiences revealed that the average PTSD score for individuals who reported killing or believing to have killed someone in combat was significantly higher than for those soldiers who did not report the experience of killing and this discrepancy was larger than for any other combat exposure item. This finding parallels other studies demonstrating that among specific combat stressors, killing or believing to have killed enemies during combat is particularly predictive of new-onset probable PTSD (Polusny et al., 2010). This effect tends to hold even after controlling for other aspects of combat exposure or warzone atrocities, indicating that the killing experience is uniquely detrimental (Maguen et al., 2010).

Negative outcomes are pervasive and multifaceted, including mental health issues such as PTSD, depression, alcohol abuse, reduced psychosocial functioning (Maguen et al., 2010) and increased risk for suicide (Maguen et al., 2011).

Interestingly, our last hypothesized combat experience of receiving “friendly incoming fire” was not a significant predictor of PTSD in the regression model after accounting for both demographic variables as well as Factor 1, “Direct Attack or Personal Injury.” However, it should be noted that soldiers who endorsed having the experience had a mean PCL-M score that was significantly higher than those who did not endorse having the experience. It is likely that
this experience is highly correlated with other combat experiences related to increased PTSD symptoms, and so even though this experience is predictive of more severe PTSD symptoms, it did not emerge in the regression model after accounting for the variance explained by Factor 1.

Although the item did not emerge as a unique independent predictor, the observed difference in PTSD severity is consistent with previous studies showing that receiving friendly incoming fire is associated with worse PTSD (Pietrzak et al., 2011). Incidents of friendly fire may cause service members to experience unique concerns about their safety, given that the “fire” had come from within their own units. Similarly, receiving friendly fire is thought to increase risk for PTSD because it conflicts with service members’ basic fundamental assumptions about themselves and the world; mainly, that one should expect to be safe amongst one’s own (Pietrzak et al., 2011).

Our overall findings revealed that warfare exposures involving the threat of direct attack or personal injury are the most significant risk factors for increased PTSD symptomatology. This finding is a noteworthy addition to the literature because we identified a cluster of combat experiences that tend to occur together and can strongly predict severity of PTSD. Consistent with a number of other studies, personal perceptions of threat (particularly threat to life) have been shown to be robust predictors of PTSD (Iverson et al., 2008; Dohrenwend et al., 2013; Franz et al., 2013). Iverson and colleagues (2008), for example, studied a number of pre-deployment, deployment-related, and post-deployment risk factors and demonstrated that an individual’s perceived threat to life showed the strongest association with PTSD. Interestingly, when perceived threat to life and number of “risk to self events” were examined together in the full model, only threat to life was significant (Iverson et al., 2008). These results would suggest that it is the subjective appraisal of threat, more than objective trauma severity, which is
important to the development of PTSD.

Our result that feeling vulnerable to direct attack is particularly predictive of PTSD symptomatology is also consistent with Iverson and colleagues’ (2008) findings regarding the importance of “time spent in a forward area.” Those authors note that perhaps being stationed in a forward area increases PTSD risk through biological mechanisms such as sleep deprivation and/or psychological mechanisms such as constant hypervigilance. Notably, the effect of time spent in a forward area on PTSD is more pronounced for those in lower ranks than for officers (Iverson et al., 2008).

Gender Differences in PTSD

Our results revealed that the warfare exposure/PTSD relationship did not differ between men and women, indicating that men and women are not differentially affected by exposure to the atrocities of war. This is consistent with several studies showing that warfare exposures have similar effects on both male and female service members’ mental health (Vogt et al., 2005; Woodhead, Wessely, Jones, Fear, & Hatch, 2012). Other research on gender differences in combat-related PTSD, however, has provided contrasting results to our findings. King and colleagues’ (1999) study of Vietnam veterans, for instance, showed warfare exposure to have a stronger effect on PTSD for women than men. A plausible explanation for this difference is that the women in King and colleagues’ (1999) sample were primarily healthcare providers (e.g., nurses) and likely had less exposure to stereotypical combat experiences. Indeed, one study of female Vietnam healthcare providers showed no direct effect of “Criterion A” type exposure (e.g., warfare) on PTSD and that the effect of potentially traumatic exposure to casualties was entirely mediated by healthcare dilemmas (McTeague et al., 2004).
In general, the primary war-zone stressors for women in Vietnam did not involve engagement with the enemy (Turner, Turse, & Dohrenwend, 2007), whereas in the current sample, there is evidence to suggest that women participated in tasks that have historically only been assigned to men. Fifty percent of the sample’s women, for instance, endorsed having gone on combat patrols or missions. Although findings from Vietnam suggest differential effects of warfare exposure on PTSD, more recent research has converged around our conclusion that exposure to the atrocities of war affect male and female service members similarly (Vogt et al., 2005; Fontana, Litz, & Rosenheck, 2000; Litz et al., 1997).

A notable finding of our study was that although men experienced significantly more exposure to warfare, women had levels of PTSD symptomatology that were similar to men. These results parallel several other studies demonstrating equal rates of PTSD despite higher levels of warfare exposure for male service members (Vogt et al., 2005; Litz et al., 1997). A number of explanations have been proposed for this discrepancy. First, female service members likely experience unique deployment stressors that we did not examine and that are rarely captured in the existing literature on predictors of military-related PTSD (Vogt et al., 2005). While deployed, women report more interpersonal stressors, including a perception of less social support from supervisors and peers, and these interpersonal stressors tend to have a stronger effect on the mental health of female service members than male service members (Polusny et al. 2010). Also, concerns about disruption to family life are likely to be a salient type of stressor for female service members, given their more frequent role as primary caregiver within the family (Vogt et al., 2005). These concerns may exacerbate the effect of any traumatic exposures experienced within the warzone. Finally, Military Sexual Trauma (MST), a term encompassing sexual assault, harassment, or unwanted sexual advances or comments, is consistently observed.
at higher rates among female service members and has been shown to have numerous deleterious psychological effects (Kimerling et al., 2010; Lutwak & Dill, 2013).

As an alternative to hypotheses suggesting distinct deployment stressors for women, some researchers have proposed cognitive models to explain why women often have higher rates of PTSD than men, even when type of trauma and level of trauma exposure is not different (Simmons & Granvold, 2005). These models suggest that women and men differ in their memory of the trauma experience; female survivors of trauma, for instance, may be more likely than male survivors to blame themselves for the traumatic event and are more likely to hold negative views of themselves (Simmons & Granvold, 2005). Because female service members in our sample had lower exposure to warfare, one might expect that their levels of PTSD would also be less severe; however, the finding that their PTSD symptomatology was comparable to men’s may have been due in part to women’s differing cognitive appraisals of their experiences.

Both categories of hypotheses seem possible for the current study, and future research should aim to more provide more definitive explanations for equal or higher rates of PTSD among women despite less exposure to warfare. For example, although several unique deployment stressors (such as concerns about family life) have been identified (Vogt et al., 2005), efforts should be made to include scales or items that adequately capture these “non-traditional” stressors (e.g., beyond warfare exposure). In addition, assessing for types of cognitive appraisals following warfare exposure has the potential to provide rich data. For instance, a result indicating that female service members tend to blame themselves for certain war experiences more than male service members would likely yield fruitful information for understanding gender differences in military-related PTSD.
Unit Cohesion

Overall, service members in our sample reported only a moderate degree of unit cohesion. The mean unit cohesion score represented the “Neither Agree Or Disagree” response option. This lack of agreement with items reflecting cohesiveness within the unit runs parallel to other findings suggesting lower reports of cohesion among National Guard and Reserve, compared to active duty, troops (Malone et al., 1996). One explanation for this discrepancy, which has been suggested within the UK military literature, is that NGR soldiers may deploy to theater as individuals and not with their parent unit; thus, opportunities to form cohesive bonds are limited (Browne et al., 2007). Also, NGR service members often experience rapid mobilization and may have less time to devote to successful bonding with other soldiers.

Results from the present study showed that female service members reported significantly lower levels of cohesion than male service members; in fact, women tended, on average, to select response options reflecting disagreement that their unit was cohesive. To our knowledge, this is only the second study to investigate gender differences in unit cohesion specifically among NGR personnel (Kline et al., 2013). Our finding of lower perceived cohesion among female service members is consistent with the nascent research on unit cohesion and gender (Dickstein et al., 2010). Although an increasing number of women are entering the service, the fact remains that the military’s predominantly male culture may engender feelings of isolation. Further research is needed to understand the processes by which female service members seek support, both from other women and from men, while deployed.

Men and women both exhibited a relationship between lower levels of unit cohesion and more severe symptoms of PTSD, and this result held above and beyond the effects of demographic control variables. This finding is consistent with an emerging body of research
documenting more salubrious mental health outcomes for individuals perceiving high unit cohesion (e.g., Mulligan et al., 2010). In addition, our results indicate that the positive direct effects of unit cohesion should benefit both genders, providing further support for the conclusion that a high level of unit cohesion is associated with better mental health outcomes among women as well as men (McTeague et al., 2004; Kline et al., 2013). Previous research suggests that high levels of unit cohesion are likely to foster a sense of personal control and self-efficacy, ultimately resulting in the use of less avoidant coping strategies and increased ability to re-appraise stressful situations (Pietrzak et al., 2010; McAndrew et al., in preparation). Additionally, the feeling of being committed to and supported by one’s unit may enhance one’s ability to derive meaning from stressful deployment experiences (Pietrzak et al., 2010).

Some literature has suggested that female service members may especially benefit from strong social support or cohesion during deployment (Vogt et al., 2005; Kline et al., 2013). In a recently published study, Kline and colleagues (2013) examined gender differences in risk factors such as combat exposure among both male and female NGR service members following deployment to Iraq. Results showed that being female predicted higher levels of post-deployment PTSD and lower levels of unit cohesion and military preparedness; after controlling for unit cohesion and military preparedness, the gender difference in PTSD was reduced by 18% (Kline et al., 2013). Thus, the authors concluded that female service members’ increased risk for developing PTSD is likely a result of these military institutional factors.

Despite the aforementioned results, the present study did not find that unit cohesion had stronger positive effects on PTSD for women versus men. Drawing upon Kline and colleagues’ (2013) results, it may be that other institutional factors besides unit cohesion play a role in the development of PTSD. In fact, preparedness, or mastery of technical military skills and
knowledge of what to expect during deployment, had a stronger effect on PTSD in women in that study than did unit cohesion (Kline et al., 2013). Future studies should aim to examine a variety of modifiable military institutional factors, including preparedness and self-efficacy among female service members (Goldmann et al., 2012).

**Unit Cohesion Buffering Hypothesis**

Although we identified a direct relationship between unit cohesion and PTSD, we did not find support among either men or women for the hypothesis that greater unit cohesion would buffer against the effects of warfare exposure on PTSD severity. Though such literature is in its early stages, the two studies that exist from OIF/OEF military personnel have demonstrated support for the hypothesis that higher levels of unit cohesion should protect against the deleterious psychological effects of warfare exposure (Armistead-Jehle et al., 2011; Dickstein et al., 2010). One possible explanation for our lack of a buffering effect is that the level of warfare exposure experienced by the soldiers in our study was lower than levels experienced by other samples (e.g., Renshaw, 2010). Our sample’s combat exposure mean score, for example, was more than one standard deviation lower than the combat exposure mean in Armistead-Jehle and colleagues’ (2011) sample of active duty U.S. Marines returning from Iraq. This lower rate of exposure may have precluded the emergence of a buffering effect.

A noted disadvantage of Armistead-Jehle and colleagues’ (2011) study was that their sample was comprised entirely of men. Although the second study that found support for the buffering hypothesis did include both men and women (Dickstein et al., 2010), these female service members were deployed as Air Force medical providers and therefore their roles in theater were likely qualitatively different than those of Army National Guard and Reservists in our sample. For instance, although both healthcare and combat stressors were associated with
PTSD, service members in that study reported a greater number of healthcare-related stressors (e.g., treating injured patients) than combat-related exposures. In addition, measurement of warfare experiences differed significantly between the two studies. Dickstein and colleagues (2010) assessed for degree of emotional impact of each exposure; the present study did not. Therefore, there may have been a greater range of exposure scores in that study from which to detect a buffering effect. Another critical difference between the two studies is that whereas the average length of deployment for service members in our sample was approximately one year, the average length of deployment for service members in Dickstein and colleagues’ (2010) was much lower: approximately 80 days.

Finally, our results are in contrast to Fontana and colleagues’ (1997) study of Vietnam veterans, which found unit cohesion had protective effects at low to moderate levels of warzone exposure, but that at high levels of exposure, unit cohesion was detrimental to mental health. Such results have not been replicated in the current conflicts (Dickstein et al., 2010), perhaps due to the significant potential for recall bias inherent in Fontana and colleagues’ design. In that study, data was collected 10 or more years following deployment; thus, recollection might have been colored by both positive and negative post-war experiences. (Similarly, the time lag may have simply led to difficulties in accurate recall of degree of unit cohesion.) The current view in the literature is that unit cohesion has an inverse, linear relationship with PTSD (McAndrew et al., in preparation; Dickstein et al., 2010). Nonetheless, Fontana and colleagues’ (1997) results point to the possibility that high levels of cohesion may have negative effects in the long-term. Future research should aim to explore the relationships among warfare exposure, unit cohesion, and PTSD longitudinally.
Clinical Implications

Given our finding that perceived threat of direct attack or personal injury is especially predictive of PTSD symptomatology, clinicians’ assessments of post-deployment psychological functioning may wish to include inquiry of whether or not soldiers experienced these types of combat exposures, or whether they were stationed in a forward area where the threat seemed pervasive. Such questions could be used to guide identification of individuals most at risk for developing PTSD. The inclusion of a warfare exposure screen within post-deployment mental health examinations may also circumvent the issue of stigma, as service members may be more hesitant to endorse overt, face-valid symptoms of psychological distress.

Although it is currently unknown whether there are interventions that could attenuate the impact of perceived threat of attack or personal injury, some researchers have argued that pre-deployment interventions that focus on preparedness for such extreme situations could be useful (Iverson et al., 2008). The perception that deployment duties surpass one’s prior experience may be related to a greater perception of threat or loss of control during a traumatic deployment experience, and indeed low preparedness has been associated with PTSD in several studies (e.g., Iverson et al., 2008; Kline et al., 2013). Systematic military interventions aimed to increase one’s sense of mastery and control may lessen the impact of perceived threat.

In addition, our study’s specific finding that killing (or believing to have killed) in combat was associated with the worst PTSD symptomatology reiterates the importance of assessing for this particular warfare experience upon return from theater. Clinicians should not assume that service members will volunteer such experiences without being asked. Maguen and Burkman (2013) point out, for example, that a veteran or service member can progress through multiple levels of treatment and never be asked directly about killing.
Killing in combat is often considered a potentially morally injurious event, in that the act of taking another’s life is likely to “transgress deeply held moral beliefs and expectations” and can lead to significant inner conflict; such conflict has been termed “moral injury” (Litz et al., 2009). The moral injury framework posited by Litz and colleagues (2009) suggests that an experience which is at odds with an individual’s core ethical and moral beliefs is likely to lead to unique outcomes such as shame, guilt, demoralization, self-handicapping behaviors (i.e., self-sabotaging of relationships), and self-harm such as parasuicidal behaviors (Litz et al., 2009). Although manifestations of moral injury may include PTSD-like symptoms (i.e., intrusive memories, avoidance, numbing), the self-condemnation that accompanies morally injurious events (such as killing) points to the importance of treatment that specifically targets the moral wounds of combat (Litz et al., 2009).

Although the present study did not demonstrate unit cohesion as a buffer against the negative effects of warfare exposure, we did find that higher unit cohesion was associated with fewer PTSD symptoms. Among the numerous military-related risk and resiliency factors studied within the literature, it is encouraging that unit cohesion is one that is potentially modifiable. Although the initial inclination is to encourage augmentation of unit cohesion within the National Guard and Reserve, several issues must first be addressed by future research.

In addition, these data were cross-sectional in nature and therefore no causal relations can be inferred. It is possible, for example, that service members who had higher PTSD symptomatology at the outset (and perhaps even before deployment) were less likely to seek support from their units and thus perceived lower levels of cohesion. Similarly, other confounding variables may play a role in the relationship. Soldiers with more extroverted personalities, for instance, may report better unit cohesion and receive better social support. In
this case, the individual’s extroversion rather than unit cohesion would be the cause of fewer PTSD symptoms. Additionally, the processes by which unit cohesion predicts fewer symptoms of PTSD is under-researched. Although resilience has been identified in two studies as a potential mechanism (Pietrzak et al., 2010; McAndrew et al., in preparation), future research should aim to examine these constructs longitudinally.

In addition, researchers may benefit from including a measure of unit cohesion at the unit level. Cohesion data could be collected from each individual within a unit, for instance, and then averaged to create a composite, unit-level cohesion score. With this design, researchers would have the advantage of comparing different units, each with a different level of cohesion, to determine whether there is any effect on PTSD rates given varying degrees of trauma exposure.

Although it is certainly first necessary to establish unit cohesion as a causal agent, an overarching goal of resiliency-related military studies is to guide the implementation of policies that may reduce PTSD symptoms. Should unit cohesion be definitively demonstrated as a protective buffer against PTSD, there are a number of institutional-level considerations to take into account. Compared to their active duty counterparts, for instance, NGR members may be more likely to deploy without a parent unit (Browne et al., 2007); thus, efforts to ensure that National Guard and Reservists are deployed with the unit through which they trained may be an important first step in increasing unit cohesion (Goldmann et al., 2012). The training that occurs prior to deployment is likely to be the original context in which cohesive bonds are formed.

Beyond more salubrious mental health outcomes for service members, high levels of unit cohesion are likely to result in desirable outcomes for the military, such as better individual and group performance and higher retention rates (Oliver et al., 1999). Importantly, high levels of cohesion may moderate the effect of deployment stress on performance, such that units with
stronger cohesion are capable of performing well even under significant stress (Bowers et al., 1996). This is consistent with one study’s findings that in groups with greater unit cohesion, individual soldiers had higher functioning during specific missions (Rom & Mikulincer, 2003). Therefore, the positive effects of unit cohesion may translate into enhanced performance for the military.

**Limitations**

Though a strength of the present study was its general representativeness of the U.S. NGR component at the time of data collection, those who agreed to participate were more likely to be White than of other races (McAndrew et al., in press). Also, although being of minority status was not associated with lower unit cohesion in our study, minorities did report more severe PTSD symptoms, a finding that is consistent with much of the literature on risk factors for PTSD in the military (e.g., Brailey et al., 2007; Dickstein et al., 2010). As psychosocial factors such as racial or ethnic discrimination would likely influence perceptions of unit cohesion, future research is needed to adequately understand the relationships between unit cohesion, warfare exposure, and PTSD among those of minority status.

A second category of limitations relates to measurement. Although some researchers have opted to use a continuous version of the CES-DRRI (e.g., Vogt & Tanner, 2007), which assesses the frequency of each exposure type, in the current study we used a dichotomous “yes/no” response format in order to combine the scale with the DE-DRRI into a composite score of warfare exposure. Thus, we could not examine whether frequency of particular exposures has any influence on PTSD symptomatology. Further, we did not assess for amount or degree of distress caused by each warfare experience. It is possible that the same type of exposure could be differentially distressing depending on the service member. Therefore, in
addition to simple item endorsement, future studies should aim to incorporate a corresponding rating of distress or emotional impact. This may be particularly elucidating for examining gender differences in perceptions of distress.

In addition, although the unit cohesion measure used in the current study has demonstrated adequate psychometric properties, it only contains three items and may not tap into all potential aspects of cohesion within a unit. Further, because no studies have examined unit cohesion in relation to warfare exposure, the ability to make comparisons across samples is limited. As an alternative, the Deployment Risk and Resilience Inventory contains a more widely used, 12-item unit support scale (King et al., 2003) that has been used in other research on warfare exposure and unit cohesion (e.g., Armistead-Jehle et al., 2011).

There are also some limitations with regard to statistical analyses that may be addressed by future research. In Hypothesis 4 (examination of a buffering effect) we used total level of warfare exposure (i.e., combined CES-DRRI and DES-DRRI score) as the predictor variable rather than the factor scores obtained from the CES-DRRI. In addition, in all analyses PTSD symptomatology was determined by using the total PCL-M score rather than specific symptom clusters. Higher unit cohesion, for example, may differentially affect PTSD symptom clusters. Despite these limitations, the current study provided further support for the detrimental impact of warfare exposure, contributed to the nascent research on differing perceptions of unit cohesion among male and female service members, and highlighted the relationship between unit cohesion and PTSD within the National Guard and Reserve.
List of References


Appendix: Review of Social Support Literature

Much research has shown that individuals who have a lot of social support are actually less vulnerable to psychological disorders (Cobb, 1976; Holahan & Moos, 1981). Although controversy exists as to the appropriate definition of social support, the construct has been described by Cobb (1976) as information received by an individual under stress that leads him or her to feel that he or she is loved and cared for, esteemed and valued, and has a network of friends that can be relied on in stressful times.

Brewin, Andrews, and Valentine’s (2000) meta-analysis of 77 studies found nine significant predictors of PTSD. Peri- and post-traumatic factors (e.g., trauma severity, subsequent life stresses) were stronger predictors of PTSD than pre-trauma factors (e.g., childhood abuse). The strongest predictor identified was a lack of post-trauma social support, which was associated with an average weighted effect size of .40 (a medium sized effect) (Cohen, 1988). Most of the other reported effect sizes were in the range of .10 to .19, suggesting that lack of social support may contribute to PTSD above and beyond a number of other predictors.

In their meta-analytic review of 68 studies, Ozer, Best, Lipsey, and Weiss (2003) identified significant effect sizes for seven PTSD predictors. Peri- and posttraumatic variables (i.e., perceived threat to one’s life, posttraumatic social support) as compared to pre-traumatic factors (i.e., history of prior trauma) were the strongest predictors of PTSD. An examination of social support in 11 studies revealed that the relationship between perceived social support following the trauma and PTSD symptoms was in the small-to-medium range. Individuals who had lower levels of perceived social support after the traumatic event reported higher levels of PTSD symptomatology.
Interestingly, Ozer and colleagues’ (2003) meta-analysis also revealed that the relationship between social support and PTSD varied depending upon sample studied. A stronger inverse relationship between perceived support and PTSD was found for studies of combat trauma than for studies of noncombat interpersonal violence. This suggests that social support may be of particular importance to military populations, who likely face exposure to unique types of traumas.

The authors also discussed the type of measures used to generate the effect sizes for social support (Ozer et al., 2003). In the majority of studies reviewed, the emphasis was on emotional support, rather than tangible support such as financial assistance. Thus, feeling supported in psychological processing of the meaning of the event, or in the management of the psychological distress associated with intrusive memories or nightmares, might be especially beneficial.

Several studies have also sought to examine which variables are primarily responsible for the relationship between social support and PTSD. Solomon and colleagues (1990) found that the most important variable that predicted long-term symptoms of PTSD in Israeli soldiers was the subjective feeling of loneliness. Similarly, another study developed a path model on the effects of social support and battle intensity on loneliness and breakdown during combat. The model suggested that battle intensity and low officer support led to PTSD directly and indirectly by causing increased feelings of loneliness (Solomon et al., 1986).

King, King, Fairbank, Keane, and Adams (1998) examined relationships among several war zone stressor dimensions, resilience-recovery factors, and PTSD symptoms in a national sample of 1,632 Vietnam veterans (26% women and 74% men). Postwar social support, one of the identified resilience-recovery factors, was broken down into two types: structural social
support and functional social support. Structural support was operationalized in terms of size and complexity of the veteran’s social network, whereas functional support was defined in terms of perceived emotional sustenance and instrumental assistance. As expected, structural support predicted functional support for both men and women (King et al., 1998).

Of the four resilience-recovery factors examined (hardiness, structural social support, functional social support, and stressful life events), functional social support most greatly impacted PTSD for both women and men. Further, among women, functional social support had the largest total effect for all variables, e.g., across both the resilience-recovery factors and types of war-zone stressors. Both of these findings highlight the unique contribution of social support to the post-war mental health functioning of veterans (King et al., 1998).

Interestingly, the hypothesized direct link from structural social support to PTSD was demonstrated in men, but not women. The authors noted that when competing with other PTSD predictors, structural social support for women was not strong enough to be considered a unique contributor (King et al., 1998). These results suggest that among female veterans, size and complexity of the social network is not as critical to PTSD development as is the quality of support received.

One study of married male combat veterans aimed to determine the specific types of social support veterans reported receiving, and to determine how these different types of social support were related to PTSD symptomatology (Wilcox, 2010). Four distinct factors were observed: significant other, family, military peers, and friends. These results indicate that combat veterans distinguish between different sources of social support, rather than perceiving one all-inclusive global construct of social support (Wilcox, 2010). As was expected, higher levels of support from each category were associated with lower levels of PTSD. Interestingly, the study
revealed that sources of social support from family, significant other, and military peers were related to the level of PTSD symptomatology among participants, but that social support from friends was not significantly related. These results suggest that social support from friends may have less of a buffering effect than sources of social support from a significant other, family, and military peers (Wilcox, 2010). Further, it lends support to the assumption that veterans may be able to closely identify with military peers (as compared to non-military friends) and thus achieve more salubrious mental health outcomes.

Social support is commonly viewed as a buffering factor against stressful life events (Cohen & Wills, 1985); however, studies with veterans have provided contrasting results. In their study of Vietnam veterans, King and colleagues (1998) hypothesized that functional social support would interact with war zone stressor exposure, such that soldiers exposed to high levels of war zone stressors and high functional social support would exhibit fewer PTSD symptoms than those exposed to high levels of war zone stressors but low functional social support. However, the buffering hypothesis was not upheld for either women or men. In explaining their findings, the authors suggested that perhaps the special combination of the severe stressor as predictor and the stressor-dependent consequence as criterion precluded the moderation of their relationship (King et al., 1998).

Although Barrett and Mizes (1988) found that social support was significantly related to the severity of Vietnam veterans’ PTSD symptoms, they similarly failed to find support for the buffering hypothesis. An examination of combat level, social support, and PTSD symptomatology demonstrated that, as expected, veterans with high combat levels reported more PTSD symptoms than those who experienced low levels of combat. Similarly, those with high levels of social support experienced fewer PTSD symptoms. However, a significant interaction
between social support and combat level was not found on PTSD symptoms. A noted shortcoming of this study, however, was that measures of social support and PTSD symptoms were not yet validated. In addition, this study’s sample was composed exclusively of men (Barrett & Mizes, 1988).

Particularly among OIF and OEF veterans, however, social support has gained increased support as a construct that mitigates post-deployment maladjustment (Griffith, 2012). In a prospective, longitudinal study of 522 Army National Guard troops deployed to Iraq, participants completed measures of PTSD symptoms and potential risk/protective factors one month before deployment. They also completed measures of PTSD, deployment stressor exposure, and post-deployment outcomes two to three months after returning from Iraq (Polusny et al., 2010). Results showed that among soldiers without PTSD symptoms pre-deployment, 13.8% reported post-deployment probable PTSD. After accounting for pre-deployment factors (e.g. education status), new-onset probable PTSD was predicted by exposure to combat. Further, post-deployment social support was a significant protective factor in the etiology of PTSD.

In one study of risk and protective factors in a sample of National Guard and Reserve OIF/OEF veterans, suicidal ideation was associated with increased combat exposure and PTSD, as well as to decreased perceptions of social support. Further, post-deployment social support was found to protect against suicidal ideation and PTSD, even after adjusting for risk factors such as high combat exposure (Pietrzak, Goldstein, Rivers, Johnson, & Southwick, 2010). Participants who reported that they had family and friends with whom they could discuss their deployment were less likely to report suicidal ideation, irrespective of combat exposure severity. These results are promising, as PTSD and risk of suicide are highly correlated (Kang & Bullman, 2008).
In a study of psychosocial buffers of traumatic stress, Pietrzak and colleagues (2010) similarly found that lower unit support and lower post-deployment social support were associated with increased PTSD and depressive symptoms amongst a sample of OIF/OEF National Guard veterans. Further, psychological resilience, unit support, and post-deployment social support were protective against both PTSD and depressive symptoms (Pietrzak et al., 2010). The bulk of these findings on social support are consistent with studies suggesting that post-deployment interventions that enhance soldiers’ interpersonal resources at home, work, and in the community might enhance recovery and resiliency (Benotsch et al., 2000).
Vita

Shaina Gulin was born on January 13, 1987 in Baltimore, Maryland. She graduated *cum laude* from the University of Maryland College Park in May 2009 with a Bachelor of Arts in Psychology and Criminology & Criminal Justice. She then worked for two years as a psychology technician at the Behavioral Health Lab of the Philadelphia Veterans Affairs Medical Center in Philadelphia, Pennsylvania before entering the Clinical Psychology doctoral program at Virginia Commonwealth University in Richmond, Virginia.