Combat-Related Stress, Cohesion, Coping, and Perceived Threat: Predictors and Moderators of Posttraumatic Symptomatology Among Deployed U.S. Army Soldiers

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COMBAT-RELATED STRESS, COHESION, COPING, AND PERCEIVED THREAT:
PREDICTORS AND MODERATORS OF POSTTRAUMATIC SYMPTOMATOLOGY
AMONG DEPLOYED U.S. ARMY SOLDIERS

A dissertation
by

KYLE P. BOURQUE

Submitted in partial fulfillment
of the requirements for a degree of
Doctor of Philosophy

August 2012
This study examined the roles cohesion, coping, and perceived threat have in buffering the effect of war-zone stress on mental health symptoms. Specifically, six factors were tested as potential moderators of the relationship between combat-related stressors and posttraumatic stress symptomatology (PTSS), including horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, problem-focused coping, emotion-focused coping, and perceived threat. In addition, direct effects and curvilinear interaction effects were examined. This study was a secondary analysis of Mental Health Advisory Team (MHAT) VI data collected by military researchers as part of an ongoing effort to assess soldiers’ behavioral health. This study analyzed data from a total of 1,824 male and female U.S. Army soldiers from 15 active-duty brigades who anonymously completed the Walter Reed Army Institute of Research (WRAIR) Deployment Well-Being Survey during their deployment to Iraq in support of Operation Iraqi Freedom (OIF). PTSS, combat-related stressors, horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, problem-focused coping, emotion-focused coping, and perceived threat were measured. Hierarchical multiple regression analysis
was used to identify both risk factors and protective factors for PTSS. The analysis revealed three risk factors and four protective factors. During a war-zone deployment, higher levels of combat-related stressors, problem-focused coping, and perceived threat (i.e., risk factors) were independently associated with greater report of PTSS. Higher levels of horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, and emotion-focused coping (i.e., protective factors) were independently associated with decreased levels of PTSS. Hierarchical moderated multiple regression analysis indicated that vertical (NCO) cohesion, vertical (officer) cohesion, and emotion-focused coping buffered the effect of combat-related stressors on PTSS; soldiers higher in vertical (NCO) cohesion, vertical (officer) cohesion, and emotion-focused coping showed weaker relationships between combat-related stressors and PTSS. No support for curvilinear interaction effects were found, suggesting that for this population of soldiers deployed to Iraq, the moderating effect of vertical cohesion and emotion-focused coping on the relationship between combat-related stressors and PTSS is linear in nature.
DEDICATION

To the Soldiers of the 1st Brigade Combat Team,

10th Mountain Division (Light Infantry), Fort Drum, New York:

Never have I been more honored than when in your presence.
ACKNOWLEDGEMENTS

Throughout my life I have been blessed with more support than any one person deserves. I truly believe that many of my seemingly individual accomplishments have, in actuality, been accomplishments of the collective. This endeavor was no different. Without the generous support of family, friends, professors, the U.S. Army, and countless others, there is absolutely no way this dissertation would have been successfully completed.

To Christine, my wife and best friend, your love enabled me to overcome self-doubt. Your encouragement kept me writing even when going to a Red Sox or Bruins game seemed like the better option. To my family—Mom, Dad, Kellie, Kevin, Bruce, Sue, Amy, and Jim and Betty Hofmann—words cannot express what you all mean to me. To my friends, I count the times spent with you as some of the best. I consider it a privilege to have each of you in my life.

To Professor Lubben, your mentorship and friendship helped me successfully navigate a system that, at times, was foreign to me. Your direction kept me focused and motivated. To Professor Crea, you have been a constant source of inspiration. You were the first professor to tell me that I could finish. After hearing your words, I really believed that I could. I truly appreciate the time you devoted to reading my drafts and improving my work. I would like to thank Professor Mahalik for his time, expert advice, and encouragement throughout this process. I would also like to thank all the Boston College professors who patiently taught me a variety of subjects including theory, methodology, and statistics.
Special thanks go to Colonel Paul Bliese and his entire MHAT VI team for collecting the data used in this study. The staff at the Walter Reed Army Institute of Research (WRAIR) was instrumental in enabling me to complete this dissertation. I would like to thank Lieutenant Colonel Jeffrey Thomas for helping me gain access to the MHAT VI data and Dr. Lyndon Riviere for tirelessly serving as my WRAIR point of contact. Dr. Riviere’s support from start to finish was unwavering.

Pursuing doctoral education requires time. I would like to thank Colonel Derrick Arincorayan for allowing me the time necessary to complete this mission. I would also like to thank Lieutenant Colonel Graeme Bicknell for his early encouragement and for introducing me to WRAIR staff.

I could not have asked for a more supportive group of students with whom to go through this program. I would like to sincerely thank Jennifer Cole, Philip Higgins, Haesang Jeon, Jennifer Leonardo, Christopher Salas-Wright, and Abby Schwartz for helping the senior citizen of the cohort make it through.

Lastly, Professor Barbara Berkman and Brenda Vitale, the doctoral program’s Assistant Director for Academic and Student Services, deserve special mention. Professor Berkman’s guidance was invaluable, and Brenda was a constant source of information and support. Thank you both for all your help.

This dissertation has been reviewed by the WRAIR. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting true views of the Department of the Army or the Department of Defense.
# TABLE OF CONTENTS

DEDICATION ............................................................................................................................. i
ACKNOWLEDGEMENTS ........................................................................................................... ii
TABLE OF CONTENTS .............................................................................................................. iv
LIST OF TABLES .......................................................................................................................... vii
LIST OF FIGURES ...................................................................................................................... viii
Chapter I. Introduction .............................................................................................................. 1
Purpose ......................................................................................................................................... 1
Significance ................................................................................................................................. 2
  Combat-Related Stressors and PTSD ......................................................................................... 2
  PTSD Prevalence and Impact .................................................................................................... 4
Protective Factors ...................................................................................................................... 9
Risk Factors ............................................................................................................................... 12
Specific Aims .............................................................................................................................. 16
Research Questions .................................................................................................................. 18
Definitions of Key Concepts .................................................................................................... 20
  Posttraumatic Stress Symptomatology .................................................................................. 20
  Combat-Related Stressors ....................................................................................................... 20
  Cohesion .................................................................................................................................. 21
  Coping ..................................................................................................................................... 22
  Perceived Threat .................................................................................................................... 22
Chapter II. Literature Review .................................................................................................. 23
Theoretical Framework .............................................................................................................. 23
  Stress and Adaptation as a Psychological Process ................................................................. 26
  Stress and Adaptation as a Social Process ........................................................................... 29
Cohesion as a Protective Factor ............................................................................................... 31
Coping as a Protective and Risk Factor .................................................................................. 35
Perceived Threat as a Risk Factor .......................................................................................... 39
Hypotheses .............................................................................................................................. 42
Chapter III. Methods ................................................................................................................ 45
Introduction to the MHAT ......................................................................................................... 45
  Background of the MHAT VI-Operation Iraqi Freedom 07-09 Study ................................. 46
Sampling ..................................................................................................................................... 47
Missing Data Issues .................................................................................................................. 48
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stochastic Regression Imputation: An Overview</td>
<td>49</td>
</tr>
<tr>
<td>Stochastic Regression Imputation: Implementation</td>
<td>50</td>
</tr>
<tr>
<td>Listwise Deletion</td>
<td>51</td>
</tr>
<tr>
<td>Sample Comparison</td>
<td>51</td>
</tr>
<tr>
<td>Measures</td>
<td>52</td>
</tr>
<tr>
<td>Combat-Related Stressors Index</td>
<td>52</td>
</tr>
<tr>
<td>Horizontal (Peer) Cohesion Index</td>
<td>53</td>
</tr>
<tr>
<td>Vertical Cohesion Indexes: NCO and Officer</td>
<td>54</td>
</tr>
<tr>
<td>Coping Indexes: Emotion-Focused and Problem-Focused</td>
<td>55</td>
</tr>
<tr>
<td>Perceived Threat</td>
<td>57</td>
</tr>
<tr>
<td>Posttraumatic Stress Symptomatology Index</td>
<td>57</td>
</tr>
<tr>
<td>Statistical Analyses</td>
<td>58</td>
</tr>
<tr>
<td>Moderation Effects: An Overview</td>
<td>58</td>
</tr>
<tr>
<td>Analysis Plan</td>
<td>60</td>
</tr>
<tr>
<td>Hierarchical Multiple Regression</td>
<td>62</td>
</tr>
<tr>
<td>Hierarchical Moderated Multiple Regression</td>
<td>62</td>
</tr>
<tr>
<td>Centering continuous variables</td>
<td>63</td>
</tr>
<tr>
<td>Hierarchical steps</td>
<td>63</td>
</tr>
<tr>
<td>Plotting and post-hoc analysis</td>
<td>64</td>
</tr>
<tr>
<td>Relationship between Statistical Model and Study Hypotheses</td>
<td>65</td>
</tr>
<tr>
<td>Regression Equation 1 and Related Hypotheses</td>
<td>66</td>
</tr>
<tr>
<td>Regression Equations 2a through 2f and Related Hypotheses</td>
<td>67</td>
</tr>
<tr>
<td>Hierarchical Linear Models (HLM)</td>
<td>69</td>
</tr>
<tr>
<td>Chapter IV: Findings</td>
<td>72</td>
</tr>
<tr>
<td>Demographic and Military Factor Characteristics</td>
<td>72</td>
</tr>
<tr>
<td>Stress, Threat, Coping, and Cohesion by PTSS</td>
<td>75</td>
</tr>
<tr>
<td>Bivariate Associations</td>
<td>79</td>
</tr>
<tr>
<td>Multivariate Associations</td>
<td>81</td>
</tr>
<tr>
<td>Hierarchical Multiple Regression: Direct-Effects-Only Model</td>
<td>81</td>
</tr>
<tr>
<td>Hierarchical Moderated Multiple Regression: Testing for Interactions</td>
<td>84</td>
</tr>
<tr>
<td>Plotting and Post-Hoc Analysis of Significant Interactions</td>
<td>89</td>
</tr>
<tr>
<td>Chapter V: Discussion</td>
<td>94</td>
</tr>
<tr>
<td>Introduction</td>
<td>94</td>
</tr>
<tr>
<td>Risk and Protective Factors</td>
<td>95</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1. Demographic and Military Factor Variables by PTSS........................................ 73

Table 2. Stress, Threat, Coping, and Cohesion by PTSS.................................................... 78

Table 3. Correlations Among All Study Variables and Reliability Estimates for Study Measures .......................................................... 80

Table 4. Results of Hierarchical Multiple Regression Model Predicting PTSS Among U.S. Army Soldiers Deployed to Iraq.......................................................... 83

Table 5. Results of Six Hierarchical Moderated Multiple Regression Models Predicting PTSS Among U.S. Army Soldiers Deployed To Iraq........................................ 88
LIST OF FIGURES

Figure 1. Soldier Adaptation Model (SAM) with factors of primary interest ............... 23

Figure 2. Moderator framework representing direct effects and interactions ............... 60

Figure 3. Moderated regression model testing for direct effects and interactions ........ 61

Figure 4. NCO cohesion as a moderator of the combat-related stressors by PTSS relationship among soldiers deployed to Iraq ...................................................... 89

Figure 5. Officer cohesion as a moderator of the combat-related stressors by PTSS relationship among soldiers deployed to Iraq ................................................................. 91

Figure 6. Emotion-focused coping as a moderator of the combat-related stressors by PTSS relationship among soldiers deployed to Iraq ................................................................. 92
Chapter I. Introduction

Purpose

During the decade since the 9/11 attacks, more than 2 million U.S. military personnel have been deployed to Afghanistan and Iraq in support of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). These conflicts represent the largest sustained period of continual combat operations in more than 3 decades (Friedman, 2005). When compared to previous conflicts, OEF and OIF deployments have been both longer in duration (e.g., 15 months or more in theatre) and higher in number (e.g., multiple deployments), with minimal restorative breaks either during or between deployments (Hosek, Kavanagh, & Miller, 2006). Military personnel involved in previous wars (e.g., Vietnam War, Persian Gulf War) and in the conflicts in Afghanistan and Iraq have been exposed to a wide variety of combat-related stressors (e.g., having been shot at, knowing someone who was killed) that have been consistently linked to elevated risk for mental health problems, particularly posttraumatic stress disorder (PTSD) (Helzer, Robins, & McEvoy, 1987; Hoge et al., 2004; Iowa Persian Gulf Study Group, 1997; Jordan et al., 1991; Kang, Natelson, Mahan, Lee, & Murphy, 2003; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Prigerson, Maciejewski, & Rosenheck, 2001; Smith et al., 2008). Based on the many studies across multiple military conflicts, few doubt that a link between combat-related stressors and PTSD exists among military personnel who have experienced a war-zone deployment.

Although the conflict in Iraq officially ended on December 15, 2011, the U.S. military continues to have a large number of deployed service members in Afghanistan and, if history is a guide, the U.S. military will more than likely be deploying soldiers to
combat zones in the future. Decreasing the number of returning military personnel with symptoms of posttraumatic stress could potentially have positive implications for individual service members, their families, the military, and society in general. To that end, this study’s primary purpose was to examine protective factors and risk factors as potential moderators of the relationship between combat-related stressors and symptoms of posttraumatic stress. In other words, this study sought to identify modifiable factors that could potentially protect military personnel from the negative effects combat-related stressors have been shown to have on the psychological health of service members who have been deployed to a war zone.

For this study, posttraumatic stress symptomatology (PTSS; Vogt et al., 2011) was used as a proxy for PTSD; a clinical diagnosis of PTSD could not be determined given the self-reported nature of the data and the absence of a clinician-administered assessment. According to the current version of the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000), PTSS includes physiological and psychological arousal; reexperiencing events through intrusive thoughts, dreams, or feelings; avoidance of circumstances associated with the event; and a general numbing of responsiveness.

Significance

Combat-Related Stressors and PTSD

Combat-related stressors, when compared to other stressors such as experiencing workplace violence or being in a life-threatening accident, have been shown to result in higher rates of PTSD (Amir, Kaplan, & Kotler, 1996). Furthermore, research suggests
those who report combat-related trauma as their worst trauma are more likely to have PTSD during their lifetime and struggle with unresolved PTSS (Prigerson, Maciejewski, & Rosenheck, 2001). The negative effects can be long-term. Estimates from the seminal mental health study on Vietnam veterans, the National Vietnam Veterans Readjustment Study (NVVRS), indicate that 31% of those males who had served in Vietnam had developed PTSD during their lifetimes and 15% met the criteria for active PTSD approximately 11 to 12 years after the war (Kulka et al., 1990). Females who served in Vietnam had slightly lower lifetime (27%) and active (9%) PTSD prevalence rates when compared to men (Kulka et al., 1990). Responding to criticisms that the NVVRS estimates may have been inflated due to recall bias and other flaws, Dohrenwend and colleagues (2006) reanalyzed the NVVRS data and reported finding “little evidence of falsification” (p. 979). In fact, they found a stronger dose-response relationship between soldiers’ combat exposure and PTSD than had been reported in the original study (Dohrenwend et al., 2006).

Importantly, the NVVRS prevalence rates for both male and female Vietnam veterans were much higher when compared to the PTSD prevalence rates found in the U.S. population. Findings from the National Comorbidity Survey yielded an 8% lifetime prevalence rate (10% male, 5% female) for the U.S. population (Kessler et al., 1995). Furthermore, prevalence rates for active PTSD in the U.S. population have generally been lower than the rates reported by the NVVRS. For example, using *DSM-IV* criteria, Kessler, Chiu, Demler, and Walters (2005) reported a 12-month prevalence rate for active PTSD in the U.S. population at 3.5%. These findings would suggest deployment to a war
zone significantly increases one’s chances of experiencing PTSD during one’s lifetime, as well as having ongoing symptoms that meet the DSM-IV criteria for active PTSD.

The nature of war-zone deployments to Afghanistan and Iraq make exposure to combat-related stressors a possibility for all deployed military personnel. No deployed service members, regardless of their job titles, are exempt from hearing frequent explosions and living in harsh conditions. Decreasing exposure is often not an option, as mission dictates that military personnel keep doing their jobs even during times of high stress. The high likelihood of exposure to combat-related stressors during war-zone deployments makes the identification of potentially modifiable protective factors and risk factors important. Furthermore, identifying factors that can buffer, or weaken, the relationship between combat-related stressors and PTSS is an important step toward ensuring those who are sent to war in the future are not negatively impacted as a result.

**PTSD Prevalence and Impact**

Since the beginning of OEF and OIF, multiple studies of deployed military personnel indicate that 10% to 18% of troops serving in Afghanistan and Iraq have symptomatology consistent with PTSD following deployment (Grieger et al., 2006; Hoge, Auchterlonie, & Milliken, 2006; Hoge et al., 2004; Hoge, Terhakopian, Castro, Messer, & Engel, 2007; Milliken, Auchterlonie, & Hoge, 2007; Seal, Bertenthal, Miner, Sen, & Marmar, 2007; Smith et al., 2008; Thomas et al., 2010). Prevalence estimates of PTSD for military personnel depend on a range of factors including when the assessment occurs (e.g., pre-deployment versus post-deployment), who is assessed (e.g., infantry versus medical personnel), and what screening instrument is used to assess
symptomatology (e.g., self-report versus clinician-administered assessment). After acknowledging these methodological challenges inherent in estimating PTSD prevalence among military populations, Tanielian and Jaycox (2008) reviewed available epidemiological studies and found that of the 1.64 million military personnel who had returned home from OEF and OIF, approximately 75,000 to 225,000 (4.6% to 13.7%) had PTSS. The authors reported that using the prevalence estimates of the most generalizable studies would indicate that approximately 150,000 (9.1%) military personnel returned home with PTSS (Tanielian & Jaycox, 2008).

The economic and personal costs related to such a large number of military personnel returning from deployment with PTSS appear to be significant. Using micro-simulation modeling techniques, Eibner, Ringle, Kilmer, Pacula, and Diaz (2008) estimated that since 2001 the two-year economic costs resulting from PTSD ranged from 2.2 billion dollars to 3.2 billion dollars. Cost estimates increased to a range of 4.0 billion dollars to 6.2 billion dollars when depression was added to the model. These estimates included expenses related to direct medical costs, lost productivity (including reduced employment and lower earnings), and lives lost to suicide. Since the 2008 study by Tanielian and Jaycox many more members of the military have deployed in support of OEF and OIF. Therefore, it is possible that a substantial number of the more than 2 million military personnel that have returned from a deployment to Afghanistan or Iraq have returned home with PTSS. The size of this estimate suggests that a significant number of military personnel are being adversely impacted as a result of being deployed to war zones and the related costs will, more than likely, expand as the number of personnel with PTSS increases.
The economic costs related to PTSS are substantial and will likely increase over time. However, beyond the economic cost is the steep price being paid by military personnel who return from deployment with PTSS. In fact, research suggests that there is significant personal cost to each service member who has been adversely impacted when exposure to combat-related stressors results in PTSS. These costs are often seen in a service member’s decreased biological, psychological, and social functioning. Furthermore, the negative impact on quality of life related to developing PTSS is not confined to the individual service member. Family members can also be negatively impacted when a service member returns from Afghanistan or Iraq with PTSS. Military personnel often experience deployment-related symptoms upon returning from a combat zone, including becoming more distant, becoming emotionally unavailable, and becoming more aggressive. When left unresolved these symptoms may ultimately lead to lower levels of family functioning and divorce (Gimbel & Booth, 1994; Taft, Schumm, Panuzio, & Proctor, 2008).

Biological and psychological functioning can be negatively impacted as evidenced by research that has found individuals with PTSS are more likely to have other psychiatric problems such as depression, substance abuse, and other anxiety disorders (Brady, Killeen, Brewerton, & Lucerini, 2000; Jacobson et al., 2008; Kulka et al., 1990). Multiple studies have shown that OEF and OIF veterans with PTSS are at greater risk of positively endorsing suicidal ideations than OEF and OIF veterans without PTSS (Guerra, Calhoun, & Mid-Atlantic Mental Illness Research, Education, and Clinical Center Workgroup, 2011; Jakupcak et al., 2009; Jakupcak et al., 2011; Kang & Bullman, 2008). Furthermore, individuals with PTSS have higher rates of unhealthy behaviors such
as smoking and overeating (Buckley, Mozley, Bedard, Dewulf, & Greif, 2004; Simon et al., 2006; Vieweg et al., 2006), as well as higher rates of physical health problems including cancer, cardiovascular illness, and early-age heart disease mortality (Boscarino, 2008, 2006; Hoge et al., 2007).

The negative consequences of having PTSS are not limited to an individual’s psychological and biological functioning. Social functioning can also be negatively impacted by PTSS. Findings from a recent study of active-duty soldiers who had been returned home from Iraq for 1 year suggest that soldiers with PTSS have a tendency to miss more days of work when compared to soldiers without PTSS (Hoge et al., 2007). Another study, using a sample of Vietnam-era veterans, found that veterans with PTSS were at greater risk of experiencing unemployment than those veterans without PTSS (Smith, Schnurr, & Rosenheck, 2005). Furthermore, Savoca and Rosenheck (2000) found that employed Vietnam-era veterans with PTSS had lower average hourly earnings than employed Vietnam-era veterans without PTSS.

Negative consequences also include being at increased risk for impaired interpersonal relationships (MacDonald, Chamberlain, Long, & Flett, 1999), marital problems (Kulka et al., 1990), and parenting difficulties (Jordon et al., 1992; Ruscio et al., 2002). Impaired marital relationships often have a secondary effect that impacts the service member’s entire family as evidenced by multiple studies that have established a relationship between PTSD and poor family functioning (Gimbel & Booth, 1994; Taft et al., 2008). Furthermore, research suggests that veterans with PTSD are at increased risk of exhibiting aggression towards a spouse or partner when compared to veterans without PTSS. Recent studies of Vietnam veterans found higher prevalence rates of
aggression among Vietnam veterans with PTSD when compared to Vietnam veterans without PTSD (Monson, Taft, & Fredman, 2009; Taft, Street, Marshall, Dowdall, & Riggs, 2007). Similar results were found in a study that compared male OEF and OIF veterans with PTSD to those without PTSD. Those male OEF and OIF veterans with PTSD were found to be between 2 and 3 times more likely to exhibit aggression toward female partners (Teten et al., 2010). Evidence from a myriad of studies clearly indicates that individuals who experience PTSS are at greater risk of decreased biological, psychological, and social functioning. Furthermore, evidence suggests that family members, the military, and society can be negatively impacted when service members return from Afghanistan or Iraq with PTSS.

Given the evidence, identifying potentially modifiable factors that could protect military personnel from the deleterious effects combat-related stressors have on psychological well-being should be a primary goal of military leaders, behavioral health researchers, mental health providers, and communities across the United States. Since 9/11, one area where military leadership and behavioral health researchers have been placing a substantial amount of effort has been in identifying certain protective factors and risk factors and gaining a better understanding of how they relate to combat exposure and measures of psychological health (Bliese, Thomas, McGurk, McBride, & Castro, 2011; Hoge et al., 2004).

This study was designed to contribute to the U.S. military’s ongoing research effort by focusing on four potential protective factors (i.e., horizontal [peer] cohesion, vertical [NCO] cohesion, vertical [officer] cohesion, and problem-focused coping) and three potential risk factors (i.e., combat-related stressors, emotion-focused coping, and
perceived threat). In general, as protective factors increase, deleterious mental health symptoms (e.g., PTSS) tend to decrease or are less likely to develop. Risk factors typically have an opposite effect on mental health symptoms, where as a risk factor increases, deleterious mental health symptoms (e.g., PTSS) tend to increase or become more likely to develop. Therefore, a better understanding of both types of factors could potentially enable the military to find more effective ways to increase protective factors or decrease risk factors in order to decrease the likelihood of deployed military personnel developing PTSS during their war-zone deployments.

**Protective Factors**

Decreasing the number of military personnel who return from war-zone deployments with PTSS could have positive implications for individual service members, their families and communities, the military, and society in general. Well-documented links exist between combat-related stressors and PTSS, as well as between PTSS and individuals’ psychological, biological, and social functioning. Identifying protective factors and risk factors—which may also moderate the relationship between combat-related stressors and PTSS—could be an important step in building effective prevention efforts for those who have yet to deploy to a war zone.

Previous military studies have identified multiple factors that may act as protection against developing PTSS. In a study of Vietnam veterans, Fontana and Rosenheck (1998) found that finding higher levels of psychological benefit (e.g., affirmation of patriotic beliefs, self-improvement, solidarity with others) weakened the positive relationship between traumatic combat exposure and PTSS. Another study of
Vietnam veterans identified hardiness and social support as potential protective factors (King, King, Fairbank, Keane, & Adams, 1998). In a study of Persian Gulf War veterans, Vogt, Samper, King, King, and Martin (2008) identified positive perception of being prepared for deployment, positive perception of both one’s deployed living and one’s deployed working environments, minimal concerns about family and relationship disruption, and positive perception of deployment social support as five factors that could reduce the chances of experiencing PTSS.

Recent studies of military personnel who deployed in support of OEF and OIF have also identified possible factors that decrease the chances of experiencing PTSS. In a prospective study, Vasterling and colleagues (2010) found that regular active-duty soldiers showed smaller increases in PTSS from pre- to post-deployment when compared with those activated from National Guard status. This study also indicated that having fewer home-front concerns during deployment (e.g., missing important events at home) and having fewer stressful life events post-deployment (e.g., going through a divorce) were both related to decreased PTSS. Rona and colleagues (2007) studied United Kingdom Armed Forces personnel deployed to Iraq and found that troops deployed for fewer than 13 months during the previous 3 years, compared to those deployed for more than 13 months during the previous 3 years, were at decreased risk of experiencing PTSS. This finding suggests that shorter deployment lengths and less total time deployed could also serve as protective factors (Rona et al., 2007). Additional OEF and OIF studies have identified a wide range of potential protective factors including dispositional optimism (Thomas et al., 2011); benefit finding (Wood, Britt, Thomas, Klocko, & Bliese, 2011); unit support and post-deployment social support (Pietrzak et al., 2009);
resilience (Pietrzak, Johnson, Goldstein, Malley, & Southwick, 2009); and cohesion (Armistead-Jehle, Johnston, Wade, & Ecklund, 2011; Dickstein et al., 2010).

Importantly, two meta-analyses of PTSD risks found lack of social support highly predictive of PTSD. In fact, Brewin, Andrews, and Valentine (2000) found that among the 14 risk factors studied, lack of social support was the strongest positive predictor of PTSD and the strength of prediction was significantly stronger (weighted average $r = .43$) in military studies when compared to civilian studies (weighted average $r = .30$). These findings suggest that social support is a protective factor wherein higher levels of social support can protect individuals from developing PTSD. In another meta-analysis, Ozer, Best, Lipsey, and Weiss (2003) also found levels of social support to be highly predictive of PTSD (weighed average $r = -.28$). Out of the seven predictors studied, only peritraumatic dissociation (i.e., dissociative experiences during and immediately after experiencing a traumatic event) was stronger than levels of perceived social support in predicting PTSD. Furthermore, Ozer and colleagues (2003) found a stronger inverse relationship between perceived social support and PTSD in studies of combat-related trauma (weighted average $r = -.26$) when compared to studies of noncombat violence (weighted average $r = -.11$). These finding are relevant to this study because in the military cohesion amongst service members has been described as conceptually equivalent to social support in non-military settings (Griffith & Vaitkus, 1999). For this study, the protective factors of primary interest were horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, and problem-focused coping. Literature relating to these four factors will be fully reviewed in Chapter II.
Risk Factors

Exposure to combat-related stressors has been established as a risk factor for developing PTSS. Furthermore, a dose-response relationship between the two factors has been supported wherein greater exposure relates to increased PTSS (Hoge et al., 2004; Kulka et al., 1990). However, the reported prevalence rates (10% to 18%) for PTSS among military personnel returning from Afghanistan and Iraq indicate that there are many service members who are exposed to significant combat-related stressors and either do not develop PTSS or experience symptoms that resolve in a relatively short period of time (Litz & Schlenger, 2009). This suggests that additional risk factors, beyond exposure to combat-related stressors, may be related to service members developing PTSS during a deployment to Afghanistan or Iraq. In fact, previous studies have identified important associations between preexisting attributes, military factors, and the development of PTSS among military personnel exposed to combat-related stressors.

Among military personnel there is some evidence that many specific attributes may serve as risk factors for PTSS. In their sample of United Kingdom Armed Forces personnel deployed to Iraq, Mulligan et al. (2010) found higher risk of psychological distress was associated with female personnel. Using a sample of Persian Gulf War veterans, Orcutt, Erickson, and Wolfe (2004) identified females and those with less education as being at higher risk of developing PTSS. Iversen et al. (2008) found that having a lower rank, being unmarried, and having a low educational attainment were all associated with higher levels of PTSS. Lapierre, Schwegler, and LaBauve (2007) identified being unmarried and having a lower rank as risk factors in a sample of
U.S. Army soldiers deployed to Iraq. Furthermore, findings by Rona et al. (2009) added support to the possibility of lower rank being a risk factor for PTSS.

Additional military factors that have been associated with higher rates of PTSS are length of deployment to a war zone, type of military component (e.g., regular active-duty versus National Guard or Reserve), and unit type (e.g., maneuver versus support and sustainment). A recent meta-analysis on deployment length reported that seven out of the nine studies reviewed indicated that longer war-zone deployments have detrimental effects on the health and well-being of deployed service members (Buckman et al., 2011). Of the seven studies, five found deployment length to have a strong negative effect on aspects of physical health, mental health, and social well-being (Buckman et al., 2011). Importantly, Rona et al. (2007) found that 13 or more months of deployment over the previous 3 years compared with less than 13 months of deployment over the previous 3 years was related to higher rates of PTSS. This finding indicates that both deployment length of current or most recent deployment and total time deployed to a war zone over the course of one’s military career should be considered as important factors in studies that examine the effect of combat-related stressors on PTSS.

Type of military component is another potential risk factor for developing PTSS. Schell and Marshall (2008) conducted a large population-based study of military personnel previously deployed in support of OEF or OIF, and they found that National Guard or Reserve personnel were at greater risk for PTSS than regular active-duty soldiers. The fact that National Guard and Reserve soldiers typically receive less training compared with active-duty soldiers may be one factor contributing to greater PTSS risk among soldiers from the National Guard or Reserve. Vogt and colleagues (2008) suggest
that National Guard or Reserve soldiers who receive less training may experience more perceived threat in response to combat-related stressors and feel less prepared for deployment when compared to active-duty soldiers. In their longitudinal study of U.S. Army soldiers who had returned from Iraq, Milliken et al. (2007) found that personnel from the National Guard or Reserve component had higher rates of PTSS when compared to regular active-duty soldiers. Furthermore, in a prospective study, Vasterling et al. (2010) found that among U.S. Army soldiers who had deployed in support of OIF, National Guard troops showed greater increases in PTSS from pre- to post-deployment as compared with regular active-duty soldiers. Similar support for this association has been found in studies that used samples from other conflicts (e.g., Persian Gulf War; Vogt et al., 2008) and from United Kingdom Reserve Forces personnel (Browne et al., 2007).

Some research suggests unit type may also be an important risk factor. In the language of the U.S. Army, unit type is defined by the unit’s role in combat. Maneuver unit soldiers (e.g., infantry, cavalry, armor) and support and sustainment unit soldiers (e.g., engineer, transportation, supply and logistics, maintenance, medical) have very different roles on the battlefield that imply different levels of exposure to combat-related stressors. Maneuver unit soldiers are known as war-fighters and typically serve in traditional front-line roles. During a war-zone deployment their role frequently takes them outside the wire (i.e., mission-related travel that occurs outside the confines of a military camp, patrol base, or forward operating base) and often includes direct engagement with the enemy. Support and sustainment unit soldiers serve a supportive role by providing services, such as logistical support and medical care, that enable the war-fighters to complete their mission. Logic suggests that compared to soldiers from
support and sustainment units, maneuver unit soldiers encounter higher levels of combat-related stressors and, therefore should be at greater risk of experiencing PTSS (Hoge et al., 2004). Two recent studies offer equivocal support for this assumption.

Using data from the Millenium Cohort Study, LeardMann and colleagues (2009) compared military personnel that were assigned to three different types of units and had at least one deployment in support of OEF or OIF. When compared to combat specialists (odds ratio = 1.00), healthcare specialists (odds ratio = 0.84) were less likely to experience PTSD. However, when compared to combat specialists, functional support personnel (odds ratio = 1.08) were more likely to experience PTSD (LeardMann, Smith, Smith, Wells, & Ryan, 2009). Iversen and colleagues (2008) found that among United Kingdom Armed Forces personnel that had deployed to Iraq in 2003, personnel from support (odds ratio = 0.43) and sustainment (odds ratio = 0.53) units had decreased odds of developing PTSD when compared to personnel from combat units (odds ratio = 1.00). Taken together these studies offer equivocal findings, but certainly indicate that unit type is a potentially important risk factor that should be included in studies exploring the relationship between combat-related stressors and PTSS among military personnel.

Overall, convergent findings from multiple studies using different military populations over a broad range of conflicts suggest that any study examining the association between combat-related stressors and PTSS should include a broad range of protective factors and risk factors. Research also suggests that the inclusion of certain preexisting attributes and military factors as controls should be strongly considered. This study included a total of eight preexisting attributes and military factors as potential confounds. This allowed for control of age, gender, rank, military component,
marital status, months deployed on current deployment, months deployed to a combat zone since 9/11, and unit type. In Chapter II the protective factors (i.e., cohesion and problem-focused coping) as well as this study’s risk factors of primary interest (i.e., emotion-focused coping and perceived threat) will be reviewed.

**Specific Aims**

This study will add to previous research in three important ways. First, I located no studies that explored the moderating effect of cohesion, coping, and perceived threat during an actual combat deployment using a sample of U.S. Army soldiers that includes combat (e.g., infantry), combat support (e.g., combat engineers), and service support soldiers (e.g., supply clerks, medical). Including soldiers from all three groups should capture heterogeneous deployment experiences, making this study’s sample more representative of all deployed U.S. Army soldiers. Second, given that U.S. Army soldiers typically deploy for longer periods of time (up to 15 months or longer) compared with U.S. Air Force personnel (3 to 6 months) and U.S. Marines (7 months), the range of combat-related stressors U.S. Army soldiers are exposed to could be greater in frequency. Also, given the established linear relationship between combat exposure and PTSS (Hoge et al., 2004; Smith et al., 2008), being able to investigate the effect of variables of interest at higher levels of combat-related stressors than previous studies may add to the overall findings on combat-related stressors, cohesion, coping, perceived threat, and PTSS. Lastly, the fact that Army soldiers make up the largest percentage of the U.S. military—and have accounted for a larger total percentage of OEF and OIF deployments—suggests that their war-zone experiences may be significantly different
than the experiences of the Air Force personnel and Marines used in previous studies. Ultimately, this study also aims to inform policy decisions made by military leadership and within the military’s behavioral health community.

Findings from this study could impact decisions related to the creation, delivery, and sustained support of programs designed to increase soldier resiliency. Findings which suggest cohesion, coping, or perceived threat are factors capable of buffering the effects combat-related stressors have on soldiers’ psychological health could motivate U.S. military leadership to sharpen their focus on ways to increase cohesion and coping at both the individual soldier and organizational level. Likewise, findings which suggest low perceived threat buffers the relationship between combat-related stressors and PTSS could serve to encourage military leadership to identify and implement programs designed to reduce levels of perceived threat among deployed soldiers.

The U.S. Army currently has programs in place that are integrating our current understanding of potential protective factors and risk factors associated with mental health outcomes for soldiers exposed to combat. One such program, called *Comprehensive Soldier Fitness*, has been designed to increase soldiers’ overall resilience by focusing on five dimensions, including the physical, emotional, social, family, and spiritual dimensions of the soldier (see Cornum, Matthews, & Seligman, 2011 for a comprehensive review of the program). Research that further explains the relationships among cohesion, coping, perceived threat, combat-related stressors, and PTSS may help improve the efficacy of military support programs, and provide empirical support for maintaining the programs during a time of impending cuts to the operating budget of the Department of Defense (DOD).
**Research Questions**

This study was guided by three primary research questions and 18 related hypotheses. The research questions are outlined below. The related hypotheses are outlined in Chapter II, following a review of the literature related to cohesion, coping, and perceived threat.

The first research question was guided by this study’s focus on identifying potentially modifiable protective factors and risk factors that could independently protect deployed soldiers from developing PTSS. For example, if higher levels of cohesion were found to be related to lower levels of PTSS, it would theoretically be possible and advantageous for the military to find ways to increase levels of cohesion within military units getting ready to deploy to a war zone. This research question is related to the seven main-effect hypotheses that will be outlined in Chapter II.

(1) Among U.S. Army soldiers deployed to a war-zone environment, to what extent are combat-related stressors, cohesion, coping, and perceived threat independently associated with PTSS?

The second research question was guided by this study’s focus on identifying potentially modifiable protective factors and risk factors that could moderate the relationship between combat-related stressors and PTSS. For example, if greater use of a specific coping strategy was found to buffer the relationship between combat-related stressors and PTSS, it would theoretically be possible for the military to enhance the
coping skills of soldiers getting ready to deploy to a war zone. This research question is related to the six interaction-effect hypotheses that will be outlined in Chapter II.

(2) Among U.S. Army soldiers deployed to a war-zone environment, to what extent do cohesion, coping, and perceived threat independently act as moderators of the relationship between combat-related stressors and PTSS?

Lastly, the third research question was guided by empirical evidence which suggests cohesion and coping do not always moderate the relationship between combat-related stressors and PTSS in a linear fashion (Brailey, Vasterling, Proctor, Constans, & Friedman, 2007; Dickstein et al., 2010; Fontana, Rosenheck, & Horvath, 1997; Rodrigues & Renshaw, 2010; Suvak, Vogt, Savarese, King, & King, 2002). Although not a primary focus of this study, in addition to testing for linear moderation, cohesion and coping were also tested for potential curvilinear moderation of the relationship between combat-related stressors and PTSS. This research question is related to the five curvilinear-interaction hypotheses that will be outlined in Chapter II.

(3) Among U.S. Army soldiers deployed to a war-zone environment, to what extent do cohesion and coping act as curvilinear moderators of the relationship between combat-related stressors and PTSS?
Definitions of Key Concepts

This study involved five key concepts including posttraumatic stress symptomatology (PTSS), combat-related stressors, cohesion, coping, and perceived threat. These concepts are described in detail below.

Posttraumatic Stress Symptomatology

PTSS includes physiological and psychological arousal; reexperiencing events through intrusive thoughts, dreams, or feelings; avoidance of circumstances associated with the event; and a general numbing of responsiveness (4th ed., text rev.; DSM–IV-TR; American Psychiatric Association, 2000).

Combat-Related Stressors

Broadly defined combat-related stressors are any aspect of the environment that places a load on a soldier during a war-zone deployment. Importantly, combat-related stressors can occur during direct combat (e.g., being fired upon by the enemy), as well as during day-to-day deployment experiences that do not necessarily include participating in direct combat (e.g., knowing someone seriously injured or killed). King, King, and Vogt (2003) define the two types of combat-related stressors measured in this study:

Combat Experiences: Exposure to stereotypical warfare experiences such as firing a weapon, being fired on (by enemy or friendly troops), witnessing injury and death, and going on special missions and patrols that involve such experiences. This war-zone factor refers to objective events and circumstances and does not include personal interpretations or subjective judgments of the events or circumstances. (p. 6)
Aftermath of Battle: Exposure to the consequences of combat, including observing or handling the remains of civilians, enemy soldiers, U.S. and allied personnel, or animals, dealing with POWs, and observing other consequences such as devastated communities and homeless refugees. This factor is also conceptualized as cataloging more objective war-zone events and circumstances. (p. 6)

Cohesion

Cohesion in the military has been broadly defined as a multidimensional construct involving the degree of social support provided by group members and leaders (Griffith & Vaitkus, 1999; Manning & Fullerton, 1988). Manning (1994) described cohesion as “confidence in the ability and willingness of peers and leaders to protect in combat and a feeling of obligation to do the same for them” (p. 15). Bliese and Halverson (1996) further characterized cohesion as involving both horizontal and vertical components.

For this study, horizontal (peer) cohesion is defined as an individual soldier’s expectation (i.e., perception) that the group (e.g., platoon) will provide for individual members in need despite stressors (Maguen & Litz, 2006). Simply stated, horizontal (peer) cohesion involves soldiers’ belief that other members of their unit will be watching out for them through good times and bad.

Vertical cohesion is defined as the “perception of subordinates that leaders are considerate and competent” (Bliese & Halverson, 1996, p. 1174). In the military, both officers and non-commissioned officers (NCO) are considered to hold leadership roles. However, NCOs typically have more day-to-day contact with lower enlisted soldiers and are responsible for their direct training and supervision. Officers have a more indirect role with day-to-day activities, but they have greater responsibility for unit performance (Britt, Dickinson, Moore, Castro, & Adler, 2007). Since the leadership roles of officers
and NCOs are distinct, it makes sense that subordinates may have different perceptions related to what extent officers and NCOs in their unit are watching out for them during their war-zone deployment. This study addressed these potential differences by examining both vertical (officer) cohesion (i.e., soldiers’ perception that officers in their company are considerate and competent) and vertical (NCO) cohesion (i.e., soldiers’ perception that NCOs in their platoon are considerate and competent).

**Coping**

In general, coping strategies encompass the efforts made by individuals to manage the strain produced during stressful encounters. Lazarus and Folkman (1984) define coping as “cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (p. 141). The two primary forms of coping measured in this study are emotion-focused coping (i.e., efforts aimed at managing the emotions associated with a stressful event) and problem-focused coping (i.e., efforts aimed at altering the stressful environment).

**Perceived Threat**

King and colleagues (2003) define perceived threat as “fear for one’s safety and well-being in the war zone, especially as a response to potential exposure to circumstances of combat” (p. 6). Relevant to this study is that perceived threat reflects individual appraisals of combat-related events and/or circumstances that may or may not accurately represent objective or factual reality (King et al., 2003).
Chapter II. Literature Review

Theoretical Framework

In order to delineate the constructs being examined and predict expected relationships among them, this study used the Soldier Adaptation Model (SAM) as a broad theoretical framework (Bliese & Castro, 2003). The SAM categorizes constructs into one of three major categories—a stressor, a moderator, or a strain. Figure 1 represents the variables of interest for this study placed within the SAM framework, which are articulated in more detail below. The transactional theory of stress, appraisal, and coping (Lazarus & Folkman, 1984) provided further guidance for this study’s examination of potential moderators of the effect stress has on strain.

![Diagram of the Soldier Adaptation Model (SAM) with factors of primary interest]

Figure 1. Soldier Adaptation Model (SAM) with factors of primary interest.
**Stressor.** The first element of the SAM is military stressors. Broadly defined, military stressors are aspects of the environment that place a load or demand on a soldier, whether in garrison, training, or deployment. This study focused on combat-related stressors during a war-zone deployment. Combat-related stressors can be experienced directly (e.g., being attacked or ambushed) or indirectly (e.g., knowing someone seriously injured or killed). Therefore, this definition acknowledges that both combat soldiers (e.g., infantry), combat support soldiers (e.g., combat engineer), and service support soldiers (e.g., supply, medical) are exposed to combat-related stressors that are not limited to direct contact with the enemy.

**Moderator.** Moderators are the second element of the SAM. Baron and Kenny (1986) define moderators as “a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable” (p. 1174). The presence of moderation suggests that the relationship between a predictor variable and an outcome varies across different levels of the moderator. Within the SAM, moderators represent factors that can potentially weaken the relationship between stressors and strains. Specific to this study, horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, emotion-focused coping, problem-focused coping, and perceived threat (Figure 1, Moderator) were examined as factors that can potentially buffer, or weaken, the relationship that exists between combat-related stressors (Figure 1, Stressor) and PTSS (Figure 1, Strain).
Focusing on moderating variables was important in the context of this study.

Bliese and Castro (2003) argue that two primary ways to reduce strain are (1) to reduce the level of the stressor or (2) increase the level of factors that have been shown to enhance adaptation when exposed to stressors (i.e., moderate the stressor-strain relationship). In support of their argument, Bliese and Castro (2003) state:

> In many situations … the stressors are likely to be immutable: mission accomplishment requires soldiers to endure difficult living conditions, heavy workloads, ambiguity, etc. Thus, it is simply not always feasible (or necessarily desirable) to reduce strain by reducing stressors. In contrast, it is theoretically and often practicably feasible to reduce strain by affecting the moderating variables. For instance, if unit cohesion serves as a moderating effect akin to social support and protects soldiers from the severe stressors of combat … then there may be practically feasible interventions that can be designed to help foster cohesion during garrison training. (p. 189)

The nature of war-zone deployments to Iraq often makes reduction of combat-related stressors an unrealistic option. On a daily basis, soldiers deployed to a war zone are expected to engage the enemy when the situation calls for engagement (e.g., shooting or directing fire at the enemy), travel outside the wire knowing that improvised explosive devices (IED) are an ever-present danger to life and limb, and grieve the loss of soldiers killed in action. In other words, the combat-related stressors experienced by soldiers deployed to Afghanistan or Iraq are often immutable. This reality suggests that option number two—identifying moderating variables that have the potential to enhance adaptation in the face of stressors—needs to be a research focus when examining the relationship between combat-related stressors and PTSS among soldiers deployed to Iraq.
**Strain.** The final component of the SAM is strains, which represent outcomes. The SAM classifies outcomes into three broad categories including health, attitudes, or performance. For this study, PTSS was defined as a health-related strain where higher levels of symptoms represent higher levels of strain.

**Stress and Adaptation as a Psychological Process**

The transactional theory of stress, appraisal, and coping, developed by Lazarus and Folkman (1984), proposes that stress is the result of a perceived disparity between an individual’s environmental demands and the way the individual responds (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986; Holahan, Moos, & Schaeffer, 1996; Lazarus, 1966). This theory suggests that an individual’s perceptions, decision making, and efforts can influence the stress-strain relationship (for this study, combat-related stressors and PTSS). Lazarus and Folkman (1984) specifically defined psychological stress as “a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being” (p. 19). This definition suggests that individual soldiers may have the ability to reduce the possibility of negative psychological outcomes resulting from combat-related stressors by altering their appraisal of the situation. In short, soldiers who are not overwhelmed with thoughts and feelings that a combat-related stressor is extremely threatening may stand a better chance of not developing PTSS during their deployment. The theory identifies two cognitive mechanisms—cognitive appraisal and coping—as important potential moderators of the individual’s stressor-strain relationship.
**Cognitive Appraisal.** Cognitive appraisal is defined as the process through which an individual evaluates whether or not a specific interaction with the environment is relevant to his or her well-being (Lazarus & Folkman, 1984). This theory recognizes that an encounter needs to be understood as relevant to one’s well-being before it can impact the relationship between the person and environment. Two types of appraisal defined by Lazarus and Folkman (1984) are *primary appraisal* and *secondary appraisal*. Primary appraisal involves one’s “judgment that an encounter is irrelevant, benign-positive, or stressful” (p. 53). During primary appraisal, an individual evaluates what is at stake in the encounter (Lazarus, 1990). Those encounters that are appraised, or perceived, as stressful are categorized as either a threat, a challenge, potentially harmful, or indicative of actual or perceived loss (Lazarus & Folkman, 1984). For example, two soldiers who are deployed to Iraq may hear the same explosion, but have two very different responses depending on their primary appraisal. The soldier who believes that a U.S. Army Explosive Ordinance Disposal Team is conducting operations nearby will likely appraise the encounter as irrelevant (i.e., low perceived threat) and the encounter will end. The soldier who believes that enemy forces are attacking his or her position with rocket-propelled grenades may appraise the encounter as a threat to his or her safety (i.e., high perceived threat) and engage in a secondary appraisal.

The process of secondary appraisal involves an individual determining what can be done to minimize the threat of loss or harm. During this process a soldier will evaluate his or her abilities, as well as his or her actual and/or perceived environmental resources (e.g., perceived and/or actual support from peers and leaders), that are available to help cope with a stressful situation. It is important to recognize that individual
differences in primary and secondary appraisal of stressful situations may account for much of the difference in how individuals adapt to different situations (Lazarus & Folkman, 1984). Also important are findings that indicate perceived support may be more important than received support in protecting individuals from the negative consequences of stressful life events (Cohen & Wills, 1985). This could suggest that soldiers’ perceptions of horizontal (peer) cohesion, vertical (NCO) cohesion, and vertical (officer) cohesion during a war-zone deployment are important factors in protecting them from psychological strain.

**Coping.** Having appraised an encounter as stressful, and recognizing that certain actions and resources may be useful in reducing the tension caused by stress, a soldier may engage in one or multiple coping strategies. The two primary forms of coping are problem-focused coping and emotion-focused coping (Folkman et al., 1986; Lazarus & Folkman, 1984). Problem-focused coping involves strategies that are directed at acting upon the stressful environment by channeling resources to solve the stress-producing problem (e.g., asking an officer or NCO for clarification of an order). Emotion-focused coping involves cognitive activity that alleviates the emotional consequences of a stressful environment (e.g., trying to see a stressful combat situation in a positive light), but does not attempt to change the environment. Seemingly important to the deployed soldier is the ability to engage in both forms of coping, as an optimal coping style consists of the largest repertoire of coping responses (Lazarus & Folkman, 1984). Solomon and colleagues (1988) support this view by suggesting that relying on only one type of coping strategy may not be the best strategy for optimal psychological outcomes.
They state, “Even if intrapsychic coping aids in maintaining emotional balance, the nonuse of problem-solving strategies will in the end have negative psychological outcomes” (p. 280).

The transactional theory of stress, appraisal, and coping situated within the SAM provides a conceptual framework to examine the effects of a specific type of stressor (for this study, combat-related stressors) on a specific type of strain (for this study, PTSS). In other words, the SAM helps to categorize variables of interest and the transactional theory of stress, appraisal, and coping begins to offer possible explanations regarding the relationships between combat-related stressors, perceived threat (i.e., appraisal), coping strategies, cohesion (i.e., coping resource), and PTSS. Before reviewing the empirical literature related to cohesion, coping, and perceived threat, further theoretical explanation regarding this study’s inclusion of cohesion as a potential moderator of the effect combat-related stressors can have on a soldier’s level of PTSS is warranted.

**Stress and Adaptation as a Social Process**

The importance of cohesion to a soldier deployed to a war zone should not be underestimated. Each soldier’s survival may literally lie in the hands of his or her peers and leaders. Historical observations of soldiers who deployed to a war zone suggest that cohesion in military units can effectively act as a buffer against negative emotions and make dangerous combat situations seem less threatening (Cohen, Gottlieb, & Underwood, 2000). Combat historian Samuel Marshall (1966) summarized his
observations of World War II experiences by stating, “I hold it to be one of the simplest truths of war that the thing which enables an infantry soldier to keep going with his weapons is the near presence or presumed presence of a comrade” (p. 42). Military psychiatrist Edwin Weinstein (1947) linked cohesion with psychological health by stating:

The main characteristic of the soldier with a combat-induced neurosis is that he has become a frightened, lonely, helpless person whose interpersonal relationships have been disrupted. … As his main defense against the dangers of combat, the soldier relied upon the support and protection given him by the group of which he was a member. (p. 307)

The lessons learned from observations of World War II were not lost on the U.S. Army as evidenced by the following guidance issued to military unit leaders and soldiers in 1982:

One of the most significant contributions of World War II and modern warfare was the recognition of the sustaining influence of the small combat unit on the individual member. … Interpersonal relationships develop among soldiers and between them and their leaders. … It is these relationships which, during times of stress, provide a spirit or force which sustains the members as individuals. (Department of the Army, 1982, p.1-1)

In the military, cohesion has been described as conceptually equivalent to social support in non-military settings (Griffith & Vaitkus,1999; Manning & Fullerton, 1988). Manning and Fullerton (1988) were among the earliest social science researchers to suggest that historical conceptualizations of cohesion fell “well short” (p. 504) of what the concept actually described. They went on to say “far closer to the mark is the ‘social support’ that has been the subject of a rapidly expanding body of research over the past decade” (p. 504). Griffith and Vaitkus (1999) supported the earlier assertion by Manning and Fullerton by stating, “In many ways, social support research in health psychology not only captures the meaning of early sociological descriptions of cohesion
but provides a basis for developing an organizing framework for cohesion and related constructs, such as stress and strain” (p. 30). Cobb (1976) defined social support as “information leading the subject to believe that he is cared for and loved, esteemed, and a member of a network of mutual obligations” (p. 300), and the term social support is widely used to refer to the mechanisms by which interpersonal relationships buffer an individual against a stressful environment (Cohen & Wills, 1985). Therefore, if cohesion is conceptually equivalent to social support, cohesion should be examined as a factor with the potential, much like social support, to protect soldiers from exposure to the stressors inherent in a war-zone deployment.

**Cohesion as a Protective Factor**

Military leaders, policy makers, and social scientists have long considered cohesion within military units an important factor for combat effectiveness and performance (Griffith, 1997), and some early cohesion studies using military populations looked at the extent to which cohesion helps maintain individual adjustment during times of stress (Savage & Gabriel, 1976; Shils, 1950; Shils & Janowitz, 1948; Solomon, Milkulincer, & Hobfoll, 1986; Steiner & Neuman, 1978). After observing the U.S. Army in World War II, Shils (1950) reported that the cohesive primary group “served two principal functions in combat motivation: It set and emphasized group standards of behavior and it supported and sustained the individual in stresses he would otherwise not have been able to withstand” (p. 25). This dynamic suggests that cohesion within military units could serve to protect soldiers from the negative psychological consequences of combat-related stressors.
Although few in number, recent military studies seem to support the qualitative observations of Shils (1950) with empirical evidence identifying cohesion as a possible factor that can protect soldiers exposed to combat-related stressors from developing mental health problems, including PTSS. Brailey and colleagues (2007) studied a group of soldiers who had never deployed and found that life experiences and cohesion independently predicted PTSS. Additionally, cohesion moderated the influence of life experiences on PTSS (Brailey et al., 2007). Armistead-Jehle and colleagues (2011) studied a group of U.S. Marines from an infantry battalion who had just completed a seven-month deployment to Iraq in support of OIF. The authors found that greater combat exposure and less cohesion were related to greater PTSS. Furthermore, their findings revealed that increased cohesion acted as a buffer between combat exposure and PTSS (Armistead-Jehle et al., 2011).

Dickstein and colleagues (2010) also looked at cohesion and PTSS using data collected from U.S. Air Force medical personnel deployed in support of OIF. The authors tested two types of stressors and found that healthcare-related stressors (e.g., exposure to patients that were about to die, exposure to patients with severe burns, exposure to patients who lost a limb) and combat-related stressors were both predictive of higher levels of PTSS, although the relationship was stronger for healthcare-related stressors. Cohesion was also found to have an inverse relationship with PTSS in this study. Interestingly, the interaction effect between cohesion and stressor exposure was significant for health-related stressors, but not significant for combat-related stressors. These studies suggest that soldiers’ perceptions of cohesion within their units is an important protective factor that can possibly attenuate the influence exposure to
combat-related stressors has on the development of PTSS. Taken together, these previous studies provide support for this study’s inclusion of cohesion as a protective factor, potentially capable of decreasing the chances a soldier develops PTSS during a war-zone deployment. Unlike previous research, the current study measured cohesion among soldiers during an extended deployment to Iraq. Assessing a soldier’s perception of cohesion during an actual combat deployment could potentially expand upon previous studies that typically measured a soldier’s perception of cohesion either before or after a combat deployment.

One significant difference between recent cohesion-as-a-moderator research and this study is the way cohesion is measured. Both Brailey et al. (2007) and Armistead-Jehle et al. (2011) measured cohesion with a deployment social-support scale from the *Deployment Risk and Resilience Inventory (DRRI)* (King et al., 2003; Vogt, Proctor, King, King, & Vasterling, 2008; King, King, Vogt, Knight, & Samper, 2006). The 12-item scale was designed to inquire to what degree service members felt supported by different elements of their units. The cumulative score of the 12 items provided an index score of perceived cohesion regarding both leaders and fellow unit members (King et al., 2003). Central to both the *DRRI*’s deployment social-support scale and the indexes used for this study is the belief that cohesion involves a perception by soldiers that both their peers and their leaders are caring and competent.

However, unique to this study is the decision to use three distinct indexes that allowed for a relative comparison of the importance of horizontal (peer) cohesion, vertical (NCO) cohesion, and vertical (officer) cohesion, as opposed to the overall cohesion score reported by Brailey et al. (2007) and Armistead-Jehle et al. (2011).
Support for examining both peer and vertical cohesion was found in a study by Bliese and Halverson (1996) wherein the authors examined how horizontal and vertical cohesion related to psychological well-being among members of the U.S. Army. The study found significant correlations between horizontal cohesion and psychological well-being ($r = .24, p < .001$), as well as vertical cohesion and psychological well-being ($r = .43, p < .001$). Notably, both sub-categories of cohesion were correlated positively with psychological well-being (higher well-being implied better psychological health), although the correlation for vertical cohesion was stronger when compared with peer cohesion.

Some studies have found that cohesion does not always moderate the relationship between combat-related stressors and PTSS in a linear fashion. Fontana, Rosenheck, and Horvath (1997) studied a sample of Vietnam veterans from the NVVRS and found no significant main effects between cohesion and PTSS. Interestingly, significant interaction effects between cohesion and combat exposure supported a *curvilinear interaction* hypothesis in which low to moderate unit cohesion was related to lower levels of reported PTSS, but high levels of unit cohesion was associated with higher than expected levels of PTSS when combat exposure was high (Fontana et al., 1997). Since the Fontana et al. (1997) study, two additional military studies examined the potential curvilinear interaction between cohesion and stressors and were unable to provide support for the curvilinear interaction hypothesis. Brailey et al. (2007) did not find a curvilinear interaction between unit cohesion and life stress. The authors suggested that their use of a life stress measure in combination with a sample that had never deployed to a war zone may have made the average rates of stress exposure too low for detection of a
curvilinear interaction. Dickstein et al. (2010) also failed to support a curvilinear interaction hypothesis. In explaining the lack of support for the curvilinear interaction hypothesis, Dickstein et al. (2010) indicated the magnitude of war-zone stressors experienced by the average participant may have been too insignificant to detect curvilinear interaction effects. Because the combat-related stressor level and length of deployment to a war zone for this study more closely replicated the Fontana et al. (1997) study, this study will also test for curvilinear interaction between cohesion and combat-related stressors.

Coping as a Protective and Risk Factor

The transactional theory of stress, appraisal, and coping suggests that coping strategies can potentially moderate the relationship between combat-related stressors and PTSS. Lazarus and Folkman’s (1984) conceptualization of coping consists of both emotion-focused and problem-focused coping strategies. Multiple studies have identified coping strategies as one potential factor influencing PTSS in military veterans (Benotsch et al., 2000; Rodrigues & Renshaw, 2010; Solomon, Mikulincer, & Avitzur, 1988; Solomon, Mikulincer, & Benbenishty, 1989; Stein et al., 2005; Sutker, David, Uddo, & Ditta, 1995). These studies have looked at military veterans from multiple wars including the Vietnam War, 1982 Lebanon War, Persian Gulf War, and the wars in Afghanistan and Iraq. However, I located no studies that have assessed the relationship between combat-related stressors, coping, and PTSS among a group of U.S. Army soldiers during an actual deployment to Iraq.
The assessment of coping during a war-zone deployment is important for two reasons. First, some research suggests the effectiveness of a particular coping strategy could be dependent on the match between the chosen strategy and perceived controllability of the situation (Park, Folkman, & Bostrom, 2001). Arguably, many of the combat-related stressors encountered during a war-zone deployment are qualitatively different than average stressors encountered in non-combat environments. Many combat-related stressors could be viewed as being beyond the personal control of the individual soldier experiencing the stressor. The perceived uncontrollability of the stressors could influence what type of coping strategy is most effective in protecting soldiers from the negative psychological effects related to exposure. Second, when coping data is collected months and sometimes years after the war, as is the case with the majority of previous coping research using military samples, there exists a possibility that the recall of what coping strategy was used at the time of exposure has been influenced by multiple factors, including current PTSS (Sharkansky et al., 2000; Wessely, et al., 2003). The MHAT VI data used for this study limits potential issues related to recall bias as data was collected very soon—sometimes only mere days—after soldiers may have utilized certain coping strategies in response to a combat-related stressor.

In general, the coping literature indicates that greater use of emotion-focused coping strategies (i.e., attempts made to alleviate the emotional distress related to the stressor) is related to negative social and psychological outcomes among military personnel exposed to combat-related stressors. The relationship has been supported in both cross-sectional (Rodriques & Renshaw, 2010; Solomon et al., 1988; Suvak et al., 2002) and longitudinal (Sharkansky et al., 2000; Solomon, Avitzur, & Mikulincer, 1989).
analyses. Findings indicate that emotion-focused coping is a potential risk factor wherein greater use of emotion-focused coping relates to increases in PTSS and poor social functioning. In contrast, problem-focused coping strategies have either been unrelated to PTSS (Blake, Cook, & Keane, 1992; Rodrigues, & Renshaw, 2010; Solomon et al., 1988), or inversely related to PTSS (Sharkansky et al., 2000). These findings suggest that problem-focused coping is a potential protective factor wherein greater use of problem-focused coping relates to lower levels of PTSS. Multiple studies using military samples from multiple wars have supported coping as both a risk and protective factor depending on which coping strategy (emotion-focused versus problem-focused) is used.

Although few in number, there are studies that support the presence of an interaction effect between coping and combat-related stressors. Sharkansky and colleagues (2000) collected coping data “just after the soldiers’ return stateside (within 5 days)” (p. 189), and found those Persian Gulf War veterans who used higher levels of problem-focused coping (relative to emotion-focused coping) in response to combat-related stress reported lower levels of PTSD. Furthermore, combat exposure was found to be a linear moderator of the relationship between coping and PTSS, wherein as levels of combat exposure increased, the inverse relationship between problem-focused coping and PTSS increased (Sharkansky et al., 2000). In others words, as combat exposure increased, problem-focused coping strategies became a more effective protective factor against developing PTSS. Solomon, Mikulincer, and Benbenishty (1989) found similar interaction effects between combat exposure and emotion-focused coping among Israeli veterans of the 1982 Lebanon War. In their study, emotion-focused
Coping was positively related to PTSD only among those veterans who experienced higher levels of combat exposure (Solomon, Mikulincer, & Benbenishty, 1989).

Focusing on combat exposure as a potential moderator of the effects of coping on PTSD, Rodrigues and Renshaw (2010) examined the associations between coping, combat exposure, and PTSD among a sample of National Guard veterans who had at least one overseas deployment since 2001. In contrast to the Sharkansky et al. (2000) study, problem-focused coping was found to be unrelated to PTSS. However, similar to the Sharkansky et al. (2000) study was the finding that indicated a positive relationship between emotion-focused coping and PTSS ($r = .45, p < .001$). Furthermore, severity of combat exposure was found to be a curvilinear moderator of the relationship between emotion-focused coping and PTSS. Emotion-focused coping was unrelated to PTSS at low levels of combat exposure; was associated with higher symptom levels at moderate levels of combat exposure; and was associated with lower levels of PTSS at high levels of combat exposure (Rodrigues & Renshaw, 2010).

In summary, coping research, using a wide range of military samples from different wars, suggests that coping strategies can be both a risk factor and a protective factor for PTSS. In general, emotion-focused coping is supported as a risk factor and problem-focused coping has been supported as a protective factor. However, problem-focused coping has also been found to be unrelated to PTSS. Furthermore, combat exposure was identified as both a linear (Sharkansky et al., 2000) and curvilinear moderator (Rodrigues, & Renshaw, 2010) of the relationship between coping and PTSS. These findings provide support for examining coping as a potential linear and curvilinear moderator of the relationship between combat-related stressors and PTSS. In the context
of this study, as Folkman and colleagues (1986) proposed, “Whether or not a coping strategy results in positive outcomes depends on the demands and constraints of the context in which it is being used and the skill with which it is applied” (p. 1001).

Perceived Threat as a Risk Factor

Perceived threat involves personal assessments of potential threats of harm to one’s personal safety (King, King, Gudanowski, & Vreven, 1995). Furthermore, perceived threat reflects emotional or cognitive appraisals of the harmfulness of situations that may or may not accurately represent objective or factual reality (King et al., 2003). Lazarus and Folkman’s (1984) transactional theory of stress, appraisal, and coping identifies appraisal as a factor that can potentially moderate the effect stress has on strain. Whether a soldier perceives a combat-related stressor as threatening or nonthreatening can influence how the stressor impacts his or her psychological health. Both theory and empirical evidence suggest that, when examining the relationship between combat-related stressors and PTSS, perceived threat should be included as a potentially important risk factor. For example, in a recent study looking at the direct and moderating effects of cohesion on PTSS, Armistead-Jehle et al. (2011) identified the inability to account for perceived threat as a study limitation, and contended that future studies of cohesion and PTSS should also measure perceived threat “in order to examine any main or interaction effects in OIF or OEF service members” (p. 87). Furthermore, I located no studies that have examined perceived threat as a potential moderator of the effects combat-related stressors have on PTSS among U.S. Army personnel deployed to Iraq in support of OIF.
Previous research suggests that individuals that perceive a stressor as dangerous to their safety may be more likely to experience PTSS as a result. Ozer and colleagues (2003) reviewed 12 studies made up of both civilian and military samples and found a statistically significant relationship (weighted average $r = .26$) between perceived threat and PTSS. Findings from their meta-analysis indicated that those individuals who perceived their lives were in danger during a stressful event (i.e., high perceived threat) reported higher levels of PTSS (Ozer et al., 2003). Of the seven predictors studied, perceived threat showed the second strongest effect. Particularly relevant to this study is the finding that indicates the relationship between perceived threat and PTSS strengthens as time elapses between experiencing a stressor and being assessed. Ozer and colleagues (2003) found that the relationship between perceived threat and PTSS for those assessed from 6 months to 3 years after experiencing a stressful event (weighted average $r = .44$) was almost 2 times as strong when compared to those who were assessed from 1 to 6 months after experiencing the stressor (weighted average $r = .24$). This study utilized perceived-threat data that was collected with minimal time elapsed from a soldier’s experience of a combat-related stressor. Therefore, this study was better able, when compared to previous studies, to examine how level of perceived threat impacts a soldier’s PTSS soon after experiencing a stressor.

The relationship between perceived threat and PTSS has been examined among veterans of multiple conflicts including OIF and OEF (Iversen et al., 2008; Renshaw, 2011; Vogt et al., 2011), the Persian Gulf War (Vogt, Pless, King, & King, 2005; Vogt et al., 2008; Vogt & Tanner, 2007), and the Vietnam War (King et al., 1998; King, King, Foy, & Gudanowski, 1996; King et al., 1995). Vogt and colleagues (2011) used
structural equation modeling to examine risk pathways for PTSS among male and female veterans of OIF and OEF and found perceived threat to be predictive of PTSS in both males and females. Greater perceived threat was related to more PTSS. Furthermore, warfare exposure demonstrated indirect effects on PTSS through perceived threat (i.e., perceived threat mediated warfare exposure), and the total effect of perceived threat on PTSS (standardized estimate for women = .45, t = 7.83, p < .05; for men = .44, t = 6.06, p < .05) was similar to the total effect of warzone exposure on PTSS (standardized estimate for women = .42, t = 9.43, p < .05; for men = .48, t = 8.64, p < .05). Findings from the Vogt et al. (2011) study indicate that how a soldier subjectively experiences a combat-related stressor is potentially as important, if not more so, than the objective experience. This is consistent with a recent reformulation of PTSD found in the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association, 1994) wherein both objective and subjective aspects of exposure are required for a diagnosis of PTSD (Vogt & Tanner, 2007).

In addition to the Vogt et al. (2011) study, the potential importance of perceived threat in predicting PTSS was examined among United Kingdom Armed Forces personnel who had deployed to Iraq. Iversen and colleagues (2008) found perceived threat to be the most important predictor of PTSS. Furthermore, Vogt & Tanner (2007) examined Persian Gulf War veterans and reported that the majority of the impact of war-zone exposure may have been mediated through perceived threat, and the total effects of perceived threat on PTSS were greater than the total effects of war-zone stress on PTSS. These studies supported similar findings from a study that used a sample of Vietnam veterans (King et al., 1995). Although perceived threat has been supported as
an independent predictor of PTSS, as well as a mediator of combat-related stressors, I found no study that has measured perceived threat during a war-zone deployment to Iraq or examined the variable as a potential moderator of the relationship between combat-related stressors and PTSS. This study attempted to address that gap.

**Hypotheses**

Based on the theoretical framework guided by the Soldier Adaptation Model (Bliese & Castro, 2003) and guided by the transactional theory of stress, appraisal, and coping (Lazarus & Folkman, 1984), as well as the literature review of the factors of primary interest, this study used the following three research questions to guide the 18 related hypotheses outlined below:

**Research Question 1:**

Among U.S. Army soldiers deployed to a war-zone environment, to what extent are combat-related stressors, cohesion, coping, and perceived threat independently associated with PTSS?

**Hypothesis 1a.** Higher levels of combat-related stressors will be associated with greater report of PTSS.

**Hypothesis 1b.** Higher levels of horizontal (peer) cohesion will be associated with lower levels of PTSS.

**Hypothesis 1c.** Higher levels of vertical (NCO) cohesion will be associated with lower levels of PTSS.

**Hypothesis 1d.** Higher levels of vertical (officer) cohesion will be associated with lower levels of PTSS.
**Hypothesis 1e.** Higher levels of emotion-focused coping will be associated with greater report of PTSS.

**Hypothesis 1f.** Lower levels of problem-focused coping will be associated with greater report of PTSS.

**Hypothesis 1g.** High perceived threat will be associated with greater report of PTSS.

**Research Question 2:**

Among U.S. Army soldiers deployed to a war-zone environment, to what extent do cohesion, coping, and perceived threat independently act as moderators of the relationship between combat-related stressors and PTSS?

**Hypothesis 2a.** Higher levels of horizontal (peer) cohesion will buffer the relationship between combat-related stressors and PTSS.

**Hypothesis 2b.** Higher levels of vertical (NCO) cohesion will buffer the relationship between combat-related stressors and PTSS.

**Hypothesis 2c.** Higher levels of vertical (officer) cohesion will buffer the relationship between combat-related stressors and PTSS.

**Hypothesis 2d.** Lower levels of emotion-focused coping will buffer the relationship between combat-related stressors and PTSS.

**Hypothesis 2e.** Higher levels of problem-focused coping will buffer the relationship between combat-related stressors and PTSS.

**Hypothesis 2f.** Low perceived threat will buffer the relationship between combat-related stressors and PTSS.
Research Question 3:

Among U.S. Army soldiers deployed to a war-zone environment, to what extent do cohesion and coping act as curvilinear moderators of the relationship between combat-related stressors and PTSS?

**Hypothesis 3a.** Horizontal (peer) cohesion will act as a curvilinear moderator of the relationship between combat-related stressors and PTSS.

**Hypothesis 3b.** Vertical (NCO) cohesion will act as a curvilinear moderator of the relationship between combat-related stressors and PTSS.

**Hypothesis 3c.** Vertical (officer) cohesion will act as a curvilinear moderator of the relationship between combat-related stressors and PTSS.

**Hypothesis 3d.** Emotion-focused coping will act as a curvilinear moderator of the relationship between combat-related stressors and PTSS.

**Hypothesis 3e.** Problem-focused coping will act as a curvilinear moderator of the relationship between combat-related stressors and PTSS.
Chapter III. Methods

Introduction to the MHAT

This study relied on secondary analyses of cross-sectional data collected as part of an ongoing military research effort. In July 2003, the U.S. Army Surgeon General, responding to an observed spike in suicides among deployed soldiers (Bliese et al., 2011), chartered the Operation Iraqi Freedom (OIF) Mental Health Advisory Team (MHAT). The MHAT mission was conducted by a senior team of military behavioral health personnel from August to October 2003. The team’s primary task was to assess OIF-related mental health and well-being issues among soldiers deployed to Kuwait and Iraq and to provide recommendations to the OIF medical and combatant commands. Importantly, this was the first time in history soldiers were surveyed in this manner about behavioral health issues during a war-zone deployment (Mental Health Advisory Team, 2003). Since the first assessment conducted in 2003, MHAT research teams—primarily comprised of military psychologists, social workers, and psychiatric nurses—have conducted nine additional assessments, five of soldiers during their deployment to Iraq and four of soldiers during their deployment to Afghanistan. This study utilized data collected for the sixth and most recent assessment of soldiers deployed to Iraq in 2009, MHAT VI-Operation Iraqi Freedom 07-09 (Mental Health Advisory Team, 2009). An overview of the MHAT VI study is provided next as background information.
Background of the MHAT VI-Operation Iraqi Freedom 07-09 Study

MHAT VI was established by the Office of the U.S. Army Surgeon General at the request of the Commanding General, Multi-National Corps-Iraq (MNC-I). As was the case for previous MHATs, the primary mission of MHAT VI was to assess soldiers’ behavioral health and provide recommendations to command for improving soldiers’ resiliency and well-being. From December 2008 through March 2009, randomly selected soldiers anonymously completed the Walter Reed Army Institute of Research (WRAIR) Deployment Well-Being Survey during their OIF war-zone deployment. Participation in the survey was voluntary. The survey, originally adapted from the Land Combat Study conducted at the WRAIR (Hoge et al., 2004; Hoge et al., 2007; Riviere, 2008), includes measures for a variety of potential risk factors, protective factors, and behavioral health outcomes associated with war-zone deployments. The MHAT VI survey contains all the core measures used in all previous MHATs allowing military researchers to examine trends across multiple years of MHATs. From February 2009 to March 2009 the Mental Health Advisory Team (MHAT VI) was deployed to Iraq and completed the following tasks: (a) processed and analyzed survey data, (b) examined secondary data sources, and (c) conducted focus group interviews with soldiers and behavioral health personnel (Mental Health Advisory Team, 2009). The MHAT VI data used in this study was made available to this researcher after WRAIR staff reviewed and approved the proposed study.
Sampling

In total, 2,442 self-report surveys were collected from soldiers assigned to 15 separate brigades. To ensure a representative sample including adequate representation regarding geography (e.g., northern Iraq, central Iraq, southern Iraq) and deployment role (e.g., infantry, combat engineer, medical), 1,260 surveys were collected from soldiers assigned to maneuver unit platoons (e.g., infantry), and 1,182 surveys were collected from soldiers assigned to combat support (e.g., combat engineers) and sustainment (e.g., supply, medical) platoons. For the first time since the MHAT mission was implemented, a cluster-based random sampling plan was used resulting in, arguably, the strongest research design of all the MHATs conducted since 2003 (Bliese et al., 2011). The combat unit sample was collected by randomly selecting three platoons from three randomly selected companies from every combat battalion in theatre. Every member of each platoon selected was asked to complete a survey. For the first time, MHAT VI also employed cluster-based random sampling of the support and sustainment platoons. Specifically, the support and sustainment platoons were randomly selected from Brigade Support Battalions (BSB), Brigade Special Troops Battalions (BSTB), and other brigade-sized elements in theatre (e.g., Maneuver Enhancement Brigade, Expeditionary Sustainment Command). The support and sustainment sample for MHAT VI represents the most comprehensive assessment of non-combat unit soldiers conducted by MHAT (Bliese et al., 2011; Mental Health Advisory Team, 2009).

Prior to administering the survey, research personnel read a script describing issues including purpose, anonymity, and consent. Out of the 2,442 soldiers surveyed, 2,027 consented to having their responses used for research, making the participation rate
83% (L. Riviere, personal communication, February 2, 2012). The final sample (consisting of 1,824 cases) for this study was drawn from the data of the 2,027 soldiers who completed the survey and provided consent for their responses to be used for research purposes.

**Missing Data Issues**

Overall, the MHAT VI dataset can be described as having minimal missing data issues. The majority of the 80 variables used in this study had fewer than 2% missing values. Missing data ranged from a low of 0% for age to a high of 4.5% for perceived threat. Although 1,432 (71%) of the original 2,027 cases were complete (i.e., no missing values on any of the 80 items used in this study), there were 595 cases (29%) with one or more missing values on at least one of the 80 items. Using only listwise deletion to address this study’s missing data issues would have resulted in the loss of over 25% of the cases in the original sample. This sizable loss of sample size would have been primarily due to soldiers missing only one or two items on the 33-item combat-related stressors index.

Experts have different opinions on what percentage of missing data on individual variables is problematic and what percentage of missing data can be adequately handled solely with listwise deletion. Schafer (1999) recommended a cutoff of 5% (greater than 5% missing data would require the use of more advanced missing data methods), but Bennett (2001) suggests that anything over 10% missing would possibly bias statistical analyses. Based on the opinions of Shafer (1999) and Bennett (2001), using listwise deletion may have adequately addressed the missing values issue. However, in order to
retain the maximum amount of possible statistical power, a combination of stochastic regression imputation and listwise deletion was utilized (Schlomer, Bauman, & Card, 2010).

**Stochastic Regression Imputation: An Overview**

Stochastic regression imputation is an established single imputation technique that uses complete-case analysis to estimate a set of regression equations that predict the incomplete variables from the complete variables. Predicted values for the missing data are obtained by substituting the observed values into the regression equations. Importantly, this method improves upon standard regression imputation by implementing a final step that augments each predicted score with a normally distributed residual term (i.e. random component). This restores lost variability due to the data and eliminates biases commonly associated with alternative regression imputation methods (Baraldi & Enders, 2010; Enders, 2010). Allison (2002) supports the use of this technique by suggesting that regression parameter estimates based on stochastic regression imputation are relatively unbiased in large samples. Enders (2010) provides further support for the use of this technique by indicating that stochastic regression imputation can produce similar results when compared to multiple imputation methods due to the fact that “stochastic regression and multiple imputation actually share the same imputation routine” (p. 47). Furthermore, Enders (2010) suggests that stochastic regression imputation is the only viable option, among the many single imputation techniques, due to its ability to produce unbiased parameter estimates.
**Stochastic Regression Imputation: Implementation**

For this study, stochastic regression imputation was used to replace missing values on all 71 variables used to calculate this study’s seven index scores. Missing values for each variable were imputed before index scores were calculated (Schlomer et al., 2010). Using IBM SPSS 20.0, Missing Values Analysis module, seven separate stochastic regressions were run to predict values for missing data items that were used to construct this study’s seven indexes. Prior to running the regressions, cases that had over 50% missing data on any one of these sets of variables were dropped from the sample. For example, if a case had over 50% missing data on the seven variables which were used to calculate vertical (NCO) cohesion index scores, that case was dropped. This step, applied to each case for each set of index variables, resulted in the deletion of 63 cases. Dropping cases with over 50% missing values on any one set of index variables ensured that information from the same soldier (i.e., each case) would be used to help determine the predicted value of any missing values for that case.

In order to maintain the exogeneity of predicted values, each stochastic regression only used the items that are part of the related index. For example, stochastic regression number one only used the 33 variables that are summed to calculate combat-related stressors index scores. This produced 33 new variables with all missing values imputed with predicted values. Stochastic regressions were run on the six additional sets of index variables (i.e. horizontal (peer) cohesion index = 3 variables, vertical (NCO) cohesion index = 7 variables, vertical (officer) cohesion index = 7 variables, emotion-focused...
coping index = 2 variables, problem-focused coping index = 2 variables, PTSS index = 17 variables). In total, 71 new variables with no missing values were created and utilized to calculate the seven index scores used in this study.

**Listwise Deletion**

Given this study’s large sample size, listwise deletion was used for the remainder of the variables with missing data. Shafer and Graham (2002) support this decision by stating, “If a missing-data problem can be resolved by discarding only a small part of the sample, then the method can be quite effective” (p. 156). The remaining variables with missing data included: rank = 8 cases (0.4%); military component = 22 cases (1.1%); marital status = 36 cases (1.8%); and perceived threat = 82 cases (4.2%). In total, listwise deletion accounted for the deletion of an additional 140 cases. The final sample used in all multiple regression analyses for this study consisted of 1,824 cases. This represents 90% of the original sample (N = 2,027).

**Sample Comparison**

To determine if the sample used differed significantly from the sample not used, t-tests were used to assess whether or not the group of soldiers dropped from the sample due to missing data on the rank, military component, marital status, or perceived threat variables had significantly different index scores when compared to the group of soldiers included in the sample. Non-significant t-tests indicated that there were no statistically significant score differences, for all seven study measures, between the two groups for rank, military component, and perceived threat. For marital status, there was a
statistically significant mean score difference on the vertical (NCO) cohesion index, between the group dropped from the sample \((M = 20.3, SD = 5.9)\) and the group included in the sample \((M = 22.7, SD = 5.9)\), \(t(1,962) = -2.51, p = .01\).

**Measures**

**Combat-Related Stressors Index**

Level of exposure to a variety of combat-related stressors was assessed using the 33-item WRAIR Combat Experiences Scale (CES). Different versions of the scale have been used in previous military research, evaluating the effects of combat experiences in Iraq and Afghanistan on military personnel (Adler, Bliese, McGurk, Hoge, & Castro, 2009; Hoge et al., 2004; Riviere et al., 2011; Thomas et al., 2010; Wilk et al., 2010; Wood et al., 2011). The stem for the CES used in the original study asked soldiers the following question: *Did you experience any of the following during this deployment?* Each of the 33 items was measured on a 5-point frequency scale ranging from 1 = *Never* to 5 = *Ten or More Times*.

For analysis, items were dichotomized into groups of ‘no exposure’ versus ‘exposure.’ All 33 items were then summed to create the combat-related stressors index (range = 0 to 33; Appendix A). Higher scores indicated higher levels of exposure to combat-related stressors. Thomas and colleagues (2011) used the CES in a study of the moderating effect of dispositional optimism on mental health outcomes among a sample of U.S Army soldiers recently returned from a 12-month deployment to Iraq. The study
reported excellent internal reliability for the CES as evidenced by a Cronbach’s alpha of .93 (Thomas et al., 2011). Internal reliability for the sample used in this study was excellent as evidenced by a Cronbach’s alpha of .92.

**Horizontal (Peer) Cohesion Index**

Level of a soldier’s perception of horizontal (peer) cohesion within his or her platoon was assessed with three items developed from Podaskoff, MacKenzie, and Fetter’s (1993) reduced 41-item version of a 74-item substitutes for leadership scale (Podsakoff, Niehoff, MacKenzie, & Williams, 1993). The 41-item version consists of 13 factors, including a three-item subscale designed to measure work-group cohesion. The three items included in the original subscale are “The members of my work group are cooperative with each other,” “My work group members know that they can depend on each other,” and “The members of my work group stand up for each other” (Podsakoff, MacKenzie, & Fetter, 1993). Podsakoff and MacKenzie (1994) validated the original subscale in two different studies using diverse employee populations (e.g., professional, managerial, and technical). The Cronbach’s alpha for the three items, when assessed as an independent horizontal cohesion scale, ranged from .88 to .92 (Podsakoff & MacKenzie, 1994). For the WRAIR Deployment Well-Being Survey, the wording of the three items was slightly changed to reflect military work groups. The modified items are: *The members of my platoon are cooperative with each other; The members of my platoon know that they can depend on each other; and The members of my platoon stand up for each other.* Responses to the three items were measured on a 5-point Likert-type scale (1 = *Strongly Disagree* to 5 = *Strongly Agree*).
For analysis, items were summed to create a horizontal (peer) cohesion index score (range = 3 to 15; Appendix B). Higher scores indicate greater perceived horizontal (peer) cohesion. The index has been used in previous studies assessing cohesion in military units as it relates to mental health stigma and perceived barriers to care (α = .89; Wright et al., 2009), morale and depression (α = .90; Britt et al., 2007), and work-family conflict (α not reported; Britt & Dawson, 2005). Internal reliability for the sample used in this study was excellent as evidenced by a Cronbach’s alpha of .90.

**Vertical Cohesion Indexes: NCO and Officer**

Level of a soldier’s perception of vertical (NCO) cohesion and vertical (officer) cohesion was each assessed with seven-item indexes generated by researchers at the WRAIR (Marlowe et al., 1985; Vaitkus, 1994). Different versions of the indexes have been used extensively in previous research with military populations (Bliese & Castro, 2000; Bliese & Halverson, 1996; Castro, Bienvenu, Huffman, & Adler, 2000; Hoge et al., 2004; Wright et al., 2009). Items represent a variety of actions that NCOs and officers may engage in during the course of a deployment to Iraq. These actions can signal to a soldier whether or not their leaders are supportive and capable of keeping them safe from the inherent dangers of a combat deployment.

The stem for the vertical (NCO) cohesion index asks soldiers, *Thinking about your platoon, rate how often the following occur.* In your platoon, NCOs. The stem for vertical (officer) cohesion index asks soldiers, *Thinking about your company, rate how often the following occur.* In your company, Officers. With the exception of one item, the individual items are the same for each index. The items that are in both indexes
include: *tell Soldiers when they have done a good job; embarrass Soldiers in front of other Soldiers* (item reverse-coded); *try to look good to higher-ups by assigning extra missions or details to Soldiers* (item reverse-coded); *exhibit clear thinking and reasonable action under stress; show favoritism to certain members in the platoon or show favoritism to certain members in the company*, depending on the index (item reverse-coded); and *ensure that Soldiers do not assume unnecessary risks when conducting missions*. The one item that is worded differently for each index is *are concerned for the safety of Soldiers* for the vertical (NCO) cohesion index and *protect the company from receiving too many taskings* for the vertical (officer) cohesion index. The items are measured on a 5-point Likert-type scale ranging from 1 = *Never* to 5 = *Always*.

For analysis, items were summed to create a vertical (NCO) cohesion index (range = 7 to 35; Appendix C) and vertical (officer) cohesion index (range = 7 to 35; Appendix D). Higher scores indicate greater perceived vertical cohesion. The items have exhibited good internal consistency in previous studies of U.S. Army personnel. Cronbach’s alpha for these studies ranged from .89 to .92 (Bliese & Halverson, 1996; Marlowe et al., 1985; Vaitkus, 1994). Internal reliability for the sample used in this study was good for the vertical (NCO) cohesion index ($\alpha = .81$) and acceptable for the vertical (officer) cohesion index ($\alpha = .77$).

**Coping Indexes: Emotion-Focused and Problem-Focused**

Level of a soldier’s use of emotion-focused coping and problem-focused coping was each assessed with rationally derived two-item indexes. Multiple authors have recommended that researchers examining coping strategies should derive sample specific
emotion-focused and problem-focused subscales from existing measures via factor analysis (Parker, Endler, & Bagby, 1993; Tennen & Herzberger, 1984). For this study, this process involved completing a factor analysis on the four available coping items. Following procedures used by Rodrigues and Renshaw (2010), a principal components analysis (PCA) with varimax rotation was conducted. Examination of the Scree plot indicated a two-factor solution that explained 78% of the variance. Item one and item two loaded on Factor 1 (problem-focused coping), and item three and item four loaded on Factor 2 (emotion-focused coping). All primary loadings were ≥ .75. Overall, the PCA indicated that two distinct factors were underlying soldier responses to the four coping items used in this study.

The stem for all four coping items informed soldiers that, *These questions deal with the ways you’ve been coping with deployment-related problems that may have come up.* The two items used to assess emotion-focused coping asked soldiers to what extent they try to see some of their deployment experiences in a positive light, and to what extent they look for something good even when bad things happen. The two items used to measure problem-focused coping asked soldiers to what extent they speak up when they think their leaders are making poor decisions, and to what extent they ask for further guidance when they do not understand an order. The coping items are measured on a 4-point frequency scale ranging from 1 = *I haven’t been doing this at all* to 4 = *I’ve been doing this a lot.*

For analysis, item one and item two (i.e., Factor 1) were summed to create a problem-focused coping index (range = 2 to 8; Appendix E), and item three and item four (i.e., Factor 2) were summed to create an emotion-focused coping index (range = 2 to 8;
Appendix F). Higher scores indicate greater use of a coping strategy. Internal reliability for the sample used in this study was good for the emotion-focused coping index ($\alpha = .81$). Given that the problem-focused index included only two items, the internal reliability was acceptable ($\alpha = .60$).

**Perceived Threat**

Level of a soldier’s perceived threat was measured with one item. After completing the 33 survey items related to experiencing combat-related stressors, the soldiers were asked to answer the following question: *Did any experience on this deployment cause you intense fear, helplessness, or horror?* The item is dichotomous (0 = no and 1 = yes). Soldiers who answered no are considered to have low perceived threat, and those who answered yes are considered to have high perceived threat. This question corresponds to Criterion A (2) of the *DSM-IV-TR* diagnostic criteria for PTSD, giving it good face and content validity.

**Posttraumatic Stress Symptomatology Index**

Level of a soldier’s PTSS was measured using the Posttraumatic Stress Disorder Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993). The 17 items that make up this self-report assessment instrument correspond to symptoms of PTSD as presented in the *DSM-IV-TR* (American Psychiatric Association, 2000). Respondents are asked to rate the extent to which they have experienced each of the 17 diagnostic symptoms outlined in the *DSM-IV-TR*. Items are rated as being bothersome over the past month on a 5-point Likert-type scale ranging from 1 = *not at all* to 5 = *extremely,*
yielding a summary score (range = 17 to 85; Appendix G). For this study, PTSS was calculated as the sum of the responses, with higher scores indicating greater PTSS. No clinical cutoffs were used to determine positive cases of PTSD. Thomas and colleagues (2011) warn against using clinical cutoffs by stating, “although the PCL is a well-validated scale in both civilian and military primary care and mental health settings … it is important to note that screening positive using clinical cutoffs does not necessarily equate diagnostically to having PTSD” (p. 807). The PCL has been shown to have high test-retest reliability ($r = .92$ for immediate and $r = .88$ for 1-week retest), internal consistency ($\alpha = .94$), and convergent validity ($rs > .93$) with the Clinician-Administered PTSD Scale (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Bliese et al., 2008; Keen, Kutter, Niles, & Krinsley, 2008; Ruggiero, Del Ben, Scotti, & Rabalais, 2003). The PCL has shown excellent internal consistency with different military populations, including Vietnam and Persian Gulf War veterans ($\alpha = .97$ and $\alpha = .96$, Weathers et al., 1993), U.S. Marines deployed to Iraq ($\alpha = .93$, Armistead-Jehle et al., 2011), and U.S. Army soldiers both during and after deployment to Iraq ($\alpha = .95$, Wood et al., 2011; $\alpha = .94$, Thomas et al., 2011). Internal reliability for the sample used in this study was excellent as evidenced by a Cronbach’s alpha of .94.

**Statistical Analyses**

**Moderation Effects: An Overview**

Central to this study was previous research that indicated exposure to combat-related stressors is associated with PTSS. The basic research question guiding this study, and much of the past research on combat exposure and PTSS, can be stated in
the following manner: To what extent does combat exposure (i.e., variable X as an independent variable) predict PTSS (i.e., variable Y as a dependent variable)?
Examining this type of direct effect relationship is important, but according to Frazier, Tix, and Barron (2004), there is a need to move beyond the examination of direct effects and “one way to do this is by examining moderators … of these effects” (p.116). This study attempts to move beyond only looking at direct-effect relationships by also examining coping, cohesion, and perceived threat as potential moderators of the relationship between combat-related stressors and PTSS.

As previously stated, Baron and Kenny (1986) define a moderator in general terms as “a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable” (p.1174). Thus, a moderator effect is an interaction whereby the effect of one variable depends on the level of another. Moderator variables can be continuous or dichotomous. This study, in addition to testing for significant direct effects, examined the extent to which the relationship between combat-related stressors (i.e., focal predictor) and PTSS (i.e., outcome) depends on the level of cohesion, coping, and perceived threat (i.e., potential moderators). Figure 2 displays the moderation framework, adapted from Frazier and colleagues (2004), that was used to guide this study. In the system displayed in Figure 2, the outcome variable is thought to be influenced by the focal-predictor variable. The presence of an interaction effect is supported when the effect of the focal-predictor variable on the outcome variable differs depending on the value of the moderator variable. The focal predictor and all moderators were also tested for any potential direct effect on PTSS.
Analysis Plan

To test the 18 study hypotheses, one direct-effects-only hierarchical multiple regression and six hierarchical moderated multiple regressions were used to test for multiple direct effects and interaction effects. All regressions were completed after the computation and examination of descriptive statistics and bivariate correlations among all study variables. Separate regressions were run for each moderator to limit the possibility of an inflated Type 1 error rate (Cohen, Cohen, West, & Aiken, 2003). All moderators, except perceived threat, were tested for both linear and curvilinear interaction. Figure 3 represents the model of the moderated multiple regression equations that were run for this study. The model was derived from the following regression equation:

\[ Y = b_0 + b_1X_1 + b_2X_2 + b_3M + b_4X_2M + b_5X_2^2 + b_6X_2^2M. \]
Figure 3. Moderated regression model testing for direct effects and interactions.

*Eight separate coefficients are represented by $b^1$. $^6$Deployed represents months deployed - C (i.e., total months on current deployment) and months deployed - T (i.e., total months deployed to a combat zone since 9/11).
Hierarchical Multiple Regression

Some researchers have suggested that including a product term (i.e., interaction term) in an equation may yield hard-to-interpret regression coefficients for the component parts (Jaccard & Turrisi, 2003). In order to ensure interpretable coefficients for the seven direct-effect hypotheses, an initial hierarchical direct-effects-only multiple regression with no interaction terms or centered variables was run. This step also allowed the model intercept to be interpreted as a function of direct effects, as opposed to the conditional effects that occur when continuous variables are centered.

Hierarchical Moderated Multiple Regression

The use of hierarchical moderated multiple regression for the 11 interaction hypotheses (i.e., six linear interactions and five curvilinear interactions) facilitated sequential examination of several predictor variables in a way that allowed for the relative importance of a predictor to be judged on the basis of how much it added to the prediction of PTSS. Six hierarchical moderated multiple regression equations, controlling for demographic and military factor variables (i.e., age, gender, rank, military component, marital status, months deployed-C, months deployed-T, and unit type) were used to examine the associations of cohesion, coping, perceived threat, and exposure to combat-related stressors with PTSS. Typically, this type of analysis places a greater focus on the change in predictability associated with variables entered later in the analysis over and above those entered in earlier steps (Petrocelli, 2003). Using hierarchical moderated multiple regression to detect and analyze moderation effects is supported by multiple researchers (Aiken & West, 1991; Baron & Kenny, 1986; Cohen
et al., 2003; Jaccard & Turrisi, 2003). This study’s analysis plan was primarily based on the recommendations of these authors and was consistent with the statistical methods outlined by Aiken and West (1991), Cohen et al. (2003), and Jaccard and Turrisi (2003).

**Centering continuous variables.** Prior to moderated regression analysis, continuous controls (i.e., months deployed-C and months deployed-T), the focal predictor (i.e., combat-related stressors), and continuous moderator (i.e. all moderators except perceived threat) were centered (i.e., put into deviation units by subtracting their sample means to produce revised sample means of zero; Cohen et al., 2003 ). Jaccard and Turrisi (2003) recommend centering continuous variables before conducting moderation analysis to reduce potential problems associated with multicollinearity (i.e., high correlations) among the variables in the moderated regression. Specifically, centering decreases the chances that the focal-predictor and moderator variables will be highly correlated with the interaction terms created from them.

**Hierarchical steps.** In Step 1, demographic and military factor variables most commonly identified as co-varying with PTSS (i.e., potential confounds) were entered, allowing for control of age, gender, rank, military component, marital status, months deployed on current deployment, total months deployed to a combat zone since 9/11, and unit type, in all subsequent steps. In Step 2, the focal predictor (combat-related stressors) was added to examine the independent association of combat-related stressors with PTSS. In Step 3, all potential moderators were added to examine the independent association of each moderator with PTSS. For the initial direct-effects-only regression, Step 3 was the
In Step 4 of each moderated regression, one interaction term (e.g., for moderated regression 2a, combat-related stressors × horizontal [peer] cohesion) was entered to evaluate the role of coping, cohesion, and perceived threat as a linear moderator of the relationship between combat-related stressors and PTSS. In Step 5, hypothesized curvilinear or quadratic effects were examined by entering combat-related stressors$^2$ alone and as a product term with the moderator being examined in that regression (e.g., combat-related stressors$^2$ × horizontal [peer] cohesion). A significant contribution of the predictor by moderator interaction term indicated the presence of moderation (Baron & Kenny, 1986).

Importantly, Petrocelli (2003) reports that hierarchical regression gives less attention to reevaluating variables based on their standardized coefficients ($\beta$s) when additional predictors are added to the analysis. In general, when interpreting results of hierarchical moderated multiple regression unstandardized coefficients ($B$), rather than standardized coefficients ($\beta$), are interpreted because the $\beta$ coefficients for the interaction terms are not properly standardized and therefore not interpretable (Frazier et al., 2004). Furthermore, in order to assess the relative contribution of variables entered at each step, a greater focus is typically placed on $\Delta R^2$ and the corresponding change in $F$ and $p$ values for each step. The results of the regressions for this study were reported with these guidelines in mind.

**Plotting and post-hoc analysis.** As recommended by Aiken and West (1991), any significant moderation effects were probed in order to inspect their particular forms and improve the overall understanding of any significant interaction. The two primary
ways of accomplishing this are by plotting and post-hoc statistical testing. Plotting involves predicting values of the outcome variable (i.e., PTSS) for representative groups of the moderator (e.g., soldiers with low vertical cohesion and soldiers with high vertical cohesion). For this study those groups who scored at the mean, 1 standard deviation above the mean, and 1 standard deviation below the mean on the predictor and moderator variables were represented (Aiken & West, 1991; Cohen et al., 2003; Holmbeck, 1997). To summarize the moderator effect visually, the predicted values were used to create a plot of the regression lines representing the simple regression equations of PTSS on combat-related stressors ($M \pm 1SD$) at high ($M + 1SD$) and low ($M - 1SD$) values of any significant moderator. Post-hoc analysis (i.e., simple slopes analysis) of the regression of PTSS on combat-related stressors at different levels ($M \pm 1SD$) of significant moderators were conducted to test the statistical significance of the slopes of the simple regression lines (Aiken & West, 1991). This test enabled this researcher to report whether or not the relations between combat-related stressors and PTSS were significantly different from zero at different levels of significant moderators.

**Relationship between Statistical Model and Study Hypotheses**

One hierarchical multiple regression and six hierarchical moderated multiple regressions were estimated to examine 18 hypotheses involving the relationships among combat-related stressors, cohesion, coping, perceived threat, and the psychological health of U.S. Army soldiers deployed to a war-zone environment. An initial hierarchical multiple regression (i.e., Regression 1) was estimated to examine hypotheses 1a through 1g which were derived from this study’s first research question that asked, “Among U.S.
Army soldiers deployed to a war-zone environment, to what extent are combat-related stressors, cohesion, coping, and perceived threat independently associated with PTSS?”

Six hierarchical moderated multiple regressions (i.e., Regressions 2a through 2f) were estimated to examine hypotheses 2a through 2f and hypotheses 3a through 3e.

Hypotheses 2a through 2f were derived from this study’s second research question that asked, “Among U.S. Army soldiers deployed to a war-zone environment, to what extent do cohesion, coping, and perceived threat act as moderators of the relationship between combat-related stressors and PTSS?” Hypotheses 3a through 3e were derived from this study’s third research question which asked, “Among U.S. Army soldiers deployed to a war-zone environment, to what extent do cohesion and coping act as curvilinear moderators of the relationship between combat-related stressors and PTSS?” Although not a primary focus of this study, curvilinear interactions were examined based on previous research that identified cohesion and coping as potential curvilinear moderators of the relationship between combat exposure and PTSS (Dickstein et al., 2010; Fontana et al., 1997; Rodrigues & Renshaw, 2010; Sharkansky et al., 2000)

**Regression Equation 1 and Related Hypotheses**

The regression equation used to examine hypotheses 1a through 1g is:

\[ Y(PTSS) = b_1(Age) + b_2(Gender) + b_3(Rank) + b_4(Military\ Component) + b_5(Marital\ Status) + b_6(Months\ Deployed-Current) + b_7(Months\ Deployed-Total) + b_8(Unit\ Type) + b_9(Combat-Related\ Stressors) + b_{10}(Horizontal\ (Peer)\ Cohesion) + b_{11}(Vertical\ (NCO)\ Cohesion) + b_{12}(Vertical\ (Officer)\ Cohesion) + b_{13}(Emotion-Focused\ Coping) + b_{14}(Problem-Focused\ Coping) + b_{15}(Perceived\ Threat). \]
Hypothesis 1a. Higher levels of combat-related stressors will be associated with greater report of PTSS. This hypothesis was formally tested by examining the regression coefficient $b_9$.

Hypotheses 1b, 1c, and 1d. Higher levels of horizontal (peer) cohesion, higher levels of vertical (NCO) cohesion, and higher levels of vertical (officer) cohesion will be associated with lower levels of PTSS. These hypotheses were formally tested by examining the regression coefficients $b_{10}, b_{11},$ and $b_{12}$.

Hypothesis 1e and 1f. Higher levels of emotion-focused coping and lower levels of problem-focused coping will be associated with greater report of PTSS. These hypotheses were formally tested by examining the regression coefficients $b_{13}$ and $b_{14}$.

Hypothesis 1g. High perceived threat will be associated with greater report of PTSS. This hypothesis was formally tested by examining regression coefficient $b_{15}$.

Regression Equations 2a through 2f and Related Hypotheses

The regression equations used to examine hypotheses 2a through 2f (i.e., linear moderation) and hypotheses 3a through 3e (i.e., curvilinear moderation) are represented by the addition of a linear interaction term in Step 4 and a curvilinear interaction term in Step 5. Separate hierarchical moderated regressions were run for each hypothesis. Step 1 ($b_1 - b_8$), Step 2 ($b_9$), and Step 3 ($b_{10} - b_{15}$), were the same as in Regression 1. For each moderated regression Step 4 was unique as represented by a different linear interaction term, and Step 5 was unique as represented by a different curvilinear interaction term.
**Hypotheses 2a, 2b, and 2c.** Higher levels of horizontal (peer) cohesion, higher levels of vertical (NCO) cohesion, and higher levels of vertical (officer) cohesion will buffer the relationship between combat-related stressors and PTSS. These hypotheses were formally tested by examining regression coefficient $b_{16a}$ for Regression 2a (i.e., combat-related stressors × horizontal [peer] cohesion); regression coefficient $b_{16b}$ for Regression 2b (i.e., combat-related stressors × vertical [NCO] cohesion); and regression coefficient $b_{16c}$ for Regression 2c (i.e., combat-related stressors × vertical [officer] cohesion).

**Hypotheses 2d and 2e.** Lower levels of emotion-focused coping and higher levels of problem-focused coping will buffer the relationship between combat-related stressors and PTSS. These hypotheses were formally tested by examining the regression coefficient $b_{16d}$ for Regression 2d (i.e., combat-related stressors × emotion-focused coping) and regression coefficient $b_{16e}$ for Regression 2e (i.e., combat-related stressors × problem-focused coping).

**Hypothesis 2f.** Low perceived threat will buffer the relationship between combat-related stressors and PTSS. This hypothesis was formally tested by examining the regression coefficient $b_{16f}$ for Regression 2f (i.e., combat-related stressors × perceived threat).

The $\Delta R^2$ from Step 3 to Step 4 was also examined for all six moderated regressions. A significant $\Delta R^2$ indicates that the interaction term added in Step 4 is significant and further supports any significant findings for regression coefficients $b_{16a-f}$. 
Hypotheses 3a, 3b, 3c, 3d, and 3e. Horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, emotion-focused coping, and problem-focused coping will act as curvilinear moderators of the relationship between combat-related stressors and PTSS. As curvilinear interaction was not the primary focus of this study, no specific hypotheses related to the specific form of curvilinear interactions were made. These hypotheses were formally tested by examining the regression coefficient $b_{18a}$ for Regression 2a (i.e., combat-related stressors $^2 \times$ horizontal [peer] cohesion); regression coefficient $b_{18b}$ for Regression 2b (i.e., combat-related stressors $^2 \times$ vertical [NCO] cohesion); regression coefficient $b_{18c}$ for Regression 2c (i.e., combat-related stressors $^2 \times$ vertical [officer] cohesion); regression coefficient $b_{18d}$ for Regression 2d (i.e., combat-related stressors $^2 \times$ emotion-focused coping); and regression coefficient $b_{18e}$ for Regression 2e (i.e., combat-related stressors $^2 \times$ problem-focused coping). The $\Delta R^2$ from Step 4 to Step 5 was also examined for all five regressions. A significant $\Delta R^2$ indicates that the curvilinear interaction term added in Step 5 is significant and further supports any significant findings for regression coefficients $b_{18a-e}$.

Hierarchical Linear Models (HLM)

Hierarchical linear models (HLM) extend the simple linear model assumed under hierarchical moderated multiple regression to account for the dependency of error occurring when data are nested within a second, higher-order group. For this study, data from individual soldiers was considered to be nested within the context of the soldier’s military unit. Individual soldiers were nested within a platoon that is typically comprised of 30 to 50 soldiers. Given this study’s use of nested data, there was a possibility that
PTSS scores obtained from each individual soldier may have been autocorrelated within the assigned platoon. If true, this autocorrelation could violate the ordinary least squares multiple regression assumption of independence of observations, as the intercept and slope coefficients normally estimated using ordinary least squares analysis may have varied as a result of group membership. Research suggests that a major grouping variable such as unit membership, when unaccounted for in the model, may result in significant increases in both Type 1 and Type 2 error rates for multiple regression results (Bliese & Hanges, 2004).

In order to address the issue of platoon assignment, potentially accounting for clustering of variability in the PTSS values of individual soldiers within platoons, this study used multilevel modeling software (HLM 7) to calculate an intraclass correlation coefficient (ICC) prior to conducting hierarchical moderated multiple regression (i.e., ordinary least squares multiple regression). Hox (2010) describes the ICC as the “proportion of the variance explained by the grouping structure in the population” (p. 15), while Kreft and de Leeuw (1998) explains the ICC as “the degree to which individuals share common experiences due to closeness in space and/or time” (p. 9). Both definitions suggest that finding a large ICC would indicate the ordinary least squares assumption of independent observations has been violated and the use of ordinary least squares regression would not be appropriate (Kreft & de Leeuw, 1998).

For this study, the ICC measured the proportion of variance in soldiers’ PTSS scores that is accounted for by platoon assignment (i.e., level-2 unit). To put it another way, the ICC measured the extent to which soldiers within the same platoon are more similar to each other than they are to soldiers in other platoons. To determine if the ICC
value indicated that HLM analysis should be used in place of ordinary least squares analysis, this study followed guidelines suggested by Lee (2000) who states, “Only when the ICC is more than trivial (i.e., greater than 10% of the total variance in the outcome) would the analyst need to consider multilevel methods” (p.128). This recommendation suggests that if the ICC is less than 0.10, sufficient independence of observations and error terms can be assumed and the use of ordinary least squares regression is warranted.

After estimating a fully unconditional model (i.e., null model), the level-1 (i.e., soldier) and level-2 (i.e., platoon) variances were used to calculate the ICC: \( \rho = \frac{\tau_{00}}{\tau_{00} + \sigma^2} = \frac{6.11}{6.11 + 188.87} = 0.03 \). The ICC indicates that 3% of the total variability in PTSS scores is due to differences across platoons. This finding suggests that the remainder of PTSS score variability (97%) is attributable to PTSS score differences across individual soldiers, thus supporting the use of ordinary least squares multiple regression for this study.
Chapter IV: Findings

Demographic and Military Factor Characteristics

Soldiers’ demographic and military characteristics describe a sample that was largely young (18 to 24 years of age, 51%), male (92%), junior enlisted (E1 to E4, 60%), and active-duty (90%). There were similar numbers of single (51%) and married (49%) soldiers. The percentage of support and sustainment unit soldiers and maneuver unit soldiers was relatively even (47% and 53%, respectively). At the time of the survey, 48% of the soldiers had been on their current deployment to Iraq for more than 6 months (months deployed-C; $M = 6.55$ months, $SD = 3.53$) and 45% had been deployed to a combat zone for a total of 13 months or more since 9/11 (months deployed-T; $M = 14.19$ months, $SD = 11.03$).

Table 1 summarizes demographic and military factors by level of PTSS ($M = 29.56$, $SD = 13.84$). For the entire sample, 20% had no PTSS (PTSS index score = 17) while 36% had either moderate (index score = 31 to 49) or high levels (PTSS index score = 50 to 85) of PTSS. A majority of soldiers (80%) had experienced at least some PTSS. For every category within each demographic and military factor, the majority of soldiers self-reported low levels of PTSS. The number of soldiers reporting moderate levels of PTSS was also substantial, as evidenced by the moderate category being the second highest percentage for the majority of categories within each factor.
### Table 1

*Demographic and Military Factor Variables by PTSS*

<table>
<thead>
<tr>
<th>PTSSa</th>
<th>No (%)</th>
<th>Low (%)</th>
<th>Mod (%)</th>
<th>High (%)</th>
<th>$\chi^2$ Sig.</th>
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<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
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<td>$p = .09$</td>
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<tr>
<td>18-24</td>
<td>23</td>
<td>42</td>
<td>25</td>
<td>10</td>
<td></td>
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<tr>
<td>25-29</td>
<td>25</td>
<td>47</td>
<td>20</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>18</td>
<td>48</td>
<td>27</td>
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<td></td>
</tr>
<tr>
<td>40 or older</td>
<td>9</td>
<td>40</td>
<td>34</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
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<td></td>
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<td>18</td>
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<td>28</td>
<td>11</td>
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</tr>
<tr>
<td>Male</td>
<td>21</td>
<td>44</td>
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<td>E1-E4 (Junior enlisted)</td>
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<td>45</td>
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<td>10</td>
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<tr>
<td>E5-E9 (NCO)</td>
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<td>43</td>
<td>27</td>
<td>11</td>
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<td>1</td>
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<td>43</td>
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<td>10</td>
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<td>Marital Status</td>
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<td>46</td>
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<td>Maneuver</td>
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<td>43</td>
<td>27</td>
<td>10</td>
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<tr>
<td>Months Deployed – Cb</td>
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<td></td>
<td></td>
<td>$p &lt; .001$</td>
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<td>1-6</td>
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<td>16</td>
<td>43</td>
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<td>12</td>
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<td>22</td>
<td>17</td>
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<td>Months Deployed – Tc</td>
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<td></td>
<td></td>
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<td>$p &lt; .01$</td>
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<td>13-24</td>
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<td>27</td>
<td>13</td>
<td></td>
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<tr>
<td>More than 2 years</td>
<td>16</td>
<td>43</td>
<td>28</td>
<td>13</td>
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Note. $N = 1,824$.

aPTSS Index scores by category, No = 17, Low = 18-30, Moderate = 31-49, High = 50-85.
bMonths deployed on current deployment to Iraq. cTotal months deployed to a combat zone since 9/11.
Soldiers’ level of PTSS differed significantly by military component, with $\chi^2(3, N = 1,824) = 12.44, p < .05$; months deployed to Iraq on current deployment, with $\chi^2(6, N = 1,824) = 26.52, p < .001$; and total months deployed to a combat zone since 9/11, with $\chi^2(6, N = 1,824) = 19.40, p < .01$. Active-duty soldiers were more likely to report moderate and high levels of PTSS and less likely to report no or low symptoms, when compared to National Guard or Reserve soldiers. Soldiers who were deployed for more months on their current deployments to Iraq reported higher levels of PTSS when compared to soldiers with fewer months deployed. For example, 17% of those soldiers who, on their current deployments to Iraq, were deployed for more than 1 year reported high PTSS, whereas only 8% of the soldiers deployed for 1 to 6 months reported similar levels. Tukey’s HSD (Honestly Significant Difference) test indicated the difference in mean PTSS scores between the two groups (i.e., more than 1 year and 1 to 6 months) was significant ($p < .05$). The difference in PTSS scores between the two groups (mean difference = 4.01) suggests that those soldiers deployed to Iraq for more than 1 year on their current deployment had higher levels of PTSS, on average, than the soldiers who were deployed for 1 to 6 months on their current deployment.

The same was true for soldiers deployed to a combat zone for more total months since 9/11. For example, 13% of those soldiers deployed to a combat zone since 9/11 for 13 to 24 total months reported high PTSS, whereas only 8% of the soldiers deployed for 1 to 12 total months since 9/11 reported similar levels. Tukey’s HSD test indicated the difference in mean PTSS scores between the two groups (i.e., 13 to 24 total months and 1 to 12 total months) was significant ($p < .01$). The difference in PTSS scores between the two groups (mean difference = 2.38) suggests that those soldiers deployed to
a combat zone for 13 to 24 total months since 9/11 had higher levels of PTSS, on average, than the soldiers deployed to an active combat zone for 1 to 12 total months since 9/11.

**Stress, Threat, Coping, and Cohesion by PTSS**

Soldiers reported being exposed to an average of 7.59 (SD = 6.84) combat-related stressors with 29% reporting 11 or more exposures. A majority of the sample (88%) was exposed to at least one combat-related stressor. Table 2 summarizes combat-related stressors by PTSS, as well as all potential moderators by PTSS. Level of PTSS significantly differed by level of exposure to combat-related stressors, with $\chi^2(9, N = 1,824) = 152.84, p < .001$. Within the moderate PTSS category, as the level of exposure to combat-related stressors increased, so did the percentage of soldiers reporting moderate levels of PTSS (e.g., 0 stressors = 17% reporting moderate PTSS; 1 to 5 stressors = 20% reporting moderate PTSS; 6 to 10 stressors = 27% reporting moderate PTSS; 11 to 33 stressors = 34% reporting moderate PTSS). A similar pattern existed within the high PTSS category (e.g., 0 stressors = 5% reporting high PTSS versus 11 to 33 stressors = 17% reporting high PTSS). Of all soldiers reporting no exposure to combat-related stressors, 38% of these also reported no PTSS. The percentage of soldiers reporting no PTSS decreased as exposure to combat-related stressors increased (e.g., 1 to 5 stressors = 25% reporting no PTSS, 6 to 10 stressors = 18% reporting no PTSS, 11 to 33 stressors = 9% reporting no PTSS).

The majority of soldiers reported having a low level of perceived threat (83%). Only 7% of those soldiers with low perceived threat also reported having high PTSS. For
those who reported high perceived threat, over half had either moderate (45%) or high (25%) PTSS. Level of PTSS significantly differed by perceived threat, with $X^2(3, N = 1,824) = 229.43, p < .001$. Level of PTSS significantly differed by both level of emotion-focused coping, with $X^2(6, N = 1,824) = 33.97, p < .001$; and level of problem-focused coping, with $X^2(6, N = 1,824) = 20.21, p < .01$. The majority of soldiers had moderate levels (coping index score = 4 to 6) of both emotion-focused and problem-focused coping, 55% and 64%, respectively. Soldiers who reported low levels (index score = 2 to 3) of emotion-focused coping, when compared to those who reported high levels (index score = 7 to 8) of emotion-focused coping, were more likely to report high levels of PTSS (e.g., low emotion-focused coping = 16% reporting high PTSS versus high emotion-focused coping = 9% reporting high PTSS). The difference in PTSS scores between the two groups (mean difference = 4.28) was significant ($p < .001$) suggesting that soldiers who reported using low levels of emotion-focused coping experienced higher levels, on average, of PTSS. The reverse was true for problem-focused coping (e.g., low problem-focused coping = 11% reporting high PTSS versus high problem-focused coping = 14% reporting high PTSS). The difference on PTSS scores between the two groups (mean difference = −2.43) was significant ($p < .05$) suggesting that soldiers who reported using low levels of problem-focused coping experienced lower levels, on average, of PTSS. As the use of emotion-focused coping increased, the percentage of soldiers reporting no PTSS increased (e.g., low emotion-focused coping = 19% reporting no PTSS versus high emotion-focused coping = 22% reporting no PTSS). There was an opposite relationship for problem-focused coping. For those soldiers reporting low problem-focused coping, 25% also reported no
PTSS. However, as the use of problem-focused coping increased from low to high, the percentage of soldiers reporting no PTSS decreased by 5%.

Level of PTSS differed significantly by level of horizontal (peer) cohesion, with $X^2(6, N = 1,824) = 74.48, p < .001$; vertical (NCO) cohesion, with $X^2(6, N = 1,824) = 90.06, p < .001$; and vertical (officer) cohesion, with $X^2(6, N = 1,824) = 60.06, p < .001$. The majority of all soldiers reported moderate to high levels of peer cohesion (59%), NCO cohesion (76%), and officer cohesion (73%). For each type, a higher level of cohesion was related to a decrease in the number of soldiers reporting moderate or high levels of PTSS (e.g., low peer cohesion = 15% reporting high PTSS versus high peer cohesion = 8% reporting high PTSS). A similar pattern held for both NCO cohesion (low NCO cohesion = 18% reporting high PTSS versus high NCO cohesion = 5% reporting high PTSS), and officer cohesion (low officer cohesion = 16% reporting high PTSS versus high officer cohesion = 5% reporting high PTSS). For all three measures of cohesion, as the level of cohesion increased from low to high, the percentage of soldiers reporting no PTSS increased (e.g., low NCO cohesion = 14% reporting no PTSS versus high NCO cohesion = 27% reporting no PTSS). The difference in PTSS scores between the two groups (low and high cohesion) was significant for horizontal cohesion (mean difference = 4.42, $p < .001$), NCO cohesion (mean difference = 9.10, $p < .001$), and officer cohesion (mean difference = 7.15, $p < .001$). These findings suggest that soldiers reporting low levels of cohesion reported higher levels, on average, of PTSS compared to soldiers reporting high levels of cohesion.
### Table 2

*Stress, Threat, Coping, and Cohesion by PTSS*

<table>
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<th>PTSS&lt;sup&gt;a&lt;/sup&gt;</th>
<th>No (%)</th>
<th>Low (%)</th>
<th>Mod (%)</th>
<th>High (%)</th>
<th>(\chi^2) Sig.</th>
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Note. \(N = 1,824\).  
<sup>a</sup>PTSS index scores by category, No=17, Low=18-30, Moderate=31-49, High=50-85.
Bivariate Associations

Table 3 illustrates bivariate correlations of control variables, the focal predictor (combat-related stressors), moderator (peer cohesion, NCO cohesion, and officer cohesion; emotion- and problem-focused coping; perceived threat), and outcome (PTSS) variables. Among control variables, PTSS was positively correlated with military component \( (r = .08, p < .01) \), months deployed on current deployment \( (r = .10, p < .001) \), total months deployed since 9/11 \( (r = .14, p < .001) \), and unit type \( (r = .05, p < .05) \). As expected, PTSS was correlated with combat-related stressors \( (r = .30, p < .001) \). Among the moderators, PTSS was negatively correlated with peer cohesion \( (r = -.19, p < .001) \), NCO cohesion \( (r = -.24, p < .001) \), and officer cohesion \( (r = -.20, p < .001) \). PTSS was positively correlated with problem-focused coping \( (r = .08, p < .01) \) and negatively correlated with emotion-focused coping \( (r = -.10, p < .001) \). As expected, PTSS was strongly positively correlated with perceived threat \( (r = .38, p < .001) \). The bivariate correlations between PTSS and age, gender, rank, and marital status were not significant. One of the strongest positive correlations was between age and rank \( (r = .45, p < .001) \). The three cohesion indexes were positively correlated with each other (e.g., NCO and officer cohesion, \( r = .38, p < .001 \)), as were the two coping indexes \( (r = .33, p < .001) \). Combat-related stressors were positively correlated with gender \( (r = .19, p < .001) \), military component \( (r = .14, p < .001) \), months deployed on current deployment \( (r = .32, p < .001) \), months deployed total since 9/11 \( (r = .16, p < .001) \), and unit type \( (r = .44, p < .001) \). The degrees of freedom for all reported correlations was 1,822.
Table 3
Correlations Among All Study Variables and Reliability Estimates for Study Measures

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<td>.08**</td>
<td>.38***</td>
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Note.  N = 1,824. Cronbach’s alpha reliability estimates are in parentheses above the diagonal.

aGender (0 = Female, 1 = Male), Component (0 = National Guard or Reserve, 1 = Active-Duty), Marital Status (0 = Single, 1 = Married), Unit Type (0 = Support and Sustainment, 1 = Maneuver), Perceived Threat (0 = Low Perceived Threat, 1 = High Perceived Threat).

*p < .05, **p < .01, ***p < .001.
Hierarchical Multiple Regression: Direct-Effects-Only Model

To determine to what extent combat-related stressors; three types of cohesion; two types of coping; and perceived threat are independently associated with PTSS, hierarchical multiple regression analysis was conducted with combat-related stressors, peer cohesion, NCO cohesion, officer cohesion, emotion-focused coping, problem-focused coping, and perceived threat as predictor variables and PTSS as the criterion variable. Results of the direct-effects-only regression (i.e., Regression 1 with no interaction terms) are presented in Table 4. Regression 1 was used to examine hypotheses 1a through hypothesis 1g. As recommended by Petrocelli (2003), the $B$ coefficients associated with each predictor variable have been reported for the step in which it was first computed. Petrocelli (2003) reports that hierarchical regression gives less attention to reevaluating variables based on their $B$s when additional predictors are added to the analysis. Furthermore, in order to assess the relative contribution of variables entered at each step, a greater focus is typically placed on $\Delta R^2$ and the corresponding change in $F$ and $p$ values for each step. The following results are reported with these guidelines in mind.

The demographic and military factor variables entered in Step 1 significantly predicted PTSS, $\Delta R^2 = .035$, $F$ change (8, 1815) = 8.19, $p < .001$. Significant control variables included gender ($p < .05$), rank ($p < .01$), military component ($p < .05$), months deployed–current deployment ($p < .05$), and total months deployed since 9/11 ($p < .001$). The focal-predictor variable (combat-related stressors) was added in Step 2 and was significantly associated with PTSS, $\Delta R^2 = .089$, $F$ change (1, 1814) = 184.32, $p < .001$, etc.
for a model $R^2 = .124$, $F(9, 1814) = 28.50$, $p < .001$. Controlling for potential confounds (i.e., variables entered in Step 1), every 1 unit increase in exposure to combat-related stressors corresponded to a 0.70 unit increase in PTSS ($B = 0.70$, $SE = 0.051$, $p < .001$).

All potential moderators, acting as independent predictors, were added in Step 3 and were significantly associated with PTSS, $\Delta R^2 = .135$, $F$ change (6, 1808) = 54.80, $p < .001$, for a final model $R^2 = .259$, $F(15, 1808) = 42.06$, $p < .001$.

The $B$ coefficients for Step 3 of Regression 1, provide support for hypotheses 1a, 1b, 1c, 1d, and 1g. Hypotheses 1e and 1f were not supported. The $B$ coefficients related to hypotheses 1e and 1f were significant, but in the opposite direction as hypothesized. This finding will be fully examined in the discussion section. Supported hypotheses include:

**Hypothesis 1a.** Higher levels of combat-related stressors were independently associated with greater report of PTSS: $b_9 = .42$, $t(1,815) = 8.27$, $p < .001$.

**Hypothesis 1b.** Higher levels of horizontal (peer) cohesion were independently associated with lower levels of PTSS: $b_{10} = -.49$, $t(1,815) = -4.13$, $p < .001$.

**Hypothesis 1c.** Higher levels of vertical (NCO) cohesion were independently associated with lower levels of PTSS: $b_{11} = -.29$, $t(1,815) = -4.80$, $p < .001$.

**Hypothesis 1d.** Higher levels of vertical (officer) cohesion were independently associated with lower levels of PTSS: $b_{12} = -.16$, $t(1,815) = -2.72$, $p < .01$.

**Hypothesis 1g.** High perceived threat was independently associated with greater report of PTSS: $b_{15} = 10.27$, $t(1,815) = 12.73$, $p < .001$. 
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<td>-0.010</td>
</tr>
<tr>
<td>Months Deployed – C</td>
<td></td>
<td></td>
<td>0.223*</td>
<td>0.097</td>
<td>0.057*</td>
</tr>
<tr>
<td>Months Deployed – T</td>
<td></td>
<td></td>
<td>0.189***</td>
<td>0.033</td>
<td>0.150***</td>
</tr>
<tr>
<td>Unit Type</td>
<td></td>
<td></td>
<td>0.466</td>
<td>0.743</td>
<td>0.017</td>
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<tr>
<td><strong>Step 2: Focal Predictor</strong></td>
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<td>Combat-Related Stressors</td>
<td></td>
<td></td>
<td>0.696***</td>
<td>0.051</td>
<td>0.344***</td>
</tr>
<tr>
<td><strong>Step 3: Moderators</strong> ( b_{10}–b_{15} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>( b_1 )</td>
<td></td>
<td>0.730</td>
<td>0.377</td>
<td>0.047</td>
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<tr>
<td>Gender</td>
<td>( b_2 )</td>
<td></td>
<td>-2.172*</td>
<td>1.098</td>
<td>-0.043*</td>
</tr>
<tr>
<td>Rank</td>
<td>( b_3 )</td>
<td></td>
<td>-0.617</td>
<td>0.592</td>
<td>-0.026</td>
</tr>
<tr>
<td>Military Component</td>
<td>( b_4 )</td>
<td></td>
<td>2.765**</td>
<td>1.026</td>
<td>0.060**</td>
</tr>
<tr>
<td>Marital Status</td>
<td>( b_5 )</td>
<td></td>
<td>-0.811</td>
<td>0.600</td>
<td>-0.029</td>
</tr>
<tr>
<td>Months Deployed – C</td>
<td>( b_6 )</td>
<td></td>
<td>-0.144</td>
<td>0.088</td>
<td>-0.037</td>
</tr>
<tr>
<td>Months Deployed – T</td>
<td>( b_7 )</td>
<td></td>
<td>0.150***</td>
<td>0.029</td>
<td>0.119***</td>
</tr>
<tr>
<td>Unit Type</td>
<td>( b_8 )</td>
<td></td>
<td>-2.051**</td>
<td>0.699</td>
<td>-0.074**</td>
</tr>
<tr>
<td>Combat-Related Stressors</td>
<td>( b_9 )</td>
<td></td>
<td>0.421***</td>
<td>0.051</td>
<td>0.208***</td>
</tr>
<tr>
<td>Peer Cohesion</td>
<td>( b_{10} )</td>
<td></td>
<td>-0.492***</td>
<td>0.119</td>
<td>-0.097***</td>
</tr>
<tr>
<td>NCO Cohesion</td>
<td>( b_{11} )</td>
<td></td>
<td>-0.289***</td>
<td>0.060</td>
<td>-0.123***</td>
</tr>
<tr>
<td>Officer Cohesion</td>
<td>( b_{12} )</td>
<td></td>
<td>-0.155**</td>
<td>0.057</td>
<td>-0.062**</td>
</tr>
<tr>
<td>Emotion-Focused Coping</td>
<td>( b_{13} )</td>
<td></td>
<td>-0.389*</td>
<td>0.163</td>
<td>-0.054*</td>
</tr>
<tr>
<td>Problem-Focused Coping</td>
<td>( b_{14} )</td>
<td></td>
<td>0.687***</td>
<td>0.191</td>
<td>0.080***</td>
</tr>
<tr>
<td>Perceived Threat</td>
<td>( b_{15} )</td>
<td></td>
<td>10.269***</td>
<td>0.807</td>
<td>0.281***</td>
</tr>
</tbody>
</table>

Note. No variables have been centered and no interaction terms have been included. \( N = 1,824 \).

\( a \) Gender (0 = Female, 1 = Male), Military Component (0 = National Guard or Reserve, 1 = Active-Duty), Marital Status (0 = Single, 1 = Married), Unit Type (0 = Support and Sustainment, 1 = Maneuver), Perceived Threat (0 = Low Perceived Threat, 1 = High Perceived Threat). \( b \) Months deployed on current deployment to Iraq. \( c \) Total months deployed to a combat zone since 9/11. \( d \) Step 3 represents the final direct-effects-only model with all variables entered.

\( * p < .05, ** p < .01, *** p < .001 \).
Hypotheses 1e and 1f were not supported. Findings were contrary to this study’s hypotheses which posited that higher levels of emotion-focused coping and lower levels of problem-focused coping would both be associated with greater report of PTSS. In fact, higher levels of emotion-focused coping were independently associated with lower levels of PTSS, $b_{13} = -.39$, $t(1,815) = -2.39$, $p < .05$; and higher levels of problem-focused coping were independently associated with greater report of PTSS, $b_{14} = .69$, $t(1,815) = 3.59$, $p < .001$. These findings will be fully examined in Chapter V.

Hierarchical Moderated Multiple Regression: Testing for Interactions

Hierarchical moderated multiple regression analysis was conducted to determine to what extent three types of cohesion, two types of coping, and perceived threat acted as moderators of the relationship between combat-related stressors and PTSS. Specifically, six hierarchical moderated multiple regression equations, controlling for demographic and military factor variables (i.e., age, gender, rank, military component, marital status, months deployed-C, months deployed-T, and unit type) were used to examine the associations of peer cohesion, NCO cohesion, officer cohesion, emotion-focused coping, problem-focused coping, perceived threat, and exposure to combat-related stressors with PTSS. The results of six hierarchical moderated multiple regressions (i.e., Regressions 2a through 2f with linear and curvilinear interaction terms) are presented in Table 5. Regressions 2a through 2f were used to examine hypotheses 2a through 2f (i.e., linear interaction) and hypotheses 3a through 3e (i.e., curvilinear interaction).
In order to assess the relative contribution of each potential moderator, in addition to looking at the $B$ coefficient for each interaction (i.e., $b_{16}$ = linear interaction, $b_{18}$ = curvilinear interaction), a focus was also placed on $\Delta R^2$ and the corresponding change in $F$ and $p$ values for Step 4 and Step 5. As previously stated, when interpreting results of hierarchical moderated multiple regression unstandardized coefficients ($B$), rather than standardized coefficients ($\beta$), are interpreted because the $\beta$ coefficients for the interaction terms are not properly standardized and therefore not interpretable (Frazier et al., 2004). A significant contribution of the focal predictor by moderator interaction term indicated the presence of moderation (Baron & Kenny, 1986). Furthermore, additional support for significant moderation was indicated by a significant $\Delta R^2$ between Step 3 and Step 4 for linear interactions, and between Step 4 and Step 5 for curvilinear interactions.

With the exception of continuous variables (which were centered), Step 1 through Step 3 in Regression 2a through Regression 2f were the same as those in Regression 1 (see Table 4). Results of the six moderated regressions indicated that three of the six proposed linear interactions were significant. For Regression 2b, the interaction term (combat-related stressors $\times$ NCO cohesion) was added in Step 4 and significantly predicted PTSS, $\Delta R^2 = .002$, $F$ change (1, 1807) = 5.14, $p < .05$, for a model $R^2 = .261$, $F(16, 1807) = 39.84$, $p < .001$. For Regression 2c, the interaction term (combat-related stressors $\times$ officer cohesion) was added in Step 4 and significantly predicted PTSS, $\Delta R^2 = .002$, $F$ change (1, 1807) = 5.92, $p < .05$, for a model $R^2 = .261$, $F(16, 1807) = 39.91$, $p < .001$. For Regression 2d, the interaction term (combat-related stressors $\times$ emotion-focused coping) was added in Step 4 and
significantly predicted PTSS, $\Delta R^2 = .004$, $F$ change (1, 1807) = 8.67, $p < .01$, for a model $R^2 = .261$, $F(16, 1807) = 40.14, p < .001$. In addition to the significant $\Delta R^2$, significant $B$ coefficients for the interaction terms ($b_{16b}, b_{16c}, b_{16d}$) entered in Step 4 of each corresponding regression (i.e., Regression 2b, Regression 2c, and Regression 2d) supported the presence of significant moderation. Supported linear moderation hypotheses include:

**Hypothesis 2b.** Higher levels of vertical (NCO) cohesion buffered the relationship between combat-related stressors and PTSS. The significantly negative value of the interaction term ($b_{16b}$) combat-related stressors $\times$ vertical (NCO) cohesion, $B = -.02$, $t(1,807) = -2.27, p < .05$, suggests that for every 1 unit increase in vertical (NCO) cohesion, the impact combat-related stress has on PTSS is decreased by 0.02 units. Vertical (NCO) cohesion during deployment acts as a buffer to decrease the effect of combat-related stressors on PTSS.

**Hypothesis 2c.** Higher levels of vertical (officer) cohesion buffered the relationship between combat-related stress and PTSS. The significantly negative value of the interaction term ($b_{16c}$) combat-related stressors $\times$ vertical (officer) cohesion, $B = -.02$, $t(1,807) = -2.43, p < .05$, suggests that for every 1 unit increase in vertical (officer) cohesion, the impact combat-related stress has on PTSS is decreased by 0.02 units. Like NCO cohesion, vertical (officer) cohesion during deployment acts to decrease the effect of combat-related stressors on PTSS.

Findings for **hypothesis 2d** were significant, but counterintuitive. Although emotion-focused coping as a moderator was supported, the hypothesized nature of the moderation was not supported. The original hypothesis suggested that lower levels of
emotion-focused coping would buffer the relationship between combat-related stressors and PTSS. In fact, the significantly negative value of the interaction term ($b_{16d}$) combat-related stressors × emotion-focused coping, $B = -.06$, $t(1,807) = -2.95$, $p < .01$, suggests that for every 1 unit increase in emotion-focused coping, the impact combat-related stress has on PTSS is decreased by 0.06 units. This indicates that, contrary to the stated hypothesis, lower levels of emotion-focused coping during deployment act to increase (i.e., enhance) the effect of combat-related stressors on PTSS.

Unsupported linear interaction hypotheses include hypotheses 2a, 2e, and 2f. Findings, including nonsignificant Step 4 $\Delta R^2$ and $B$ coefficients for the interaction terms (i.e., $b_{16a}$, combat-related stressors × horizontal [peer] cohesion; $b_{16e}$, combat-related stressors × problem-focused coping; and $b_{16f}$, combat-related stressors × perceived threat), suggest that horizontal (peer) cohesion, problem-focused coping, and perceived threat do not moderate the relationship between combat-related stressors and PTSS.

This study found no support for curvilinear interaction hypotheses 3a, 3b, 3c, 3d, and 3e. Findings including nonsignificant $\Delta R^2$ and $B$ coefficients for the interaction terms added in Step 5 (i.e., $b_{18a}$, combat-related stressors$^2$ × horizontal [peer] cohesion; $b_{18b}$, combat-related stressors$^2$ × vertical [NCO] cohesion; $b_{18c}$, combat-related stressors$^2$ × vertical [officer] cohesion; $b_{18d}$, combat-related stressors$^2$ × emotion-focused coping; and $b_{18f}$, combat-related stressors$^2$ × perceived threat) suggest no proposed interactions were curvilinear in nature.
Table 5
Results of Six Hierarchical Moderated Multiple Regression Models Predicting PTSS Among U.S. Army Soldiers Deployed To Iraq

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>B</th>
<th>SE B</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Demographic/Military Factors$^a$</td>
<td>.035***</td>
<td>.035***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Focal Predictor$^a$</td>
<td>.124***</td>
<td>.089***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Moderators$^a$</td>
<td>.259***</td>
<td>.135***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Linear interaction variables$^b$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>CRS $\times$ Peer Cohesion</td>
<td>.259***</td>
<td>.001</td>
<td>-0.021</td>
<td>0.015</td>
<td>-0.028</td>
</tr>
<tr>
<td>b.</td>
<td>CRS $\times$ NCO Cohesion</td>
<td>.261***</td>
<td>.002*</td>
<td>-0.016*</td>
<td>0.007</td>
<td>-0.047*</td>
</tr>
<tr>
<td>c.</td>
<td>CRS $\times$ Officer Cohesion</td>
<td>.261***</td>
<td>.002*</td>
<td>-0.019*</td>
<td>0.008</td>
<td>-0.050*</td>
</tr>
<tr>
<td>d.</td>
<td>CRS $\times$ Cope Emotion-Focus</td>
<td>.262***</td>
<td>.004**</td>
<td>-0.064**</td>
<td>0.022</td>
<td>-0.060**</td>
</tr>
<tr>
<td>e.</td>
<td>CRS $\times$ Cope Problem-Focus</td>
<td>.259***</td>
<td>.001</td>
<td>-0.035</td>
<td>0.025</td>
<td>-0.028</td>
</tr>
<tr>
<td>f.</td>
<td>CRS $\times$ Perceived Threat</td>
<td>.259***</td>
<td>.001</td>
<td>0.142</td>
<td>0.103</td>
<td>0.038</td>
</tr>
<tr>
<td>5</td>
<td>Curvilinear interaction variables$^c$</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>CRS$^2$</td>
<td>.261***</td>
<td>.001</td>
<td>0.008</td>
<td>0.005</td>
<td>0.039</td>
</tr>
<tr>
<td></td>
<td>CRS$^2$ $\times$ Peer Cohesion</td>
<td></td>
<td></td>
<td>0.002</td>
<td>0.002</td>
<td>0.041</td>
</tr>
<tr>
<td>b.</td>
<td>CRS$^2$</td>
<td>.261***</td>
<td>.001</td>
<td>0.005</td>
<td>0.006</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>CRS$^2$ $\times$ NCO Cohesion</td>
<td></td>
<td></td>
<td>-0.001</td>
<td>0.001</td>
<td>-0.022</td>
</tr>
<tr>
<td>c.</td>
<td>CRS$^2$</td>
<td>.262***</td>
<td>.001</td>
<td>0.006</td>
<td>0.005</td>
<td>0.028</td>
</tr>
<tr>
<td></td>
<td>CRS$^2$ $\times$ Officer Cohesion</td>
<td></td>
<td></td>
<td>-0.001</td>
<td>0.001</td>
<td>-0.022</td>
</tr>
<tr>
<td>d.</td>
<td>CRS$^2$</td>
<td>.264***</td>
<td>.002</td>
<td>0.006</td>
<td>0.005</td>
<td>0.030</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>-0.004</td>
<td>0.003</td>
<td>-0.049</td>
</tr>
<tr>
<td>e.</td>
<td>CRS$^2$</td>
<td>.260***</td>
<td>.001</td>
<td>0.008</td>
<td>0.005</td>
<td>0.041</td>
</tr>
<tr>
<td></td>
<td>CRS$^2$ $\times$ Cope Problem-Focus</td>
<td></td>
<td></td>
<td>0.001</td>
<td>0.003</td>
<td>0.009</td>
</tr>
</tbody>
</table>

Note. All continuous variables centered. \(N = 1,824\).

$^a$Step 1, Step 2, and Step 3 contain the same variables (except for continuous variables being centered) for all 6 moderated regressions, See Table 4. $^b$Step 4a through Step 4f each represent a separate moderated regression. $^c$No curvilinear interactions were significant.

*p < .05, **p < .01, ***p < .001
Plotting and Post-Hoc Analysis of Significant Interactions

As recommended by Aiken and West (1991), this study’s three significant linear interactions (i.e., combat-related stressors × NCO cohesion, combat-related stressors × officer cohesion, and combat-related stressors × emotion-focused coping) were probed to improve the overall understanding of the interactions. As previously outlined in the methods section, the two primary ways to probe interactions are plotting and post-hoc statistical testing.

The plot of the regression lines representing the simple regression equations of PTSS on combat-related stressors ($M \pm 1SD$) at high ($M + 1SD$) and low ($M – 1SD$) values of NCO cohesion is presented in Figure 4. This figure illustrates that high NCO cohesion is related to reduced PTSS when compared to low unit cohesion. Furthermore, high NCO cohesion reduces the impact of high combat-related stressors on PTSS when compared to low unit cohesion.

![Figure 4](image)

*Figure 4.* NCO cohesion as a moderator of the combat-related stressors by PTSS relationship among soldiers deployed to Iraq. Low values are plotted at 1 standard deviation below the mean and high values are plotted at 1 standard deviation above the mean.
Post-hoc analysis (i.e., simple slopes analysis; Aiken & West, 1991) of the regression of PTSS on combat-related stressors at different levels ($M \pm 1SD$) of NCO cohesion revealed that the simple slope of each regression line was significantly different from zero. Combat-related stress was positively associated with increased PTSS for soldiers reporting low NCO cohesion, $t(1,807) = 8.09, p < .001$, as well as for soldiers reporting high NCO cohesion, $t(1,807) = 4.49, p < .001$. When compared to soldiers with low NCO cohesion ($B = .50, p < .001$), the relationship was weaker for soldiers with high NCO cohesion ($B = .31, p < .001$). Furthermore, the simple slopes of the regression of PTSS on NCO cohesion at different levels ($M \pm 1 SD$) of combat-related stress indicated that NCO cohesion was negatively associated with PTSS for soldiers reporting low combat-related stress, $t(1,807) = −2.32, p < .05$, as well as for soldiers reporting high combat-related stress, $t(1,807) = −5.16, p < .001$. The relationship was stronger for soldiers reporting high combat-related stress ($B = −.40, p < .001$), when compared to those reporting low combat-related stress ($B = −.18, p < .05$).

The plot of the regression lines representing the simple regression equations of PTSS on combat-related stressors ($M \pm 1SD$) at high ($M + 1SD$) and low ($M – 1SD$) values of officer cohesion is presented in Figure 5. This figure illustrates that high officer cohesion is related to reduced PTSS when compared to low officer cohesion. As was the case for NCO cohesion, high officer cohesion reduces the impact of high combat-related stressors on PTSS when compared to low officer cohesion.
Figure 5. Officer cohesion as a moderator of the combat-related stressors by PTSS relationship among soldiers deployed to Iraq. Low values are plotted at 1 standard deviation below the mean and high values are plotted at 1 standard deviation above the mean.

Post-hoc analysis of the regression of PTSS on combat-related stressors at different levels ($M \pm 1SD$) of officer cohesion revealed that the simple slope of each regression line was significantly different from zero. Combat-related stress was positively associated with increased PTSS for soldiers reporting low officer cohesion, $t(1,807) = 8.02, p < .001$, as well as for soldiers reporting high officer cohesion, $t(1,807) = 4.63, p < .001$. When compared to soldiers with low officer cohesion ($B = .52, p < .001$), the relationship was weaker for soldiers with high officer cohesion ($B = .31, p < .001$). Interestingly, only the simple slopes of the regressions of PTSS on officer cohesion at high ($M + 1SD$) and moderate ($M$) levels of combat-related stress were significantly different from zero. Officer cohesion was negatively associated with
PTSS for soldiers reporting high combat-related stress, $B = -.28$, $t(1,807) = -3.66$, $p < .001$, as well as for soldiers reporting moderate combat-related stress, $B = -.16$, $t(1,807) = -2.73$, $p < .01$. The relationship was not significant when combat-related stress was low, $B = -.03$, $t(1,807) = -.36$, $p = .72$.

The plot of the regression lines representing the simple regression equations of PTSS on combat-related stressors ($M \pm 1SD$) at high ($M + 1SD$) and low ($M - 1SD$) values of emotion-focused coping is presented in Figure 6. This figure illustrates that high emotion-focused coping is related to reduced PTSS when compared to low emotion-focused coping. Additionally, this figure illustrates that high emotion-focused coping reduces the impact of high combat-related stressors on PTSS when compared to low emotion-focused coping.

*Figure 6.* Emotion-focused coping as a moderator of the combat-related stressors by PTSS relationship among soldiers deployed to Iraq. Low values are plotted at 1 standard deviation below the mean and high values are plotted at 1 standard deviation above the mean.
Post-hoc analysis of the regression of PTSS on combat-related stressors at different levels ($M \pm 1SD$) of emotion-focused coping revealed that the simple slope of each regression line was significantly different from zero. Combat-related stress was positively associated with increased PTSS for soldiers reporting low emotion-focused coping, $t(1,807) = 8.38, p < .001$, as well as for those reporting high emotion-focused coping, $t(1,807) = 4.37, p < .001$. When compared to soldiers reporting low emotion-focused coping ($B = .54, p < .001$), the relationship was weaker for soldiers reporting high emotion-focused coping ($B = .29, p < .001$). Similar to the findings for officer cohesion, only the simple slopes of the regressions of PTSS on emotion-focused coping at high ($M + 1 SD$) and moderate ($M$) levels of combat-related stress were significantly different from zero. Emotion-focused coping was negatively associated with PTSS for soldiers reporting high combat-related stress, $B = -.81$, $t(1,807) = -3.75, p < .001$, as well as for those reporting moderate combat-related stress, $B = -.37, t(1,807) = -2.30, p < .05$. The relationship was not significant when combat-related stress was low, $B = -.06, t(1,807) = -.28, p = .78$. 
Chapter V: Discussion

Introduction

Guided by Lazarus and Folkman’s (1984) transactional theory of stress, appraisal, and coping, as well as the Soldier Adaptation Model (Bliese & Castro, 2003), this study sought to examine three research questions and 18 related hypotheses in order to further existing military research that has focused on identifying risk and protective factors for PTSS among military personnel who have been deployed to a war zone. Specifically, this study examined the associations between combat-related stressors, cohesion, coping, perceived threat, and PTSS among U.S. Army soldiers who were assessed during a deployment to Iraq, in an effort to identify potentially modifiable risk and protective factors for PTSS.

The study’s first research question and seven related hypotheses were concerned with the extent to which combat-related stressors, horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, emotion-focused coping, problem-focused coping, and perceived threat were each independently associated with PTSS. The second research question and six related hypotheses were concerned with the extent to which cohesion, coping, and perceived threat each acted as moderators of the relationship between war-zone stress and mental health outcomes. Specifically, this research question focused on the roles horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, emotion-focused coping, problem-focused coping, and perceived threat played in buffering, or weakening, the influence of combat-related stressors.
on PTSS. Lastly, the third research question and five related hypotheses sought to examine to what extent cohesion and coping acted as curvilinear moderators of the relationship between combat-related stressors and PTSS.

**Risk and Protective Factors**

Previous research has identified important risk factors and protective factors for PTSS among military personnel who have experienced combat-related stressors during a war-zone deployment. For example, combat-related stressors and perceived threat have been identified as independent risk factors for PTSS, wherein higher levels of each relates to increased PTSS (Hoge et al., 2004; King et al., 1995; Kulka et al., 1990; Vogt et al., 2011). The results of this study support previous findings and suggest that, for U.S. Army soldiers deployed to Iraq, level of combat-related stressors and level of perceived threat each independently predicts PTSS. They do so in the expected direction, above and beyond variation related to demographic factors, military-related factors, and additional predictors included in this study. For U.S. Army soldiers deployed to Iraq, high perceived threat and greater exposure to combat-related stressors were independently associated with higher PTSS. With all study variables in the model, combat-related stressors ($\beta = .21, p < .001$) and perceived threat ($\beta = .28, p < .001$) were the two strongest predictors of PTSS.

In contrast to previous studies that have assessed military personnel, which sometimes are conducted years after a war-zone deployment (e.g., NVVRS), MHAT VI assessed soldiers very soon after their exposure to combat-related stressors. Therefore, the findings of this study indicate that the negative impacts of combat-related stressors
and perceived threat on a soldier’s psychological health occurs soon after exposure to combat-related stressors. This highlights the importance of the identification of specific modifiable factors that will protect soldiers against developing PTSS from the moment they experience a combat-related stressor.

Previous findings related to cohesion and coping as potential protective factors for PTSS are mixed; however, both factors have been found to protect military personnel from negative mental health outcomes (Armistead-Jehle et al., 2011; Bliese & Halverson, 1996; Brailey et al., 2007; Dickstein et al., 2010; Rodrigues & Renshaw, 2010; Sharkansky et al., 2000). The results of this study suggest that, for U.S. Army soldiers deployed to Iraq, level of horizontal (peer) cohesion, level of vertical (NCO) cohesion, and level of vertical (officer) cohesion each predict PTSS independently, in the expected direction (i.e., inverse relationship), above and beyond variation related to demographic factors, military-related factors, and other predictors. Among the three types of cohesion examined, NCO cohesion was the strongest predictor of PTSS ($\beta = -0.12$, $p < .001$), peer cohesion was the second strongest ($\beta = -0.10$, $p < .001$), and officer cohesion was the weakest ($\beta = -0.06$, $p < .01$). This suggests that the level of both horizontal and vertical cohesion are important predictors of PTSS. The extent to which soldiers perceive their NCOs as being caring and competent may, however, be relatively more important when compared to their perceptions of both peers and officers.

In this study NCO cohesion appears to be a slightly more robust protective factor, but it is important to emphasize that this study’s findings also indicate that having caring and competent NCOs and officers, as well as supportive peers, all play a role in
decreasing PTSS among soldiers who deploy to a war zone. Future research could expand upon these findings by examining the relationships between the different types of cohesion.

Results are less clear for the coping strategies included in this study. In general, research suggests emotion-focused coping acts as a risk factor for PTSS wherein greater use of emotion-focused coping strategies are related to greater report of PTSS (Rodrigues & Renshaw, 2010; Solomon et al., 1988). In contrast, problem-focused coping has either been unrelated to PTSS (Blake et al., 1992) or acts as a protective factor (Sharkansky et al., 2000). The results of this study suggest that, for U.S. Army soldiers deployed to Iraq, utilization of emotion-focused coping and problem-focused coping each independently predict PTSS, above and beyond variation related to demographic factors, military-related factors, and other predictors. However, in contrast to previous military studies, emotion-focused coping acted as a protective factor for PTSS and problem-focused coping acted as a risk factor for PTSS. In other words, as soldiers’ used more emotion-focused coping their levels of PTSS decreased ($\beta = -.05, p < .05$). In contrast, as soldiers’ used more problem-focused coping their levels of PTSS increased ($\beta = .08, p < .001$).

One possible explanation for this study’s equivocal findings related to coping involves what has been referred to in the literature as the *goodness of fit hypothesis* (Folkman & Lazarus, 1980; Masel, Terry, & Gribble, 1996; Zakowski, Hall, Klein, & Baum, 2001). The hypothesis suggests that when stressors are appraised as controllable, individuals may be more likely to benefit from the use of problem-focused coping and less likely to benefit from the use of emotion-focused coping. Additionally,
the use of emotion-focused coping in situations that are appraised as uncontrollable may be more effective than the use of problem-focused coping. A good match between one’s appraisal of the controllability of a situation and coping strategy may result in better psychological adjustment.

Collins and colleagues (1983) provide some empirical support for the goodness of fit hypothesis. In their study of individuals coping with chronic stress (e.g., nausea, headaches, depression, anxiety, fear, anger, and alienation) related to the nuclear accident and two-year aftermath at Three Mile Island, they found the use of emotion-focused coping strategies were associated with better psychological adjustment when compared to the use of problem-focused coping (Collins, Baum, & Singer, 1983). One reason given for this finding was that “… stress was chronic and the sources of stress were not easily changed” (p. 149).

Much like the chronic stressors experienced by civilians at Three Mile Island, combat-related stressors experienced by soldiers deployed to Iraq are often chronic and not easily changed over the course of a 15-month deployment. Furthermore, it is possible that many of the combat-related stressors experienced by soldiers deployed to a war zone could be appraised as uncontrollable. For example, when soldiers go on patrols outside the wire there is always a chance they will be fired upon by the enemy or that the convoy they are in will encounter an IED. These are immutable stressors that, very often, cannot be changed. In these instances there is very little soldiers can do to control the situation. Therefore, the use of emotion-focused coping could be more beneficial when compared to problem-focused coping for soldiers deployed to a war zone. To fully examine the
goodness of fit hypothesis among soldiers deployed to a war zone, future studies would need to include a measure for appraised controllability.

The findings of this study suggest that, during a war-zone deployment, being able to maintain a positive internal state or change one’s internal state from negative to positive may be a more effective coping strategy when compared to an ultimately frustrating attempt to alter what could be an immutable situation. Furthermore, recent military research supports the use of a positive psychological coping approach during a war-zone deployment. Wood and colleagues (2011) found that, among soldiers deployed to Iraq, high levels of benefit finding (i.e., cognitive process that involves finding purpose and meaning in one’s suffering) was associated with lower PTSS. Moreover, benefit finding was found to buffer the relationship between combat exposure and PTSS (Wood et al., 2011). Thomas and colleagues (2011) studied dispositional optimism (i.e., generalized expectation for positive outcomes) and reported that higher optimism was related to lower PTSS and that optimism buffered the relationship between combat exposure and PTSS. These findings provide further support for emotion-focused coping (e.g., looking for something good even when bad things happen) as a potentially robust protective factor for PTSS among military personnel deployed to a war zone.

From a leadership perspective it is possible that one way officers and NCOs could influence the internal state of soldiers under their command is by consistently and constructively offering guidance and positive feedback before, during, and after their soldiers’ exposure to combat-related stressors. Positive feedback and reassurance from leadership could increase the ability of soldiers to form and maintain a positive internal state. Furthermore, leadership could model the use of emotion-focused coping strategies.
If soldiers hear their leaders (NCOs and officers) express a belief that good things can be found even when things are bad, they may be more willing and able to see some of their experiences in a positive light, even when those experiences are seemingly negative. For example, even when a mission is perfectly planned bad things happen. In Iraq, soldiers have been injured and killed by IEDs even when the mission was planned perfectly and every member of the platoon and company performed admirably. In these situations, leaders may positively influence how their soldiers process the experience by acknowledging the losses and communicating ways the experience will make the unit stronger. Theoretically, positive feedback and reassurance from leaders should be beneficial for the psychological health of soldiers deployed to a war zone, but future studies are needed to examine to what extent soldiers’ perceptions of their NCOs and officers as caring and competent leaders relates to what coping strategies are utilized during a war-zone deployment.

**Linear Interactions**

This study furthered the existing military research on cohesion as a potential buffer and coping as a potential buffer—previously conducted on military personnel from multiple conflicts (Armistead-Jehle et al., 2011; Brailey et al., 2007; Dickstein et al., 2010; Rodrigues & Renshaw, 2010; Sharkansky et al., 2000)—by extending this inquiry to U.S. Army soldiers assessed during a war-zone deployment to Iraq. Furthermore, this study was the first to examine perceived threat as a potential moderator of the association between combat-related stressors and PTSS. The independent buffering influence of cohesion and coping was also supported by this study. Specifically, vertical (NCO)
cohesion, vertical (officer) cohesion, and emotion-focused coping were supported as 
buffers by demonstrating that the associations of combat-related stressors with PTSS 
decreased as NCO cohesion, officer cohesion, and emotion-focused coping increased. 
Additionally, the inverse associations between NCO cohesion, officer cohesion, and 
emotion-focused coping with PTSS increased as combat-related stressors increased.

This study’s findings are similar to those produced by previous studies, which 
found cohesion and coping to have both direct and indirect influence on PTSS. 
Consistent with this analysis, studies by Armistead-Jehle et al. (2011), Dickstein et al. 
(2010), Rodrigues and Renshaw (2010), Brailey et al. (2007), and Sharkansky et al. 
(2000) all found that cohesion and/or coping serves to buffer military personnel from the 
negative effects of stressors on the development of PTSS. However, the Sharkansky 
et al. (2000) study supported problem-focused coping as a buffer while this study 
supported emotion-focused coping as a buffer. Similar to the direct-effect findings 
previously discussed, this differential finding could also be related to how soldiers in 
each study appraised the controllability of combat-related stressors (i.e., goodness of 
fit hypothesis).

Additional differences between this study and the Sharkansky et al. (2000) study 
include time of assessment (e.g., during versus after deployment), level of exposure to 
combat-related stressors (e.g., $M = 7.6$ versus $M = 5.5$), and the measure used to assess 
coping (e.g., problem-focused and emotion-focused coping versus approach-based and 
avoidance-based coping). It is possible that these differences contributed to this study’s 
identification of emotion-focused coping as a buffer and Sharkansky et al.’s (2000) 
identification of problem-focused coping as a buffer. For example, the higher level of
exposure to combat-related stressors experienced by the soldiers in this study may have made the use of problem-focused coping strategies seem futile. This, in turn, may have made the use of emotion-focused strategies seem more helpful. Because soldiers in the Sharkansky et al. (2000) study experienced lower levels of combat-related stressors, it is possible that the use of problem-focused coping strategies were perceived as improving the situation, thus facilitating a more positive psychological outlook and less PTSS.

This study also expanded on previous cohesion studies by examining the moderating influence of different forms of cohesion. As a result, this study was able move beyond the suggestion that cohesion is beneficial, towards being able to suggest that cohesion is beneficial and certain forms of cohesion may be relatively more beneficial than others. These relative comparisons could also be made with any other factor in this study that was found to buffer the influence which combat-related stressors have on PTSS. For this study, emotion-focused coping was found to be the strongest buffer against the negative influence combat-related stressors have on PTSS (emotion-focused coping × combat-related stressors, $B = -.064, p < .01$). Vertical cohesion (both NCO and officer) also buffered the association between combat-related stressors and PTSS. However, NCO and officer cohesion provided relatively less indirect protection when compared to emotion-focused coping as evidenced by the interactions’ $B$ coefficients (NCO cohesion × combat-related stressors, $B = -.016, p < .05$; officer cohesion × combat-related stressors, $B = -.019, p < .05$).

One issue that needs to be addressed is the fact that the statistically significant interaction terms for NCO cohesion × combat-related stressors, officer cohesion × combat-related stressors, and emotion-focused coping × combat-related stressors were
small \((B = -0.16, p < .05; B = -0.19, p < .05; \text{and } B = -0.064, p < .01, \text{respectively})\), as was the resulting reduction in model error due to adding the terms \((\Delta R^2 = 0.002, p < .05; \Delta R^2 = 0.002, p < .05; \text{and } \Delta R^2 = 0.004, p < .01, \text{respectively})\). Although small, this study’s moderator effects and resulting \(\Delta R^2\) are comparable with the three most recent studies of cohesion as a buffering influence (Armistead-Jehle et al., 2011; Dickstein et al., 2010; Brailey et al., 2007). Furthermore, two recent studies that examined the interaction between coping and combat stressors on PTSS (Rodrigues & Renshaw, 2010) and life adjustment (Suvak et al., 2002) also support the small but significant moderator effects found in this study. Moreover, the importance of small moderator effects has been supported by Evans (1985), who suggests that moderator effects explaining as little as 1% of total variance should be considered to be important due to the difficulty in detecting moderation. Finally, according to Cohen et al. (2003), small moderator effects are to be expected given constraints on main effects found in many social science experiments.

**Curvilinear Interactions**

In contrast to one cohesion study using a sample of Vietnam veterans (Fontana et al., 1997) and another coping study using a sample OIF and OEF era veterans (Rodrigues & Renshaw, 2010), no evidence was found in this study to support the curvilinear interaction hypothesis for either cohesion or coping. This suggests that as NCO cohesion, officer cohesion, and emotion-focused coping increases, the relationship between combat-related stressors and PTSS decreases. Simply put, among U.S. Army soldiers deployed to Iraq, the moderating influence of NCO cohesion, officer cohesion,
and emotion-focused coping appears to be linear in nature. With the exception of the study by Fontana et al. (1997), previous research investigating potential curvilinear interactions between cohesion and combat exposure have also failed to support the hypothesis.

In one such study, Dickstein et al. (2010) suggested that the low levels of exposure to war-zone stressors ($M = 2.5$, $SD = 2.7$) experienced by participants in their study may have been insufficient for detecting any deleterious effects of high cohesion during times of high exposure. Furthermore, the authors suggested that the short length of deployment ($M = 80.2$ days) may have prevented service members from experiencing the broad range of stressors necessary to detect a curvilinear interaction effect. This study addressed the two potential reasons (low levels of stressor exposure and short length of deployment), posited by Dickstein et al. (2010), for not finding high rates of PTSS in conjunction with high levels of stressors and cohesion. Even though the average level of combat-related stressors for this study was over 3 times greater than Dickstein et al.’s study (2010), and deployment length was much longer, support for the curvilinear interaction hypothesis was still not found.

In an attempt to explain the presence of a curvilinear interaction effect between cohesion and combat exposure, Fontana and colleagues (1997) used a theory posited by Milgram and Hobfall (1986). The theory suggested that as cohesion advances to high levels, unit members could be more negatively affected by combat exposure because they may identify more closely with members of their unit. Greater identification could, in turn, contribute to non-injured unit members feeling more responsible for unit members who became casualties, while at the same time causing the non-injured unit members to
experience feelings of guilt for not protecting their peers from harm. It should be noted that the Vietnam veterans used by Fontana et al. (1997) were assessed approximately 12 years after the war, raising the possibility that high cohesion is beneficial during a deployment (as seen in this study) but becomes detrimental at some yet-undetermined point after a deployment. Further study using longitudinal methods would be needed to determine which, if any, of these explanations are valid.

Other Significant Findings

Although the demographic and military factors included in this study were not a primary focus, some discussion is warranted, given that four of the eight control variables entered into the final direct-effects-only model were statistically significant. Each of the four significant factors including gender, military component, total months deployed since 9/11, and unit type will be briefly discussed.

Multiple studies examining the relationship between gender and PTSS among military personnel who deployed to Iraq and Afghanistan have reported mixed results. Skopp et al. (2011) found that female soldiers exposed to high levels of combat were more likely to experience PTSS when compared to male soldiers. However, Vogt and colleagues (2011) reported finding “fairly comparable levels of resilience to combat-related stressors for women and men” (p. 8). In support of Skopp et al. (2011), this study’s analysis of the MHAT VI data indicates that male soldiers were more likely to have lower levels of PTSS when compared to female soldiers ($B = -2.17, p < .05$).
However for this study, gender differences in the development of PTSS could be related to a variety of factors not addressed in this study and caution should be used before drawing any simple conclusions.

Previous research has identified military component as a potential risk factor for developing PTSS. In general, research indicates that National Guard or Reserve personnel who deployed to Iraq or Afghanistan in support of OIF and OEF were at greater risk for developing PTSS than regular active-duty soldiers (Milliken et al., 2007; Schell & Marshall, 2008; Vasterling et al., 2010). Greater PTSS risk among National Guard or Reserve soldiers could be related to the tendency for soldiers from these types of units to receive less training when compared with active-duty soldiers (Vogt et al., 2008). This study, contrary to some previous research, found that active-duty soldiers were more likely to experience higher levels of PTSS when compared to National Guard and Reserve soldiers ($B = 2.77, p < .01$). Additional research is needed before conclusions based on this finding should be made.

Research has shown that the total amount of time soldiers have been deployed to a combat zone can impact their mental health. A recent meta-analysis on deployment length reported that seven out of nine studies reviewed indicate that longer war-zone deployments have detrimental effects on the health and well-being of deployed service members (Buckman et al., 2011). One study found that soldiers deployed for 13 or more months during the previous 3 years had higher rates of PTSD when compared to soldiers with less than 13 months of deployment during the previous 3 years (Buckman, et al., 2011). For this study, total time deployed to a combat zone since 9/11 was found to be significantly related to PTSS. As the number of total months deployed to a combat zone
since 9/11 increased, a soldier’s level of PTSS increased ($B = .15, p < .001$). This finding indicates that when all the other factors in the model were controlled, there was a 0.15 unit increase in a soldier’s PTSS level for every 1-month increase in total months deployed since 9/11. Over the past decade many U.S. military personnel have deployed to active combat zones in Iraq and Afghanistan for a second, third, and sometimes fourth time. Given the positive relationship between months deployed to a combat zone and PTSS, U.S. military personnel who have experienced multiple war-zone deployments since 9/11 should be closely monitored for any signs of increased PTSS.

Unit type may also be an important factor to include when examining the relationship between combat-related stressors and PTSS. As previously stated, unit type in the U.S. Army is defined by the unit’s role in combat. Maneuver unit soldiers and support and sustainment unit soldiers each have very different roles on the battlefield that imply different levels of exposure to combat-related stressors. Maneuver unit soldiers are known as war-fighters and typically serve in traditional front line roles such as infantry or cavalry. During a war-zone deployment their role frequently takes them outside the wire and often includes direct engagement with the enemy. Support and sustainment unit soldiers serve more of a supportive role by providing services, such as medical care, that enables the maneuver unit soldiers to complete their mission.

Given their combat role, logic suggests that maneuver unit soldiers may encounter more combat-related stressors and therefore should be at greater risk of experiencing PTSS. However two recent studies reported equivocal findings for this assumption. LeardMann and colleagues (2009) found that support personnel were more likely to experience PTSD than combat personnel deployed in support of OIF or OEF. However,
Iversen and colleagues (2008) found that among United Kingdom Armed Forces personnel that had deployed to Iraq in 2003, personnel from support and sustainment units had decreased odds of developing PTSD when compared to personnel from combat units. For this study, maneuver unit soldiers were more likely than support and sustainment unit soldiers to have lower levels of PTSS \((B = -2.05, p < .01)\). As with the three previous factors (gender, military component, and total months deployed since 9/11), additional research is needed in order to make conclusions regarding unit type and PTSS levels. One potentially important factor that has not been studied is the possible existence of different cultures within each type of unit. It is possible that maneuver unit soldiers are more likely to suppress feelings and emotions during a combat deployment and therefore may be less likely to self-report PTSS. This is only one of many potential factors that could help explain the relationship between unit type and PTSS.

**Limitations**

Any study, including this one, has limitations. One limitation of this study is its cross-sectional design, such that causal inferences regarding the relationships among combat-related stressors, cohesion, coping, perceived threat, and PTSS cannot be made. It is thus impossible to say with certainty that NCO cohesion, officer cohesion, and emotion-focused coping cause combat-related stressor exposure to have a lesser impact on the development of PTSS. Furthermore, this study is unable to address whether or not cohesion, coping, and perceived threat change over time as a result of exposure to combat-related stressors. Longitudinal research that measures the variables of interest used in this study at pre-deployment, during deployment, and post-deployment is needed.
to more clearly identify the roles of cohesion, coping, and perceived threat, and to what extent levels of these factors change over time. Given the nature of war-zone deployments (e.g., minimal time between notification of deployment and being deployed), designing a study wherein measures could be obtained from the same participants at all three points in time would be very challenging. However, there is potentially much to be learned if a researcher could design and complete such a study.

Another limitation is the self-reported nature of all study measures. By assessing study participants during their deployment to Iraq issues related to retrospective recall bias may have been decreased (Wessely et al., 2003), but it is possible that PTSS could have been confounded with reports of general psychological distress that were not associated with combat-related stressors. However, recent research on the validity of self-report data suggests that this limitation may be exaggerated, especially in situations where the variables of interest reflect attitudes and beliefs (Chan, 2008; Spector, 2006). It should be noted that the scores of cohesion, coping, perceived threat, combat-related stressors, and PTSS represented *perceived* levels of each construct versus an objective level. Future studies may benefit from measuring both perceived and objective levels of each construct, although that may be difficult considering the inherent constraints involved with research conducted in war-zone environments.

Given that a primary aim of this study was to research a population not previously examined in relation to the potential moderating effects of cohesion, coping, and perceived threat (i.e., U.S. Army soldiers assessed during a deployment to Iraq), the generalizability of the findings (beyond U.S. Army soldiers assessed during a war-zone deployment) may be a limitation. Although it is possible NCO and officer cohesion, as
well as emotion-focused coping, may moderate the effect stress has on strain in garrison and other non-combat environments, the findings of this study should not be used to definitively make that assertion. For example, given that the stressors encountered in garrison are generally less threatening than stressors encountered in a war zone, it is possible that soldiers in garrison would perceive garrison-related stressors as highly controllable, thus increasing the probability that their use of problem-focused coping strategies would be more effective than their use of emotion-focused coping strategies in the garrison setting. Therefore, a study using a sample of soldiers in a garrison environment might find that problem-focused coping serves as a directly effective protective factor for PTSS that is also capable of buffering the relationship between garrison-related stressors and PTSS.

This study’s findings should not be used to generalize to individuals in most civilian work groups (e.g., office workers). It is likely that the nature of cohesion and coping experienced in military groups is unique when compared to civilian groups. Unlike civilians working in a corporate setting, military personnel deployed to a war zone are subject to control 24 hours per day, cannot easily leave the war zone, and experience ongoing lethal threat from the enemy (Siebold, 2006). These conditions are typically not present among corporate workgroups comprised of civilian office workers. In cautioning against the generalization of findings from cohesion research using military samples to civilian populations, Siebold (2006) states, “the findings about military group cohesion may not fully transfer to or be of concern in many nonmilitary groups” (p. 185). Although there would be methodological challenges, future studies could address this issue by comparing military personnel deployed to a war zone with civilian contractors.
working in the same war zone. This is theoretically possible given the large number of both military personnel and civilian contractors currently operating in Afghanistan.

**Implications**

The results of this study suggest that the military community would be well served by maintaining a focus on identifying potential factors that could serve to protect soldiers from PTSS. By obtaining a greater understanding of potentially modifiable risk and protective factors that can serve to decrease PTSS (both directly and indirectly) during war-zone deployments, military leadership, researchers, and those ultimately responsible for delivering interventions (e.g., unit-level officers and NCOs, mental health clinicians, and chaplains) would be in a better position to make sure soldiers who serve in the military during times of war are not negatively changed as a result of their service. To that end, this study has shown that efforts to improve peer cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, and emotion-focused coping at both the individual soldier and organizational level could result in decreased levels of PTSS during deployments. Furthermore, efforts to decrease levels of perceived threat experienced by soldiers deployed to a war-zone environment could also result in decreased levels of PTSS.

In order to facilitate these efforts, three steps should be considered. First, military leadership will need to craft and implement policies that make increasing levels of cohesion within units a priority. Second, military researchers will need to identify and empirically support interventions that work. Lastly, those on the front line of program delivery will need to provide interventions in a competent and caring manner. In other
words, a yearly one-hour block of mandatory cohesion and coping training will not be sufficient. Soldiers typically understand when something is being done because of a check-the-box requirement, versus a training program in which both leaders and providers are truly invested. By committing sufficient time and resources towards increasing the level of cohesion (horizontal and vertical), and the use of healthy and appropriate coping strategies among soldiers preparing for a war-zone deployment, it is possible that fewer soldiers will return home from this country’s next war negatively impacted by PTSS.

The U.S. Army does have programs in place that are integrating our current understanding of cohesion and coping as a potential protective factor for soldiers. One ongoing program that evolved from research on military personnel supporting OEF and OIF is called Battlemind Training (See https://www.battlemind.army.mil/ for a comprehensive review of the program). Using a cognitive and skills-based approach, the program focuses on cohesion and coping by identifying what peers and leaders can do to help unit members successfully adapt to military life before, during, and after a war-zone deployment. Research suggests that receiving Battlemind Training is associated with fewer reported posttraumatic stress symptoms, lower levels of stigma, and fewer depressive symptoms (Adler et al., 2009). More recently, the U.S. Army has been developing a program called Comprehensive Soldier Fitness. The program has been designed to increase soldiers’ overall resilience by focusing on five dimensions including the physical, emotional, social, family, and spiritual dimensions of the soldier (see Cornum, Matthews, & Seligman, 2011 for a comprehensive review of the program). Importantly, elements of each program have been influenced by research that has
examined a variety of potential risk and protective factors for both mental-health and well-being outcomes. Research that further explains the relationships among combat-related stressors, perceived threat, cohesion, coping, and PTSS may help improve the efficacy of Battlemind Training and Comprehensive Soldier Fitness.

**Conclusion**

The results of the present study provide further evidence that combat-related stressors, cohesion, coping, and perceived threat directly influence PTSS. For horizontal (peer) cohesion, vertical (NCO) cohesion, vertical (officer) cohesion, and emotion-focused coping, higher levels of each factor are associated with lower levels of PTSS. The finding supporting emotion-focused coping as a protective factor for PTSS may be related to the type of combat-related stressors (controllable versus uncontrollable) that are encountered during a war-zone deployment to Iraq. For combat-related stressors, problem-focused coping, and perceived threat, higher levels of each factor are associated with higher levels of PTSS. The finding that suggests problem-focused coping may be a potential risk factor for PTSS may be related to the generally uncontrollable nature of war-zone stressors.

In addition to having direct relationships with PTSS, three factors including vertical (NCO) cohesion, vertical (officer) cohesion, and emotion-focused coping can potentially moderate the relationship between combat-related stressors and PTSS wherein each factor independently buffers the relationship between combat-related stressors and PTSS. This suggests that these three factors can protect soldiers, both directly and indirectly (via an interaction with combat-related stressors), from PTSS. This study
expands upon similar findings in previous research that, up to this point, did not include U.S. Army soldiers assessed during a deployment in support of OIF. Importantly, the moderating influence of NCO cohesion, officer cohesion, and emotion-focused coping appears to be linear in nature, suggesting that as each protective factor increases, the relationship between combat-related stressors and PTSS decreases. Relevant to soldiers deployed to a combat zone is the finding that suggests as exposure to combat-related stressors increase the protective effect of NCO cohesion, officer cohesion, and emotion-focused coping also increases.

From 1997 to 2010, the number of veterans who used Veteran’s Health Administration (VHA) mental health services increased 120%. Furthermore, since 2005, veterans accessing care for PTSD increased at a greater rate when compared to other mental health disorders. Moreover, from 2005 to 2010, the rate of increase has been highest for veterans of Iraq and Afghanistan, although Vietnam veterans constituted the majority of all veterans treated for PTSD (Hermes, Rosenheck, Rani, & Fontana, 2012). These statistics suggest the personal costs related to deploying to a war zone (e.g., Vietnam, Iraq, Afghanistan) are both increasing and long-term. Even though the Vietnam War ended more than 35 years ago, close to 260,000 Vietnam veterans were treated by the VHA for PTSD in 2010 (Hermes et al., 2012).

Military personnel who volunteer to fight this country’s wars ask for little in return. However, at a minimum, we as United States citizens—civilians and military personnel alike—ought to do everything in our power to ensure that 35 years from now 260,000 OIF and OEF veterans will not need to access VHA mental health services for
issues related to PTSD. This study suggests that decreasing perceived threat and increasing levels of cohesion and emotion-focused coping among soldiers preparing to deploy to a war zone are three potential ways to achieve that goal.
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Jacobson, I. G., Ryan, M. A., Hooper, T. I., Smith, T. C., Amoroso, P. J., Boyko, E. J., …


Appendix A: Combat-Related Stressors Index

<table>
<thead>
<tr>
<th>Item</th>
<th>Never</th>
<th>One Time</th>
<th>Two to Four Times</th>
<th>Five to Nine Times</th>
<th>Ten or More Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being attacked or ambushed</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Seeing destroyed homes and villages</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Receiving small arms fire</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Witnessing an accident which resulted in serious injury or death</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Witnessing violence within the local population or between ethnic groups</td>
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<td>☐</td>
<td>☐</td>
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<td>☐</td>
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<tr>
<td>Seeing dead or seriously injured Americans</td>
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<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Knowing someone seriously injured or killed</td>
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<td>☐</td>
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<td>☐</td>
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<tr>
<td>Participating in demining operations</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Improvised explosive device (IED)/booby trap exploded near you</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Working in areas that were mined or had IED’s</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Having hostile reactions from civilians</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Disarming civilians</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Being in threatening situations where you were unable to respond because of rules of engagement</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Shooting or directing fire at the enemy</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Calling in fire on the enemy</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Engaging in hand-to-hand combat</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Clearing/searching homes or buildings</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Clearing/searching caves or bunkers</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Being wounded/injured</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Seeing ill/injured women or children who you were unable to help</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Receiving incoming artillery, rocket, or mortar fire</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Being directly responsible for the death of an enemy combattant</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Having a member of your own unit become a casualty</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Had a close call, dud landed near you</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Had a close call, equipment shot off your body</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Had a close call, was shot or hit but protective gear saved you</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Encountering sniper fire</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Had a buddy shot or hit who was near you</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Seeing a unit member blown up or burned alive</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Informed unit members/friends of a Service Member’s death</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Seeing dead bodies or human remains</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Handling or uncovering human remains</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Being physically moved or knocked over from an explosion</td>
<td>✔</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Note: 33 index items recoded (1 = 0, 2-5 = 1) prior to creating Index. After recode, 0 = no exposure and 1 = exposure to a combat-related stressor one or more times.
### Appendix B: Horizontal (Peer) Cohesion Index

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The members of my platoon are cooperative with each other.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The members of my platoon know that they can depend on each other.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The members of my platoon stand up for each other.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C: Vertical (NCO) Cohesion Index

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>In your platoon, NCOs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tell Soldiers when they have done a good job.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>embarrass Soldiers in front of other Soldiers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>try to look good to higher-ups by assigning extra missions or details to Soldiers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>exhibit clear thinking and reasonable action under stress.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>show favoritism to certain members in the platoon.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>are concerned about the safety of Soldiers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ensure that Soldiers do not assume unnecessary risks when conducting missions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 2nd, 3rd, and 5th items were reverse-coded
Appendix D: Vertical (Officer) Cohesion Index

<table>
<thead>
<tr>
<th>4. Thinking about your company, rate how often the following occur.</th>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>In your company, Officers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tell Soldiers when they have done a good job.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>embarrass Soldiers in front of other Soldiers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>try to look good to higher-ups by assigning extra missions or details to Soldiers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>exhibit clear thinking and reasonable action under stress.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>show favoritism to certain members in the company.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ensure that Soldiers do not assume unnecessary risks when conducting missions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>protect the company from receiving too many taskings.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 2\textsuperscript{nd}, 3\textsuperscript{rd}, and 5\textsuperscript{th} items were reverse-coded
### Appendix E: Problem-Focused Coping Index

22. These questions deal with the ways you’ve been coping with deployment-related problems that may have come up.

<table>
<thead>
<tr>
<th>I haven’t been doing this at all</th>
<th>I’ve been doing this a little bit</th>
<th>I’ve been doing this a medium amount</th>
<th>I’ve been doing this a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>I speak up when I think my leader(s) are making poor decisions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I ask for further guidance when I don’t understand an order.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
### Appendix F: Emotion-Focused Coping Index

22. These questions deal with the ways you’ve been coping with deployment-related problems that may have come up.

<table>
<thead>
<tr>
<th></th>
<th>I haven't been doing this at all</th>
<th>I've been doing this a little bit</th>
<th>I've been doing this a medium amount</th>
<th>I've been doing this a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>I try to see some of my deployment experiences in a positive light.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I look for something good even when bad things happen.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table allows you to rate your coping strategies on a scale from 0 (not at all) to 4 (a lot).
## Appendix G: PTSS Index

12. Below is a list of reactions that Service Members sometimes experience during deployment or in response to other stressful life experiences. Please mark how much you have been bothered by each problem in the past month.

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Not at All</th>
<th>A Little Bit</th>
<th>Moderately</th>
<th>Quite a Bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeated, disturbing memories, thoughts, or images of the stressful experience</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Repeated, disturbing dreams of the stressful experience</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Suddenly acting or feeling as if the stressful experience were happening again (as if you were re-living it)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Feeling very upset when something reminded you of the stressful experience</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Having physical reactions (like heart pounding, trouble breathing, sweating) when something reminded you of the stressful experience</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Avoiding thinking about or talking about the stressful experience or avoiding having feelings related to it</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Avoiding activities or situations because they reminded you of the stressful experience</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Trouble remembering important parts of the stressful experience</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Loss of interest in activities that you used to enjoy</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Feeling distant or cut-off from other people</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Feeling emotionally numb or being unable to have loving feelings for those close to you</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Feeling as if your future somehow will be cut short</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Trouble falling or staying asleep</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Feeling irritable or having angry outbursts</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Having difficulty concentrating</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Being &quot;super alert&quot; or watchful or on-guard</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Feeling jumpy or easily startled</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>