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An Etiological Model of Posttraumatic Stress Disorder in Female OEF/OIF/OND Veterans: Adding Military Sexual Trauma as a Risk Factor

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ABSTRACT

AN ETIOLOGICAL MODEL OF POSTTRAUMATIC STRESS DISORDER IN FEMALE OEF/OIF/OND VETERANS: ADDING MILITARY SEXUAL TRAUMA AS A RISK FACTOR

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Studies on posttraumatic stress disorder (PTSD) in returning Iraq and Afghanistan veterans have involved limited focus on the specific risk and protective factors for female veterans and how these may differ from factors identified for male veterans. Additionally, models incorporating risk and protective factors for PTSD in female veterans have yet to include military sexual trauma (MST) as a risk factor. Given the prevalence of MST among female service members, this study examined whether MST predicts PTSD diagnosis in addition to other frequently examined variables (premilitary trauma exposure, combat exposure, postmilitary trauma, and perceived social support). In addition, the degree to which social support mediated any identified relationship between MST and PTSD diagnosis was explored, as well as whether MST moderated the relationship between combat exposure and PTSD diagnosis. An etiological model for PTSD was proposed and was explored for model fit with female veterans to determine pathways among risk and protective factors for women. Data were examined from 202 female veterans and active duty service members who took part in a multi-site research study conducted through the Department of Veterans Affairs (VA) VISN 6 Mid-Atlantic Mental Illness Research, Education, and Clinical Center (MIRECC). Results indicate that MST is a key risk factor to include in models of PTSD in female veterans returning from Iraq and Afghanistan. It was found that social support mediated the relationship between MST and PTSD symptoms, and partially mediated the relationship between aftermath of battle and PTSD symptoms, but did not

mediate the relationship between combat trauma and PTSD symptoms; rather, combat experiences had a direct effect on PTSD symptoms. Additionally, results suggest that experiences of premilitary trauma may increase female service members' vulnerability to MST and that social support mediated the relationship between premilitary trauma and PTSD symptoms, but only through an increased vulnerability to MST. Postmilitary trauma was also found to mediate the relationship between premilitary trauma and PTSD symptoms. Results may provide key information for developing training programs and therapeutic interventions to reduce both MST and PTSD in female veterans.

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INTRODUCTION

The recent military conflicts in Iraq and Afghanistan highlight the need for researchers to understand the effects of war on service members' mental health. Moreover, an unprecedented number of women have been involved in these conflicts, with numbers of active duty female personnel consistently over 200,000 between 2002 and 2011 (Department of Defense, 2011). Legislation passed after the Persian Gulf War made it possible for women to serve in a greater number of combat-related positions than women in previous conflicts, resulting in women's greater exposure to combat. Women's increased risk of combat exposure is reflected by statistics indicating that, to date, 1,177 female soldiers were wounded or killed in action over the course of Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND; Defense Casualty Analysis System, 2016). Additionally, recent research by Kelley et al. (2012) revealed that 92% of men and 85% of women in one sample of war-zone deployed veterans reported combat exposure, which suggests that the gender gap in combat exposure has narrowed compared to previous conflicts. With the recent decision to rescind the ban on women in combat roles (Dempsey & Panetta, 2013), it is likely that an increased number of women will be exposed to combat situations in future military operations.

Studies of posttraumatic stress disorder (PTSD) in OEF/OIF combat veterans have been prevalent in the scientific literature over the past decade. In order to better protect and treat veterans exposed to combat situations, studies have explored pertinent PTSD risk and protective factors. The majority of these studies, however, have included primarily male samples. Among studies that have included data on male and female veterans from all eras, the majority have found no gender differences in PTSD rates (e.g., Brewin, Andrews, & Valentine, 2000; Street, Vogt, & Dutra, 2009, see Tolin & Foa, 2006, for a review). Due to specific risk factors and vulnerabilities, female veterans are likely to have different deployment experiences than male

veterans. One such risk factor for the development of PTSD in female veterans is sexual trauma experienced during deployment. Several studies have indicated military sexual trauma (MST) as a significant predictor of PTSD in female veterans, with some suggesting MST is a better predictor of PTSD than combat exposure (Street et al., 2009; Surís, Lind, Kashner, Borman, & Petty, 2004) or the strongest predictor of PTSD in female veterans (Yaeger, Himmelfarb, Cammack, & Mintz, 2006). Although risk and protective factors such as premilitary trauma history, combat type and severity, social support, MST, and postmilitary trauma have been explored, few studies have looked at interactions between MST and other PTSD risk and protective factors. The primary aim of this study was to explore whether MST adds to the prediction of PTSD diagnosis in female veterans above the contribution of combat exposure, premilitary trauma history, social support, and postmilitary trauma, and whether MST interacts with other risk and protective factors to predict PTSD diagnosis for female veterans. Ideally, having a greater understanding of how MST interacts with factors contributing to the development of PTSD in female veterans would assist in the development of training programs and treatments that enhance protective factors and target risk factors for female veterans' mental health.

Gender Differences in PTSD Prevalence Rates

Reviews of the literature have typically revealed several key gender differences in trauma exposure and PTSD in the general population. First, researchers have reported differences in types of trauma reported by men and women in civilian samples. Women are more likely to report sexual assault or abuse, both in childhood and adulthood, whereas men are more likely to report accidents, nonsexual assault, combat or war, disaster, fire, serious illness, and witnessing death or injury (Nemeroff et al., 2006; Tolin & Foa, 2006). Second, compared to adult women, adult men are significantly more likely to report a potentially traumatic event during their

lifetime, such as those listed above (Tolin & Foa, 2006). Lastly, meta-analyses conducted on studies of civilians have demonstrated that women are approximately twice as likely to meet criteria for PTSD as men (see Nemeroff et al, 2006; Tolin & Foa, 2006). Taken together, these findings show that women are more likely to meet criteria for PTSD despite an overall lower likelihood of experiencing traumatic events and reporting fewer types of potentially traumatic events.

In contrast to studies of civilian samples, evidence is inconclusive regarding whether PTSD is more common among female veterans. For example, a meta-analysis of risk factors for PTSD revealed that being female was a significant risk factor for PTSD among civilians (r = .13); however, gender was not associated with PTSD in military samples (r = .00). It is important to note that these correlations were significantly different (Brewin et al., 2000). In their meta-analysis of the literature on gender differences in PTSD, Tolin and Foa (2006) concluded that female civilians exposed to combat, war, or terrorism were significantly more likely to meet diagnostic frequency and symptom severity for PTSD than male civilians exposed to combat, war, or terrorism. However, when they confined their review to research with veteran samples only, gender was no longer associated with PTSD frequency or severity upon exposure to combat, war, or terrorism.

One explanation offered for the gender discrepancy in PTSD prevalence between civilian and veteran samples is that, because of their increased exposure to traumatic events while in the military, male veterans are more likely to meet criteria for PTSD than civilian men (Zinzow, Grubaugh, Monnier, Suffoletta-Maierle, & Frueh, 2007). However, one might anticipate that female veterans' exposure to traumatic events would also be increased over that of civilian women, which would still result in higher PTSD prevalence in female veterans over male veterans. Another suggested reason for the discrepancy is that male veterans are exposed to a

greater number and severity of combat experiences than female veterans, thus increasing male veterans' vulnerability to PTSD and narrowing the gender gap seen in the civilian population. This explanation may have been especially applicable to Vietnam and Gulf War veterans because women were not as likely to be exposed to combat-related stressors at that time. However, when Street et al. (2009) reviewed studies of gender differences in the prevalence rates of PTSD after controlling for combat exposure, they still found little to no difference between male and female veterans. To gain a clearer understanding of the correlates that contribute to the development of PTSD in veterans, including any possible gender differences, research has turned to focus on specific risk and protective factors that may be relevant to a veteran population.

Key Risk and Protective Factors

Research has identified many factors that may put active duty personnel and veterans at a higher risk of developing PTSD. Defined by King et al. (2012) as "a characteristic of the person, environment, or traumatic event that initiates, exacerbates, or maintains a negative response" (p. 333), a risk factor may occur before, during, or after a traumatic event. Similarly, protective factors may also occur pre-, during, or post-trauma, and are defined by King et al. as "a characteristic of the person, environment, or traumatic event that prevents, decreases, or contains a negative response" (p. 333). Protective factors are often associated with resilience, which is defined as one's lack of or recovery from negative functioning following adverse events. In an examination of PTSD risk factors in a general adult population, Brewin et al. (2000) found the largest effect sizes for trauma severity, lack of social support, and additional subsequent life stress. In military samples, these researchers reported that, compared to civilian samples, younger age at trauma, lower education, minority status, childhood adversity, trauma severity, and lack of social support were the most significant risk factors for PTSD. In his review of the military trauma literature, Litz (2007) additionally cited parental psychopathology, pre-

deployment psychopathology, lower pre-war intelligence, deployment injury, and perceived family instability as risk factors for PTSD in veterans. Overall, Brewin et al. concluded that trauma intensity and posttrauma risk factors appear to be more powerful predictors than pretrauma variables and that the effects of pretrauma variables may be mediated by the individual's response to the traumatic event or later aspects of the trauma. Researchers have begun to examine more complex models of risk and protective factors before, during, and after trauma exposure. In part, the complexity of current models of PTSD reflects greater awareness that predeployment experiences may put veterans at risk for additional exposure to traumatic and stressful events, may increase their perceptions of threat, and may predict their inability to access coping mechanisms and protective factors when confronted with new stressors (Vogt, Smith, et al., 2011).

Premilitary Trauma. One predeployment factor that has implications for veterans' risk of developing PTSD is premilitary trauma exposure. Several theoretical models, including the diathesis-stress and the conservation of resources (COR) models, postulate that individuals with prior trauma exposure may be more vulnerable to experiencing additional traumatic events and may have fewer resources with which to cope with additional stressors (Hobfoll, 1989; Schumm, Stines, Hobfoll, & Jackson, 2005). These models are supported by research demonstrating relationships between childhood or other premilitary trauma and PTSD in veterans. For example, in a study of 1,301 male and female veterans from OEF, OIF, and the Persian Gulf War, Van Voorhees et al. (2012) found that childhood trauma had a significant direct effect on PTSD. In studies of male veterans, childhood physical abuse has been found to be associated with increased PTSD symptom severity (Clancy et al., 2006; Zaidi & Foy, 1994).

According to Zinzow et al. (2007), the risk of premilitary trauma exposure is particularly salient for female veterans. In part, this greater risk may reflect that female veterans were more

likely to endorse personal trauma history prior to deployment than male veterans, and female veterans reported greater likelihood of having experienced traumatic events than women in the general population (81%-93% vs. 51%-69%, respectively). Studies have suggested that this heightened risk of personal trauma history reflects that women entering the military are often escaping low economic backgrounds and/or violent environments (Sadler, Booth, Mengeling, & Doebbeling, 2004). However, premilitary trauma is not limited to female veterans. Clancy et al. (2006) found that in a sample of male veterans (primarily Vietnam and Gulf War), 40% endorsed at least one event of childhood physical violence (i.e., being severely physically punished or witnessing family violence), and 11% endorsed at least one event of childhood sexual abuse. In addition, 23% of these participants reported at least one personal trauma before military service (e.g., life-threatening illness, unexpected death of close friend or family member, abortion or miscarriage by partner). It is clear that both female and male veterans may enter military service with prior traumatic exposure and that for women, exposure to premilitary trauma may be particularly likely relative to their civilian counterparts.

In a study of 1,301 male and female OEF, OIF, and Gulf War veterans, Van Voorhees et al. (2012) found that, although both childhood trauma and combat exposure had significant direct effects on PTSD, childhood trauma and combat exposure did not interact to increase the risk of PTSD symptoms. Additionally, these researchers found that the effect of childhood abuse on social support was mediated by PTSD symptom clusters of re-experiencing, avoidance and numbing, and hyperarousal. In contrast, in a study of 115 female Gulf War and OEF/OIF veterans, Hassija, Jakupcak, Maguen, and Shipherd (2012) found that after accounting for the effects of childhood and adult traumatic events, including physical and sexual abuse and assault, combat exposure was the only significant predictor of PTSD symptoms. Similarly, Vogt, Smith, et al. (2011) did not find a positive correlation between exposure to prior stressors and

posttraumatic stress symptomatology (PTSS) in a survey of male and female OEF/OIF veterans who had returned from deployment within the past year. Although Hassija et al. (2012) did not consider potential mediating or moderating effects of childhood and adult traumatic events on the development of PTSD, Vogt, Smith, et al. analyzed chains of risk factors associated with PTSD. Vogt, Smith, et al. found support for their hypothesis that for both male and female veterans, prior stressors are associated with PTSS through an increase in postdeployment stressors. Research findings regarding the impact of premilitary trauma exposure on the development of PTSD in veterans has been complicated by varying definitions of premilitary trauma exposure and a lack of focus on gender differences. Given that women report more premilitary trauma than men (Zinzow et al., 2007), premilitary trauma may have differing effects on the complex development of PTSD in female and male veterans.

Combat Exposure. Another frequently studied risk factor for veterans that may impact the development of PTSD differently for male and female service members is the type and severity of combat exposure. For example, Vogt, Vaughn, et al. (2011) noted four specific categories of combat-related stress, including combat experiences (fire fights, shooting at the enemy, participating in an attack), exposure to the aftermath of battle (handling human remains, seeing destroyed villages, exposure to injured or dead civilians or fellow soldiers), perceived threat, and a difficult living/working environment. These categories of combat-related stress may be important factors in exploring gender differences in combat exposure and its effects on returning soldiers' mental health. In a review of trauma-related studies involving female veterans, Zinzow et al. (2007) concluded that women reported a lower number of combat experiences than men but found no gender differences in frequency of exposure to aftermath of battle. Combat experience is often considered to be a more severe form of trauma than exposure to aftermath of battle and has been associated with high levels of stress. For example, the Mental

Health Advisory Team VI (MHAT-VI)'s report from 2009 of both OEF and OIF conflicts revealed a positive relationship between the number of combat experiences and levels of acute stress in Maneuver Unit samples (i.e., those engaged in direct combat-related tasks). In addition, Mitchell, Gallaway, Millikan, and Bell (2011) found that increased combat experiences predicted male soldiers' level of perceived stress. One might anticipate higher levels of PTSD in male veterans than in female veterans given that men report more combat experiences, which are related to greater acute stress. However, when Vogt, Vaughn et al. (2011) explored gender differences in a variety of mental health issues (PTSS, depression, substance abuse, and general mental health functioning) in OEF/OIF veterans who experienced different types of combat exposure, they did not find any significant interactions between combat-related stressors and gender in the prediction of PTSD, depression, or mental health functioning. The authors noted that male veterans reported more combat experiences, aftermath of battle, difficult living/working environment, and substance abuse, whereas female veterans' reported significantly more prior life stressors and sexual harassment/assault; however, all effect sizes were small (ranging from .09 to .19).

Additionally, studies have found that individuals' perceptions of threat mediate the relationship between combat experience and PTSD symptoms, further complicating the pathways from combat exposure to the development of PTSD. For example, in a sample of predominantly White male service members deployed to the OEF/OIF conflicts, Renshaw (2011) found that the effect of combat experience on PTSD was fully mediated by perceptions of threat. However, perceived threat did not mediate the association between aftermath of battle exposure and PTSD symptoms. In a similar vein, Vogt, Smith, et al. (2011) found that combat exposure (defined as exposure to both combat experience and aftermath of battle) had a direct effect on PTSD symptomatology and an indirect effect on PTSD through perceived threat. These authors

also noted that approximately half of the total effect of warfare exposure on PTSD symptomatology was direct in both men and women. Vogt, Smith, et al. suggested this direct effect may indicate that exposure to combat has a more direct influence on PTSD symptomatology than initially anticipated, or that its influence on PTSD symptomatology may be mediated by factors other than those examined in their research (predeployment stressors, perceived threat, childhood family functioning, postdeployment stressors, and postdeployment social support).

Social Support. Although premilitary trauma history and combat exposure have been identified as risk factors in the development of PTSD, several studies have identified social support as a significant protective factor, both in civilian and military populations (Brewin et al., 2000; Olff, Langeland, Draijer, & Gersons, 2007; Vogt, Smith, et al., 2011). Vogt, Smith, et al. (2011) demonstrated that lower postdeployment social support was positively related to PTSS for both male and female veterans, but that social support had a stronger association with PTSS for women than men. Additionally, social support has been shown to interact with other risk factors, such as prior traumatic experiences. For example, in a study of civilian females, Vranceanu, Hobfoll, and Johnson (2007) found that individuals with a history of childhood maltreatment reported smaller support networks and less satisfaction with these networks. In their exploration of social support as a possible mediator of PTSD, Vranceanu et al. found that social support partially mediated the impact of multiple occurrences of childhood maltreatment on PTSD symptoms. These authors also suggested that individuals who have experienced childhood trauma may experience limited family support which may reduce adult social support.

Research on social support in the military setting has been extended to include unit cohesion (also called unit morale), which has become a central focus of interventions during the OEF/OIF/OND conflicts (MHAT-VI, 2009). Similar effects to those found by Vranceanu et al.

(2007) were detected in a sample of Army soldiers not yet deployed to OEF/OIF (Brailey, Vasterling, Proctor, Constans, & Friedman, 2007). When controlling for common demographic covariates, results suggested that not only does unit cohesion have a direct negative effect on PTSD symptoms, but it also has an indirect effect, reducing the effect of previous stressful life experiences on PTSD symptoms. Consistent with these findings, when unit cohesion is examined in active duty personnel, it has been found to predict perceived stress levels, with male troops reporting higher unit cohesion more than twice as likely to have lower levels of perceived stress as those reporting low unit cohesion (Mitchell et al., 2011).

Military Sexual Trauma. One key potential risk factor that has been consistently absent in studies of developmental pathways for PTSD in OEF/OIF combat veterans is that of military sexual trauma (MST). According to Zinzow et al. (2007), most studies define MST as "attempted or completed oral, vaginal, or anal penetration through threat or use of physical force that took place on or off duty during the course of military service" (p. 386), although the definition used by the Veteran's Administration includes sexual harassment and unwanted sexual contact (Veterans' Benefits U.S. Code, Section 1720D, 1992). The review of MST research by Zinzow et al. suggests a prevalence rate of 30%-45% among female veterans, with prevalence reaching as high as 71% in a disability-seeking sample. These high prevalence rates of MST in female veterans likely contribute to their levels of PTSD symptoms. For example, Street et al. (2009) found military-related sexual assault and harassment to be a better predictor of PTSD than combat exposure in female veterans. Yaeger et al. (2006) found that MST was a significant predictor of PTSD whereas premilitary trauma was not. Additionally, the likelihood of meeting criteria for PTSD in female veterans who reported sexual assault that occurred while active duty has been shown to be nine times higher than for those who reported no history of sexual assault,

whereas those who reported non-military sexual assault may be five times more likely to meet PTSD criteria (Surís et al., 2004).

It is clear that MST can have devastating effects on military personnel during and following their military service. Not only does MST have direct effects on PTSD symptomatology, it also is related to increases in other mental disorders (e.g., depression, eating disorders, and substance use disorders) and physical illness (O'Brien & Sher, 2013). Additionally, sexual trauma has been shown to increase vulnerability to future stressors, may enhance perceived threat, and may be associated with difficulties in readjustment for female veterans following military discharge (Street et al., 2009; Surís et al., 2004). In a recent study, Scott et al. (2014) explored the relationship between combat exposure and MST in female OEF/OIF veterans and found that MST moderated the relationship between combat exposure and posttraumatic stress symptoms (PTSS) such that veterans with higher combat and MST reported higher PTSS than veterans without MST. It is likely that sexual assault by one's fellow service members or superiors would affect one's sense of unit cohesion (Street et al., 2009; Surís et al., 2004), which has been targeted as a significant protective factor against the development of PTSD and other negative mental health outcomes (Brailey et al., 2007; MHAT-VI, 2009; Mitchell et al., 2007). Additional contextual factors associated with MST may also contribute to its deleterious effects on mental health. For example, individuals for whom the perpetrator was a fellow service member may be fearful of or discouraged from reporting MST and may receive unsupportive or victim-blaming responses from superiors or fellow service members (Campbell & Raja, 2005; Fontana & Rosenheck, 1998). Victims of MST may be required to continue to work in close proximity with the perpetrator and may even have to report to the perpetrator as a superior (Allard et al., 2011).

Although much of the MST literature has focused on its effects on female veterans, male veterans are also susceptible to MST. Reporting rates for male veterans range from 0.7% to 12.5% depending on the operational definition of MST and whether the sample is treatment-seeking or not, with studies including verbal harassment and treatment-seeking samples evidencing higher rates of MST (Katz, Cojucar, Beheshti, Nakamura, & Murray, 2012; Kimerling et al., 2010; Luterek, Bittinger, & Simpson, 2011). In a review by Morris, Smith, Farooqui, and Surís (2013), the authors estimated that MST is typically reported by 1% to 3% of men. Morris et al. cite that masculine stereotypes, desire to maintain unit cohesion, stigma of male sexual trauma, and fear of damaging one's military career may all contribute to men's reluctance to report sexual assault or harassment. Given such low reporting rates, research on MST in male veterans is sparse, but Morris et al. cite that research has indicated that MST has a significant influence on rates of PTSD in male veterans.

Etiological Models

Considering evidence that women are much more likely to report sexual assault in their personal history than men, and that this discrepancy increases in a veteran population (Zinzow et al., 2007), MST warrants inclusion in explorations of PTSD prevalence and models of PTSD risk and protective factors in the female veteran population. Given the unique contribution that MST has on PTSD symptoms, it is surprising that it has not been included as of yet in models exploring PTSD risk and protective factors in OEF/OIF/OND veterans. Fontana, Schwartz, and Rosenheck (1997) explored an etiological model for the probability of PTSD among Vietnam women in theater, and found that childhood abuse, sexual trauma, and war trauma each contributed to PTSD probability, but that only sexual trauma exhibited a direct effect on PTSD whereas low social support fully mediated the relationships between childhood abuse and PTSD and war trauma and PTSD. King et al. (1999) also looked at prewar factors, war zone stressors,

and postwar factors in the development of PTSD in Vietnam veterans and identified significant pathways for both male and female veterans. For both men and women, these authors found that family instability was related to traditional combat exposure, early trauma history was associated with postwar stressful life events, and malevolent environment (e.g., discomfort, heat, poor living facilities) was associated with reduced social support and hardiness. For female participants, atrocities of war were associated with postwar stressful life events, while traditional combat exposure was related to postwar stressful life events for men. Both of these studies provide strong etiological models of PTSD among Vietnam veterans, whereas similar models incorporating MST as a risk factor with a population of OEF/OIF/OND veterans are not yet a part of the extant literature.

Current Research Directions

Based on the previous research, the primary goal of the current study includes gaining a better understanding of the associations among PTSD risk and protective factors by including MST and other possible risk and protective factors in etiological models of the development of PTSD in female veterans. It was anticipated that correlations would show that combat experience, exposure to aftermath of battle, MST history, premilitary trauma, and postmilitary trauma experiences would be positively related to PTSD, whereas perceived social support would be negatively related to PTSD.

MST and Combat Exposure. It was anticipated that MST, combat experience, and exposure to aftermath of battle would each have unique effects on PTSD (Hypothesis 1). Previous research has demonstrated that perceived threat mediates the relationship between combat experience and PTSD (Renshaw, 2011). Due to the potential of MST to heighten perceived threat, it is hypothesized that MST would moderate the relationship between combat experience and PTSD, heightening the overall effect of combat experience on PTSD. More

specifically, it was expected that individuals experiencing MST would perceive combat experience as a greater threat, and this greater perceived threat would therefore have a significantly greater impact on their PTSD prevalence than individuals who have not experienced MST (Hypothesis 2). This moderating role of MST was not anticipated within the relationship between exposure to aftermath of battle and PTSD (Hypothesis 3; see Figure 1 for visual depiction of the proposed relationships).

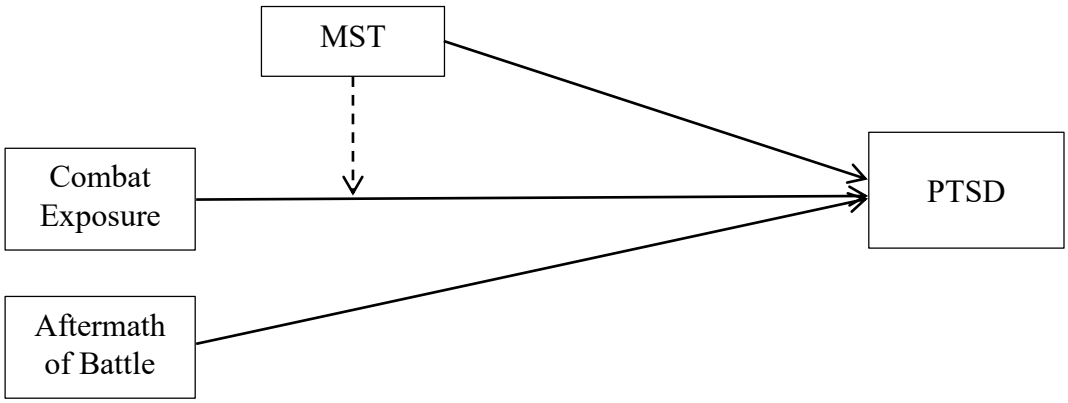

Figure 1. Proposed effects tested in Hypotheses 1 through 3. Dashed arrow represents moderation.

MST, Social Support, and Premilitary Trauma. Given the impact of MST on unit cohesion, loss of current social support, and one's ability to effectively garner social support, it was expected that MST would be negatively associated with perceived social support. However, because previous trauma history also has demonstrated effects on social support, effects of premilitary trauma history were controlled for to explore whether MST reduces perceived social support above and beyond the effects of premilitary trauma. It was expected that MST would remain a significant predictor of social support after accounting for the effects of premilitary

trauma (Hypothesis 4). Given research that has demonstrated premilitary trauma may increase vulnerability for MST, it was anticipated that MST would mediate the effects of premilitary trauma on PTSD (Hypothesis 5). It was further hypothesized that premilitary trauma and MST would have indirect positive effects on PTSD through reduced perceived social support (Hypothesis 6; see Figure 2 for hypothesized model).

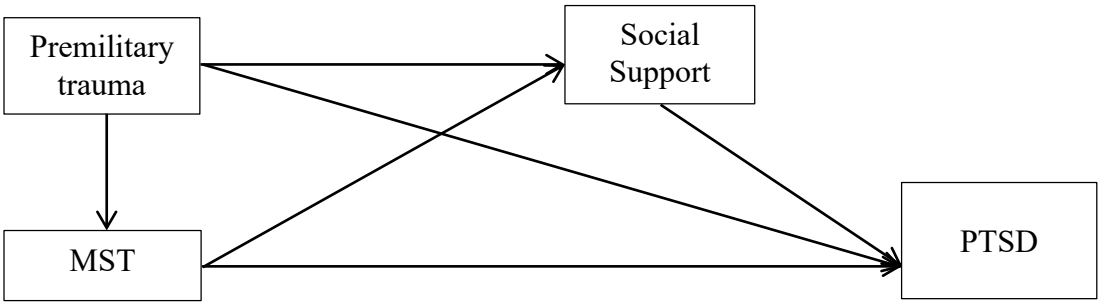

Figure 2. Proposed model depicting relationships tested in Hypotheses 4 through 6.

Etiological Model. Based on prior research and the results from the previous hypotheses, this study proposed a model to examine the best fit pathways between premilitary trauma, military-related stressors (i.e., combat exposure, aftermath of battle exposure, and military sexual trauma), postmilitary factors (social support and postmilitary trauma), and PTSD in female veterans. The proposed model for the current study is presented in Figure 3 and is based primarily on literature regarding female veterans. The model extends previous research by incorporating MST as a mediating variable between premilitary trauma and PTSD and as a risk factor in the development of PTSD. The model predicts that premilitary trauma would have an indirect effect on PTSD through MST, social support, and postmilitary trauma (Hypothesis 7). It

was further anticipated that premilitary trauma, combat experience, aftermath of battle exposure, and MST would all have both direct effects on PTSD as well as indirect effects through social support (Hypothesis 8). Lastly, it is hypothesized that postmilitary trauma would mediate the effects of premilitary trauma and MST on PTSD (Hypothesis 9).

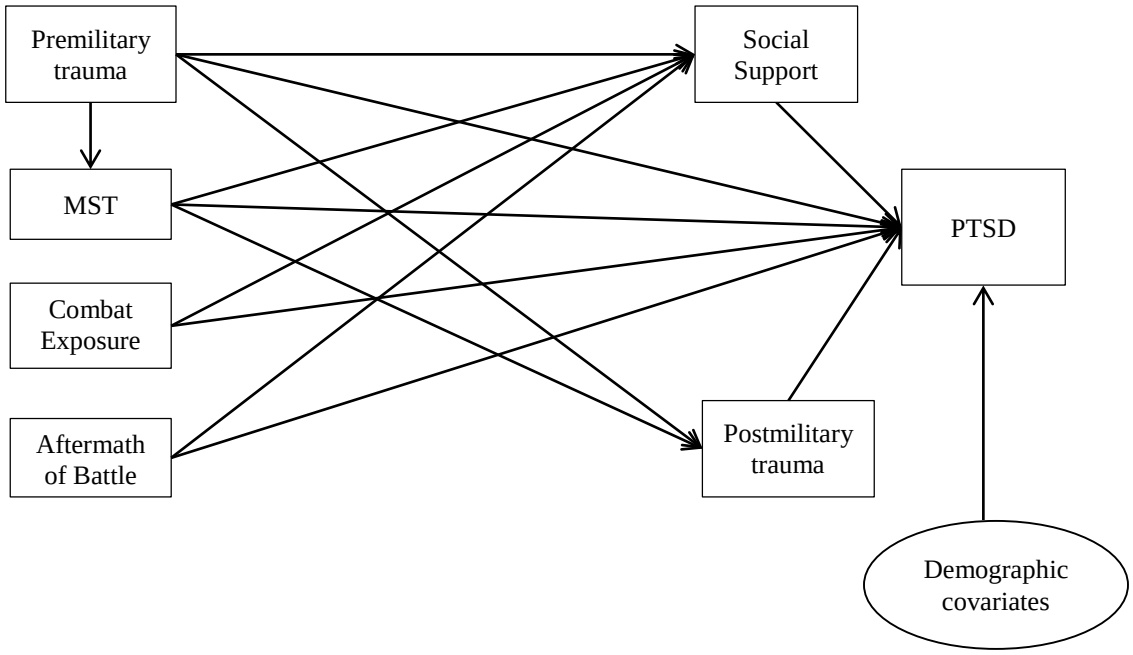

Figure 3. Hypothesized etiological model of PTSD using premilitary, military, and postmilitary factors.

It was expected that confirmation of previous research regarding risk and protective factors in female veterans as well as exploration of the addition of MST as a PTSD risk factor would provide additional information for use in the development of training programs that can be implemented to support female veterans. Additionally, this information may assist in the

development of psychological interventions that target both PTSD and MST in female veterans who have returned from OEF/OIF/OND deployments.

METHOD

Participants and Procedures

Participants were recruited as part of a multi-site research study conducted through the Department of Veterans Affairs (VA) Veterans Integrated Service Network (VISN) 6 Mid-Atlantic Mental Illness Research, Education, and Clinical Center (MIRECC). The initial study was advertised through letters, flyers, and clinical referrals within the VA system as a study on post-deployment mood and mental and physical health. Participants in the full study included male and female veterans and active duty personnel from all military branches who have served since September 11, 2001. After providing informed consent, participants completed either pencil-and-paper or computer-based self-report measures regarding their demographic information, combat experiences, history of trauma, perceived social support, mental health, and physical health. Participants also completed a structured psychological interview conducted by a doctoral-level psychologist or a master's level clinician. Data were collected at one time point, thus the data represent a cross-sectional study design. Data collection for this VISN 6 Mid-Atlantic MIRECC project started in June 2005 and is ongoing. Institutional Review Board approval for the current study was obtained through the Old Dominion University College of Sciences committee and through the Hampton Veterans Affairs Medical Center (VAMC).

When data for the present study were received in October, 2015, data for 3,200 participants were available. The current study's aim was to examine PTSD in female participants, so 2,550 male participants were excluded. Additionally, for the current study, data from 233 participants who did not report service in the OEF, OIF or OND conflicts in Iraq and Afghanistan were excluded. Finally, due to the late inclusion of the Deployment Risk and Resilience Inventory (DRRI) in the data collection, only participants who completed this measure were included in the analyses. Of the total remaining participants, 213 were not

administered the DRRI and were thus excluded for this study. Two participants were missing data on one of the measures being used in the study, and were thus excluded from this study.

Final participants in the current study were 202 female service members who reported service in the Iraq and Afghanistan conflicts. These participants' data were collected between 2010 and 2015. The average participant reported that their most recent warzone service began in 2005 and ended in 2006, and the largest percentage of participants indicated most recent warzone service beginning in 2003 (16.8%); however, starting year of most recent warzone service in the sample ranged from 1987 to 2014. Ending year of most recent warzone service in the sample ranged from 1989 to 2014. Participants' ages ranged from 23 to 65 years old, with an average of 36.35 years of age (*SD* = 9.64). The majority of participants identified as African American (60.9%) or Caucasian (37.6%), with 3.0% identifying as Asian/Pacific Islander and 2.0% identifying as Native American. Thirteen participants (6.4%) identified as Hispanic. Most participants reported never being married (36.6%), being married (27.2%), or being divorced (25.7%). The average number of years of education in the sample was 15.2 (*SD* = 2.07). The majority of participants indicated they were no longer active duty military (70.3%), while 29.7% reported being active duty in their most recent branch of service. Most recent branches of service for participants included Army (36.1%), Army Reserve (20.3%), Navy (15.3%), Army National Guard (13.9%), Navy Reserve (4.5%), Air Force (4.5%), Air Force Reserve (1.5%), Air National Guard (1.5%), Marine Corps (1.5%), and Marine Corps Reserve (1.0%). Participants reported serving an average of 1.48 tours of duty (*SD* = 0.88). A total of 15 participants (7.4%) reported officer rank; the remainder of participants reported enlisted rank. Regarding their military service, 112 participants (55.4%) reported being under fire at some point, 33 participants (16.3%) reported having to fire their weapon, and 30 participants (14.9%) reported being wounded in a warzone.

Measures

Deployment Risk and Resilience Inventory (DRRI). The DRRI (L. A. King, King, Vogt, Knight, & Samper, 2006) is a 14-dimension inventory of deployment-related risk and resilience factors that may impact military personnel and veterans' mental and physical health and well-being postdeployment. Scales or dimensions assess two predeployment factors (i.e., prior stressors and childhood family environment), 10 deployment-related factors (i.e., combat experiences; aftermath of battle; sense of preparedness; difficult living and working environment; perceived threat; nuclear, biological, and chemical exposures; concerns about life and family disruptions; deployment social support; sexual harassment; and general harassment), and two postdeployment factors (i.e., postdeployment social support and postdeployment stressors). Based on early psychometric studies, each of the 14 subscales within the DRRI may be used as a stand-alone scale (L.A. King et al., 2006). For the current study, participants completed the combat experiences and aftermath of battle scales, which were used to evaluate participants' type and severity of combat exposure. Each of these two scales is composed of 16 questions regarding respondents' combat exposure, to which participants provide a dichotomous (1 = *yes*, 0 = *no*) response. The combat experiences scale focuses on exposure to stereotypical warfare experiences (e.g., "While deployed, I went on combat patrols or missions," "While deployed, I received hostile incoming fire from small arms, artillery, rockets, mortars, or bombs," and "While deployed, I fired my weapon at the enemy"), whereas the aftermath of battle scale assesses exposure to the consequences of combat (e.g., "I saw refugees who had lost their homes and belongings as a result of battle," "I took care of injured or dying people," and "I saw the bodies of dead enemy soldiers"). For each scale, a total continuous score was computed by summing affirmative item scores. To avoid overlap with its use as a measure of deployment-related sexual trauma, the item assessing the experience of unwanted sexual activity ("I

experienced unwanted sexual activity as a result of force, threat of harm, or manipulation") was removed from the aftermath of battle scale when calculating a continuous score for this scale. As a result, the final range of scores was 0 to 16 for the combat experiences scale and 0 to 15 for the aftermath of battle scale.

Both the combat experiences scale and the aftermath of battle scale from the DRRI have demonstrated good internal consistency, with Cronbach's alphas of .85 (combat experiences) and .89 (aftermath of battle) in a Gulf War veteran sample (L. A. King et al., 2006). In a sample of OIF Army soldiers, internal consistency ratings for these scales were .85 (combat experiences) and .86 (aftermath of battle; Vogt, Proctor, King, King, & Vasterling, 2008). The Cronbach's alphas for these two subscales of the DRRI were similar to those reported by Vogt and colleagues. Specifically, in the current study Cronbach's alphas were .88 (combat experiences) and .90 (aftermath of battle).

Studies of the validity of these two scales also suggest good criterion-related and discriminative validity. L. A. King et al. (2006) hypothesized that the risk and resilience factors measured by the DRRI would be more strongly related to mental as compared to physical health outcomes and would be more strongly related to PTSD symptoms than to symptoms of depression or anxiety. Results of correlational analyses confirmed that the combat experiences scale tended to exhibit higher correlation with PTSD (r = .32) than anxiety and physical (r = .18) or depression (r = .16) symptom counts. Similarly, associations between the aftermath of battle scale and PTSD symptoms (r = .28) had a tendency to be higher than associations with depression symptom (r = .19), multisymptom illness (r = .17), and anxiety symptom (r = .16) counts. In their OIF veteran sample, Vogt et al. (2008) also found higher correlations of combat experiences to PTSD symptoms (PTSS) (r = .23) than to depression symptomatology and to mental health functioning (r = .09). Vogt et al. also found that aftermath of battle scores tended

to have higher correlations with PTSS (r = .29) than depression (r = .15) or physical (r = .14) symptom counts. Authors of the scale expected that men would report more combat experiences and aftermath of battle experiences than women, such that significant differences in reports for men and women in both of these scales indicate that the scales are able to discriminate between men and women's experiences. (L. A. King et al., 2006; Vogt et al., 2008). Additional exploration of discriminative validity supported expected differences between combat/combat-support troops and service-support troops, with combat/combat support troops reporting significantly more combat experiences and aftermath of battle experiences than service-support troops (L. A. King et al., 2006).

Trauma Life Events Questionnaire (TLEQ). The TLEQ (Kubany et al., 2000) is a 22-item self-report questionnaire that assesses exposure to 21 types of potentially traumatic events, such as natural disasters, exposure to warfare, being threatened with death or serious bodily harm, witnessing violence, and nonconsensual sexual contact. One open-ended question at the end of the survey assesses exposure to other life-threatening or highly disturbing events not measured by the other 21 items. Respondents are asked to indicate the frequency of their exposure to each type of traumatic event assessed (*never*, *once*, *twice*, *3 times*, *4 times*, *5 times*, or *more than 5 times*), and then to indicate whether the traumatic event evoked intense fear, helplessness, or horror (Kubany et al., 2000). Consistent with previous studies with veterans (Dedert et al., 2009; Van Voorhies et al., 2012), a modified version of the TLEQ was used in the current study to assess the relationship between each traumatic event exposure and military service. This version includes one extra question for each traumatic event type that requests information on whether the event happened before the military, while on active duty, or as a veteran. Respondents may check one or more of these options.

Four scores evaluating trauma exposure were calculated for each respondent. These reflect the total number of premilitary trauma experiences, the number of interpersonal premilitary trauma experiences, the total number of postmilitary trauma experiences, and the number of interpersonal postmilitary trauma experiences. These scores were continuous, and the overall means reflect the mean number of premilitary and postmilitary total and interpersonal traumas reported. Because physical and sexual assault, and witnessing violence may confer greater risk than other types of traumas (e.g., natural disasters or accidents), the following items were used to evaluate interpersonal trauma exposure: (a) robbery involving a weapon, (b) severe assault by an acquaintance or stranger, (c) threats of death or serious bodily harm from another person, (d) childhood physical abuse (i.e., punishment causing burns, cuts, bruises, or broken bones), (e) witnessing family violence, (f) intimate partner abuse, and (g) sexual abuse as a child, adolescent, or adult. Analyses were run using both total pre- and post-military trauma experiences and interpersonal pre- and post-military trauma experiences to determine if significant differences were evident in this sample.

Data on the TLEQ's temporal stability (test-retest reliability) have indicated kappa coefficients of .60 or above for 12 of the 21 items, indicating substantial agreement, and kappa values falling within the moderate agreement range of .40 to .60 for 8 additional items over a two-week test-retest interval (Kubany et al., 2000). Pearson product-moment correlations of frequency of traumatic event occurrence between Time 1 and Time 2 ranged from .50 to .93, with an average correlation of .77. In creating the TLEQ, Kubany et al. (2000) established content validity for the traumatic events by having seven PTSD experts evaluate the relevance and representativeness of the individual items as well as the general item pool. The TLEQ questionnaire has been shown to have good overall convergent validity with a trauma events interview administered both on the same day and one week later (Dedert et al., 2009; Kubany et

al., 2000). Individuals identified as having PTSD using the Distressing Events Questionnaire (DEQ) reported having experienced significantly more types of traumatic events on the TLEQ than individuals without PTSD, significantly more total traumatic events on the TLEQ, and significantly more events that evoked intense fear, helplessness, or horror, thus providing support for the TLEQ's discriminative validity (Kubany et al., 2000).

Military Sexual Trauma Exposure. Exposure to military sexual trauma (MST) was determined using TLEQ item number 18 ("After your 18th birthday, did anyone touch sexual parts of your body or make you touch sexual parts of their body against your will or without your consent?"). Participants were classified as having experienced MST if they endorsed a positive response to this item and also indicated that this event took place while on active duty. Presence of MST was coded as 1; absence was coded as 0. Test-retest reliability of the TLEQ's assessment of adult sexual abuse indicates moderate agreement, with overall agreement percentages ranging from 79% to 88% across multiple studies and kappa coefficients ranging from .51 to .56 (Kubany et al., 2000). Overall same-day agreement of adult sexual trauma occurrence on the TLEQ with the Traumatic Life Events Interview (TLEI) was 95%, exhibiting high short-term convergent validity. Overall agreement and kappa coefficient for convergent validity was lower after a 1-week delay (87% agreement, $\kappa = .56$), but still exhibited moderate agreement.

To further confirm MST in the present study and to identify participants who may have been reluctant to reveal MST on the TLEQ, responses to TLEQ item 18, which assessed whether the participant had experienced MST while on active duty, were compared to participants' responses to an item from the DRRI aftermath of battle scale wherein individuals indicated experiencing "unwanted sexual activity as a result of force, threat of harm, or manipulation" while on active duty. Correlation between these two items was $r = .59$. An independent samples

t-test suggested that the TLEQ item 18 significantly discriminated between those endorsing MST (M = .68, SD = .48) and denying MST (M = .06, SD = .242) on the DRRI item; $t(200) = -10.30$, $p < .001$. An affirmative response to TLEQ item 18 was used as the primary indicator of MST regardless of DRRI item response. The rationale for using the TLEQ as the primary measure of MST is that some MST events may not involve force, threat of harm, or manipulation, as required by the DRRI item. However, participants with an affirmative DRRI MST response and a negative TLEQ item 18 response were also coded as having experienced MST because the DRRI item meets the definition for MST used in this study.

Medical Outcomes Study Social Support Survey (MOS-SSS). The MOS-SSS (Sherbourne & Stewart, 1991) is a 19-item self-report that was initially developed for patients in the Medical Outcomes Study (MOS), a two-year longitudinal study of care for patients with prevalent and treatable chronic conditions (i.e., hypertension, diabetes, coronary heart disease, and depression). Using a Likert-type response scale ranging from 1 (*none of the time*) to 5 (*all of the time*), respondents indicate how often different types of support are available if needed. Sample items include "Someone you can count on to listen to you when you need to talk," "Someone who shows you love and affection," and "Someone to help with daily chores if you were sick." In the original development sample, multitrait scaling analysis and confirmatory factor analysis supported five social support dimensions: an overall functional social support index and four subscales: (a) emotional/informational, (b) tangible, (c) affectionate, and (d) positive social interaction (Sherbourne & Stewart, 1991). Factor loadings ranged from .76 to .93 with all items correlating higher with their hypothesized subscales than any other social support subscale. All four subscales and the overall index exhibited high internal consistency, with Cronbach's alphas for the individual subscales ranging from .91 to .96 and .97 for the overall social support index. One-year stability coefficients were estimated from Pearson product

moment correlations between participants' scores on the measure at enrollment and one-year follow-up. All subscales and the overall social support index were found to have moderate stability (.72 to .78).

To establish convergent, divergent, and discriminant validity, all four subscales and the overall social support scale were correlated with measures of closely related constructs (e.g., loneliness, family functioning, marital functioning, and marital health) as well as measures of dissimilar constructs (e.g., physical symptoms, physical functioning, and pain severity). As anticipated, the highest Pearson product moment correlations were found between social support and loneliness (r = -.53 to -.69), marital functioning (r = .44 to .57), and mental health (r = .36 to .56), whereas lower correlations were demonstrated between social support and purely physical measures such as pain severity (r = -.14 to -.21) and physical functioning (r = .07 to .15).

Scores for each of the four subscales are first computed by averaging across item scores. Scales are then transformed so that the lowest possible score is 0 and the highest possible score is 100, and the average of these transformed scores is calculated to obtain the overall social support index for each participant, with higher scores indicating greater levels of perceived social support (Sherbourne & Stewart, 1991). For the current study, internal reliability was good, with Cronbach's alpha for the total scale at .98.

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID). The diagnosis of PTSD was determined using classification from the SCID (First, Spitzer, Gibbon, & Williams, 1997), a clinician-administered diagnostic interview that corresponds to the DSM-IV-TR Axis I diagnosis for PTSD. Participants were divided into two diagnostic categories for PTSD: absence and subthreshold were combined into a no-diagnosis condition (0); those meeting diagnostic criteria were coded as having a PTSD diagnosis (1).

Zanarini et al. (2000) evaluated the test-retest and interrater reliability of the DSM-IV version of the SCID using master's and doctoral level raters trained for one week. Test-retest kappa for PTSD diagnoses after a 7-10 day interval was .78, and the median interrater kappa for PTSD diagnoses was .88. Both of these kappa values reveal excellent interrater agreement according to J. L. Fleiss, 1981 (as cited in Zanarini et al., 2000). In a mixed sample of inpatients, outpatients, and non-patient controls, Lobbestael, Leurgans, and Arntz (2011) found the interrater kappa for PTSD to be .77 using doctoral-level psychologists or doctoral-level psychology students who attended a two-day training session on how to use the SCID to determine mental health diagnoses. These studies indicate that the SCID has strong interrater reliability when interviewers are adequately trained. Raters for the MIRECC study were trained by expert interviewers and had a mean interrater reliability kappa of .96 (Dedert et al., 2009).

The SCID has frequently been considered as the "gold standard" in structured clinical interviews and has frequently been used to confirm concurrent validity of other PTSD measures (e.g., Davidson et al., 1997). In an effort to validate their use of multiple measures to diagnose Vietnam war veterans with PTSD in the National Vietnam Veterans Readjustment Study (NVVRS), Schlenger et al. (1992) compared the ability of the PTSD scale from the SCID for DSM-III to accurately diagnose PTSD with diagnoses made from the combination of the SCID, the Mississippi Combat-related PTSD scale, and Keane's PTSD scale for the Minnesota Multiphasic Personality Inventory. Specificity of the PTSD scale of the SCID for DSM-III was found to be 97.6%, and sensitivity was 81.2%, both indicative of excellent construct validity.

Davidson Trauma Scale (DTS). The Davidson Trauma Scale (DTS; Davidson et al., 1997) is a self-report measure of 17 PTSD symptoms based on criteria from the DSM-IV-TR. The purpose of the measure is to serve as a continuous measure of both the frequency and severity of PTSD symptoms. Items are rated on a 5-point Likert scale ranging from 0 to 4 in

terms of frequency (0 = *not at all*, 4 = *every day)* and severity (0 = *not at all distressing*, 4 = *extremely distressing*) during the previous week, with a total possible score of 136 points. Additionally, items can be sorted into PTSD criteria clusters, with items 1-4 and item 17 representative of intrusive re-experiencing (criterion B), items 5-11 representative of avoidance and numbness symptoms (criterion C), and items 12-16 representative of hyperarousal symptoms (criterion D). For the purposes of the current study the total DTS score was used as a continuous measure of PTSD symptoms.

Reliability and validity of the measure were evaluated by Davidson et al. (1997) using over 300 subjects from studies of rape, combat, natural disasters, and mixed traumas. Reliability was good, with Cronbach's alpha at .99 for both frequency and severity items, and Pearson product-moment correlation of .86 over a 2-week test-retest interval. The SCID was used to evaluate concurrent validity, and the DTS demonstrated significant distinction between those who met SCID criteria for PTSD (M = 62.0) and those who did not (M = 15.5). Convergent validity was established using the Clinician Administered PTSD Scale (CAPS), Impact of Event Scale (IES), and the Symptoms Checklist (SCL-90-R). Pearson product-moment correlations revealed strong correlations with the CAPS (r = .78) and IES (r = .64), and moderate correlation with SCL-90-R subscales (r = .44 to .65). These authors identified a PTSD classification cut-point of a total score of 40 at an efficiency of 83%.

McDonald et al. (2009) evaluated the validity, reliability, and diagnostic efficiency of the DTS in Veterans serving after September 11, 2001. These authors also found good concurrent validity comparing the DTS to the SCID, such that participants with SCID diagnosis of PTSD had significantly higher DTS scores (M = 79.6) than those without a PTSD diagnosis (M = 14.7) and those with a SCID diagnosis other than PTSD (M = 37.6). McDonald et al. used the anxiety-related subscales of the SCL-90-R to establish convergent validity; Pearson product-moment

correlations were r = .77 for the OCD subscale and r = .73 for the anxiety subscale. A lower cut-point for maximum efficiency was found in this sample. Using a cut-point of 32 resulted in 94% efficiency in this sample versus the cut point of 40 and efficiency of 83% found by Davidson et al. (1997). For reliability, McDonald found good internal consistency, with Cronbach's alpha at .97. Cronbach's alpha for the present study was .98.

Demographic questionnaire. Participants completed a demographic questionnaire regarding information on age, gender, ethnicity, education, marital and employment status, military service characteristics, and help-seeking status. The following variables are commonly identified as covarying with PTSD in a military population and were reviewed as possible covariates: age, marital status, education (in years), minority status (White vs. minority), number of deployments, military-related injury, and military rank (Brailey et al., 2007; Brewin et al, 2000). Additionally, the present study evaluated mental health treatment and mental health hospitalization as possible covariates. For the present study, age, years of education, and number of deployments were coded as continuous variables. Marital status was coded as a nominal variable with six categories (0 = *married/domestic partner*, 1 = *remarried*, 2 = *widowed*, 3 = *separated*, 4 = *divorced*, 5 = *never married*). Warzone injury, mental health treatment, and mental health hospitalization were coded dichotomously (0 = *no*, 1 = *yes*). Although altering nominal or ordinal variables to be dichotomous is not typically recommended, minority status and military rank each had several cell values that were small enough they would lend results to be uninterpretable. Rather than excluding the participants within these small cells (e.g., those identifying as Native American or Asian/Pacific Islander), which would reduce power even further, these two variables were dichotomized. Minority status was coded as White (0) or minority (1), and rank was coded as enlisted (0) or officer (1). Previous studies have used

similar dichotomization criteria for race despite the limitations on interpretation of results this process generates (see review by Brewin et al., 2000).

CHAPTER III

RESULTS

Data Preparation

Prior to performing any analyses, data were checked for missing data points, skew and kurtosis, and univariate outliers. Only two participants (1.0%) had missing data on the scales being used for analyses. Given the few respondents who were missing items, it was determined that analysis to determine any differences between participants who were and were not missing items would not have adequate power. As a result, missing data were handled using listwise deletion, and data from both of these participants were excluded from analyses.

Logistic regression does not rely upon the assumptions of normality or homoscedasticity in the way that linear regression does (Burns & Burns, 2008). On the other hand, path analysis using structural equation modeling (SEM) does rely on the assumption of normality; however, Bentler and Chou (1987) looked at simulation evidence indicating that conclusions with non-normally distributed data should be reliable if using both fit indices and statistical criteria. To be sure no variables were extremely non-normally distributed and to identify any outlying cases, box plots were reviewed for skew and kurtosis as well as univariate outliers. Descriptive statistics and frequencies were also reviewed (see Tables 1 and 2). Skew and kurtosis were found to be within an acceptable range (skew < 2.0, kurtosis < 3.0) for all variables except for total postmilitary trauma exposure and interpersonal postmilitary trauma exposure, which were positively skewed, leptokurtic, and had multiple extreme outliers, reflecting that few respondents reported experiencing multiple postmilitary trauma experiences. These variables were dichotomized to reflect those who did and did not report postmilitary trauma exposure (0 = *no postmilitary trauma*, 1 = *postmilitary trauma*). Only one variable, premilitary trauma exposure,

Table 1

Descriptive Statistics for Continuous Study Variables

Variable (Measure)	Mean	*SD*	Range	Skew	Kurtosis
PTSD symptoms (DTS)	45.91	41.04	0 - 136	0.52	-1.06
Combat experiences (DRRI)	4.04	3.82	0 - 16	1.22	0.78
Aftermath of battle experiences (DRRI)	4.14	4.18	0 - 15	0.87	-0.40
Social support (MOS-SSS)	69.07	28.48	0 - 100	-0.60	-0.80
Premilitary trauma (TLEQ)	2.62	2.80	0 - 14	1.53	2.52
Interpersonal premilitary trauma (TLEQ)	1.61	1.97	0 - 9	1.45	1.94

Note. $N = 202$. DTS = Davidson Trauma Scale; DRRI = Deployment Risk and Resilience Inventory; MOS-SSS = Medical Outcome Study Social Support Survey; TLEQ = Trauma Life Events Questionnaire.

Table 2

Frequencies for Categorical Study Variables

Variable (Measure)	N	%
PTSD diagnosis (SCID)		
No	135	66.8
Yes	67	33.2
MST (TLEQ and DRRI)		
No	166	82.2
Yes	36	17.8
Postmilitary trauma (TLEQ)		
No	104	51.5
Yes	98	48.5
Interpersonal postmilitary trauma (TLEQ)		
No	171	84.7
Yes	31	15.3
Warzone injury		
No	172	85.1
Yes	30	14.9
Rank		
Enlisted	187	92.6
Officer	15	7.4
Mental health treatment		
No	66	32.7
Yes	136	67.3
Mental health hospitalization		
No	181	89.6
Yes	21	10.4

Note. $N = 202$. SCID = Structured Clinical Interview for DSM-IV Disorders; DRRI = Deployment Risk and Resilience Inventory; TLEQ = Trauma Life Events Questionnaire.

had extreme outliers. One extreme outlier was identified and was Winsorized to the 75th percentile.

Preliminary analyses examined the association of demographic variables with PTSD outcome using Pearson product-moment and Spearman rank correlations. Variables correlated with current PTSD diagnosis in the present study were race (White vs. minority), rank (enlisted vs. officer), warzone injury (yes/no), mental health hospitalization (yes/no), and mental health treatment (yes/no). See Table 3 for correlations. Mental health hospitalization and treatment were expected to be negatively correlated with current PTSD in order to be considered as predictive variables (i.e., individuals with mental health hospitalization and treatment would be less likely to have a current diagnosis of PTSD). However, these two variables were positively correlated with current PTSD and thus were not included as covariates in predictive models, as it is unlikely that people who are hospitalized or receive treatment for mental health concerns will be more likely to develop PTSD following this treatment. Rather, it is more likely that individuals have PTSD and are then referred for mental health treatment or hospitalization. The other demographic variables significantly correlated with PTSD diagnosis were initially included and evaluated as covariates in further analyses.

Pearson product-moment and Spearman rank correlations were used to assess the anticipated positive relationships between combat exposure, aftermath of battle, military sexual trauma, and total and interpersonal premilitary and postmilitary trauma experiences and PTSD, the anticipated negative relationship between perceived social support and PTSD, and any multicollinearity among these risk and protective factors. Significant correlations were found for all expected relationships, and correlations were in the anticipated direction. Correlations between independent variables were all below .4, with the exception of the relationship between

Table 3

Bivariate Correlations between PTSD Variables and Demographic Covariates

Variable	Current PTSD Diagnosis	PTSD Symptoms
1. Age	-.01	-.05
2. Rank (Enlisted vs. Officer)	-.16*	-.09
3. Race (White vs. Minority)	.15*	.08
4. Marital Status	-.08	-.00
5. Warzone Injury (Y/N)	.21**	.38***
6. Years of Education	-.06	-.04
7. MH Hospitalization (Y/N)	.24**	.23**
8. MH Treatment (Y/N)	.36***	.49***
9. Number of Deployments	.10	.06
10. Branch of Service (most recent)	-.06	-.05
11. Starting Year of Warzone Service (most recent)	-.05	.00

Note. Pearson product-moment correlations for continuous variables; Spearman's rank correlations for binary variables.
* $p < .05$. ** $p < .01$. *** $p < .001$.

combat experience and aftermath of battle exposure, which was .67. See Table 4 for these correlations.

Power Analysis

In order to evaluate the minimum sample size needed for a power level of .80, a commonly used estimate of adequate power (Cohen, 1992), several a priori power analyses were conducted. First, for the hierarchical logistic regressions used in Hypotheses 1-3, results from Scott et al. (2014) were used to predict anticipated odds ratios and probabilities for the power analysis. These authors found that a regression model including combat exposure, military sexual trauma, and their interaction exhibited a large effect size (R^2 = .32) on PTSD symptoms. To calculate the approximate power based on the available sample size and anticipated probabilities, G*Power 3.1.3 (Faul, Erdfelder, Buchner, & Lang, 2009) was used. Using the illustrative example for multiple logistic regression provided by these authors, it was determined that power for the logistic analysis involving MST and combat exposure or aftermath of battle would be .89 given a sample size of 130. A sensitivity analysis was conducted to compute required effect size to detect a significant effect given alpha of .05, power of .80, and a sample size of 202. Results suggested that an odds ratio of .58 could be detected with this sample size. To calculate the approximate effect size detectable with the hierarchical linear regressions in Hypotheses 4-7, G*Power was again used. Using an alpha of .05, power of .80, seven predictors (to allow for demographic covariates), and a sample size of 202, it was determined that a small effect size would be needed (f^2 = .04) to detect significant results. Standardized path coefficients found by Fontana et al. (1997) with female Vietnam era veterans were used to estimate that the effect size of MST on social support might be expected to be small to medium.

Table 4

Bivariate Correlations between Study Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Current PTSD Diagnosis	-	**.66*** **	**.33*** **	**.32*** **	**.40*** **	**-.24****	**.21****	**.22****	**.16***	**.28*** **
2. PTSD Symptoms	.69***	-	.33***	.53***	.51***	-.37***	.27***	**.37*** **	.18*	**.32*** **
3. Military Sexual Trauma	.33***	.35***	-	**.17***	**.25*** **	**-.21****	**.15***	**.20****	**.14**	**.23****
4. Combat Experiences	.32***	**.50*** **	.22**	-	.66***	-.16*	-.00	**.18****	-.04	**.08**
5. Aftermath of Battle	.37***	**.48*** **	.29***	**.67*** **	-	-.24***	-.01	**.16***	-.05	**.10**
6. Social Support	-.25***	**-.37*** **	-.22**	**-.15***	**-.24****	-	-.11	**-.16***	-.08	**-.21****
7. Premilitary Trauma	.23**	**.28****	.17*	**-.03**	**-.01**	**-.13**	-	**.29*** **	.89***	**.19****
8. Postmilitary Trauma	.29***	.34***	.20**	.12	.14*	-.14*	.37***	-	.25***	**.57*** **
9. Interpersonal Premilitary Trauma	.20**	**.22****	.16*	**-.05**	**-.03**	**-.13**	**.91*** **	**.31*** **	-	**.19****
10. Interpersonal Postmilitary Trauma	.28***	.33***	.23**	.03	.09	-.21**	.26***	**.65*** **	.21**	-

Note. Pearson product-moment correlations below axis; Spearman's rank correlations above axis. Bolded values are the appropriate correlation value based on continuous vs. binary variables.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Power analyses for the structural equation models were conducted using a calculator by Preacher and Coffman (2006). Based on guidelines from Kline (2011), the null RMSEA entered was .08 and the alternative RMSEA entered was .03. Based on model degrees of freedom with no demographic covariates included ($df = 5$), a sample size of 630 would be needed to achieve a power of .80, a commonly used estimate of adequate power (Cohen, 1992). However, according to Kline, for each demographic covariate added to the model, three degrees of freedom are gained. It was initially estimated that there would be a maximum of 5 significant demographic covariates, which would result in a maximum of 20 degrees of freedom. Power analysis based on $df = 20$ suggested that a sample size of 226 participants would be necessary for the RMSEA of the model to fall within the confidence interval of .03 to .08. Given the final sample size of 202 women, it was possible that there would not be adequate power to achieve model fit for female veterans even if the model is a well-fitting model.

Hypotheses 1-3

To examine the hypotheses related to combat exposure and MST, several hierarchical logistic regressions were run with current PTSD diagnosis as determined by SCID diagnosis (0 = no; 1 = yes) as the outcome variable. For each of these regression analyses, demographic covariates of race, rank, and warzone injury, were entered into the first block. MST, combat experiences, and aftermath of battle experiences were entered into the second block. A test of this model against a constant only model was statistically significant, indicating that the set of predictors reliably distinguished between female veterans with and without a current diagnosis of PTSD ($\chi^2 = 53.47$, $p < .001$, $df = 6$). Overall prediction success was 74.3% (89.6% for no PTSD diagnosis and 43.3% for PTSD diagnosis), reflecting an increase over the prediction success of the constant model at 66.8%. Nagelkerke's R^2 of .32 indicates a small-to-medium effect size of this predictive model. The Wald statistic demonstrated that several predictors made significant

contributions to prediction. Race, warzone injury, and combat experiences did not make significant contribution to the prediction of PTSD diagnosis above and beyond the other variables in this model. Rank was a significant contributor to the prediction of PTSD (Wald = 5.93, p = .015, OR = .05), in that officers were about 20 times less likely to have a current diagnosis of PTSD than enlisted participants. As anticipated, MST was a significant contributor to the prediction of current PTSD diagnosis, controlling for demographic variables, combat experiences, and aftermath of battle experiences (Wald = 8.46, p = .004, OR = 3.61), suggesting that when participants reported MST, they were about 3.6 times more likely to have a current diagnosis of PTSD compared to those not reporting MST. Also as expected, aftermath of battle experiences was a significant contributor to the prediction of current PTSD diagnosis, controlling for other variables (Wald = 6.44, p = .011, OR = 1.15), indicating that as aftermath of battle experiences self-report score increased by one point, participants were 1.2 times more likely to have a current diagnosis of PTSD. A review of the Hosmer-Lemeshow test for overall model fit suggests that the overall model was not a significantly good fit for the data (χ^2 = 17.85, p = .022, df = 8).

A hierarchical logistic regression was performed with the above variables, adding the interactions of MST x combat experiences, MST x aftermath of battle experiences, and combat experiences x aftermath of battle experiences. Contrary to expectations, the interaction of MST x combat did not add to the prediction of PTSD diagnosis; thus, MST was not a significant moderator of combat experiences on PTSD diagnosis. Similarly, the MST x aftermath of battle experiences interaction was not significant, suggesting that MST was not a significant moderator of the relationship between aftermath of battle experiences and PTSD diagnosis. Unexpectedly, the interaction of combat experiences x aftermath of battle experiences was significant

Table 5

Summary of Logistic Regression Analysis Predicting PTSD Diagnosis

Predictor	*B*	*SE*	Wald	Exp(B)	95% CI for Exp(B) [*LL, UL*]
Race	0.75	0.37	4.09*	2.11	[1.02, 4.34]
Warzone Injury	0.43	0.52	0.68	1.54	[0.55, 4.31]
Rank	-2.63	1.17	5.05*	0.07	[0.01, 0.72]
MST	1.44	0.48	9.08**	4.23	[1.66, 10.80]
Combat	0.14	0.08	3.05	1.15	[0.98, 1.34]
Aftermath	0.15	0.06	6.10*	1.16	[1.03, 1.31]
MST x Combat	0.03	0.16	0.05	1.04	[0.75, 1.42]
MST x Aftermath	-0.03	0.15	0.05	0.97	[0.72, 1.30]
Combat x Aftermath	-0.03	0.01	5.02*	0.97	[0.95, 1.00]

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. PTSD diagnosis = no (0) or yes (1); Race = White (0) or minority (1); Warzone injury = no (0) or yes (1); Rank = enlisted (0) or officer (1); MST = no (0) or yes (1).
*$p < .05$. **$p < .01$.

(B = -0.03, Wald = 5.02, p = .025, OR = .97), and including this interaction in the model improved overall model fit based on the Hosmer-Lemeshow test (χ^2 = 7.98, p = .436, df = 8). Nagelkerke's R^2 of .35 was slightly increased over the model without any interactions, and prediction success overall increased to 77.2% (91.1% for no PTSD diagnosis, 49.3% for PTSD diagnosis). Rank, MST, and aftermath of battle remained significant contributors to the prediction of current PTSD diagnosis in this model. In addition, race was identified as a significant contributor to PTSD diagnosis prediction, with participants identifying as minority about twice as likely as those identifying as White to have a diagnosis of PTSD. Also in this model, combat experiences trended toward significance (B = 0.14, Wald = 3.05, p = .081, OR = 1.15). Detailed statistical results for this model are available in Table 5.

The MODPROBE procedure (Hayes & Matthes, 2009) was used to further explore the interaction between combat experiences and aftermath of battle experiences. The negative beta coefficient for the interaction (reported in Table 5) suggests that as combat experiences and aftermath of battle experiences increase, there is a reduced effect of aftermath of battle experiences on PTSD diagnosis. Specifically, among those whose scores are 1.4 points or higher than average on combat experiences, aftermath of battle experiences do not have a significant effect on the prediction of current PTSD diagnosis. However, among those whose scores are less than 1.4 points above average on combat experiences, aftermath of battle experiences do significantly contribute to the prediction of current PTSD diagnosis (b = 0.11, p = 0.05). Again, this result suggests that aftermath of battle experiences are associated with PTSD diagnosis except in those with especially high exposure to combat. This relationship is depicted in Figure 4.

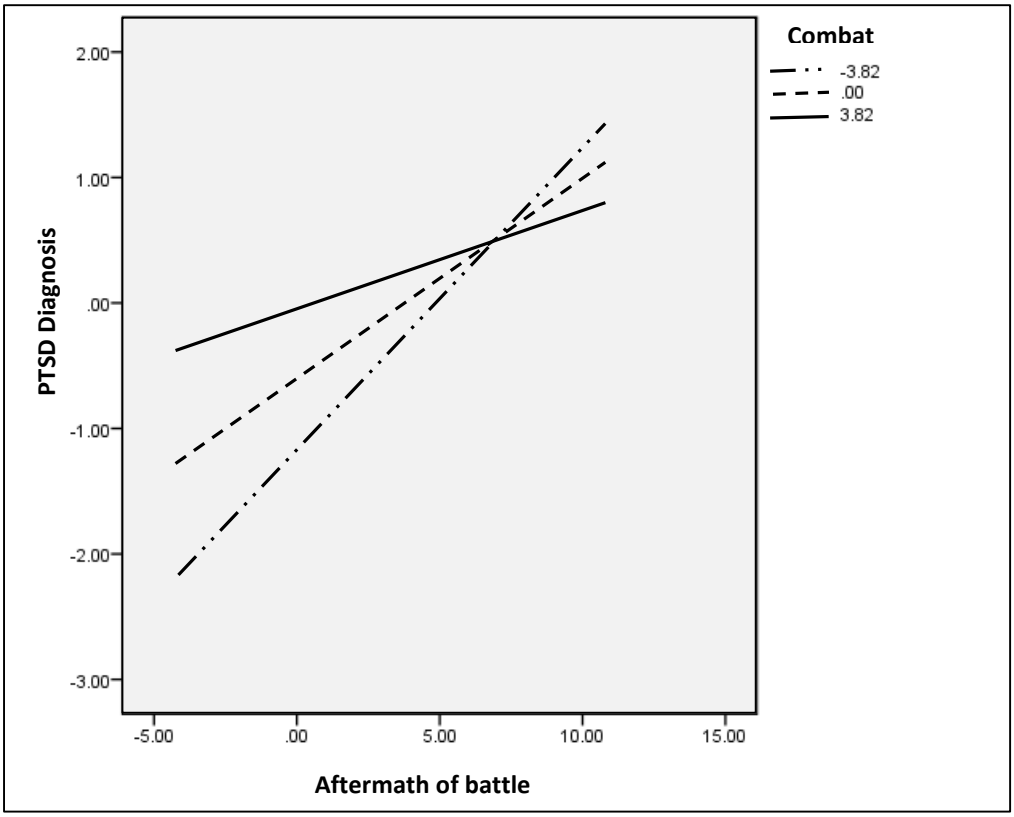

Figure 4. Graphical depiction of combat experience moderating relationship between aftermath of battle and PTSD diagnosis.

Hypotheses 4-6

To explore the effects of MST on perceived social support, a hierarchical linear regression was conducted with centered scores from the MOS-SSS overall social support index as the dependent variable. Total premilitary trauma experiences were centered and entered in block one of the regression analysis. MST was entered in block two. The same regression analysis was run with interpersonal premilitary trauma in block one. Contrary to expectations, neither total premilitary trauma nor interpersonal premilitary trauma was significantly correlated with social support (r = -.13 and r = -.13, respectively) in initial correlations, and neither was a significant predictor of social support once entered into a model with MST. Controlling for any

Table 6

Summary of Linear Regression Analyses Predicting Social Support

Predictor	R^2	β	*B*	*SE*	*t*	95% CI [*LL*, *UL*]
Total Premilitary Trauma Model	.058					
Total Premilitary Trauma		-.10	-.91	0.67	-1.36	[-2.22, 0.41]
MST		-.21	-15.26	5.19	-2.94**	[-25.50, -5.02]*
Interpersonal Premilitary Trauma Model	.059					
Interpersonal Premilitary Trauma		-.10	-1.38	1.01	-1.37	[-3.36, 0.60]
MST		-.21	-15.42	5.17	-2.98**	[-25.62, -5.23]*

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; MST = military sexual trauma. *significant 95% confidence interval. **$p < .01$.

effects of premilitary trauma, MST did significantly predict current reported social support in both the total premilitary trauma model and the interpersonal premilitary trauma model (see Table 6).

The model proposed in Figure 2 was explored using structural equation modeling (SEM) in M*plus* Version 7 (Muthén & Muthén, 2015). Given that this is a just-identified model, no model fit statistics were generated. However, non-parametric bootstrapping procedures using bias-corrected confidence intervals (CIs) at 95% based on 5,000 bootstrap samples with replacement were used to estimate standardized path coefficients, standard errors, and indirect, direct, and total effects (Efron & Tibshirani, 1993). The model was specified as a probit model, which is standard in M*plus* for models with a binary outcome variable, versus a maximum likelihood model. All demographic control variables were initially included in the model to explore significant effects on current PTSD diagnosis. Rank was the only demographic variable with a significant direct effect on current PTSD diagnosis, and was thus kept in the model at first. When the new model was run with rank as the only control variable, rank was no longer a significant predictor of current PTSD diagnosis, and was thus removed from the final model, which was the same model that was initially specified in Figure 2. The final model with standardized path coefficients can be seen in Figure 5. As depicted in the figure, both MST and premilitary trauma exhibited significant direct effects on PTSD diagnosis. Contrary to expectations, social support did not exhibit a significant effect on PTSD diagnosis. Consistent with the previous linear regression analyses conducted, premilitary trauma did not have a significant effect on social support, while MST was significantly and negatively associated with social support.

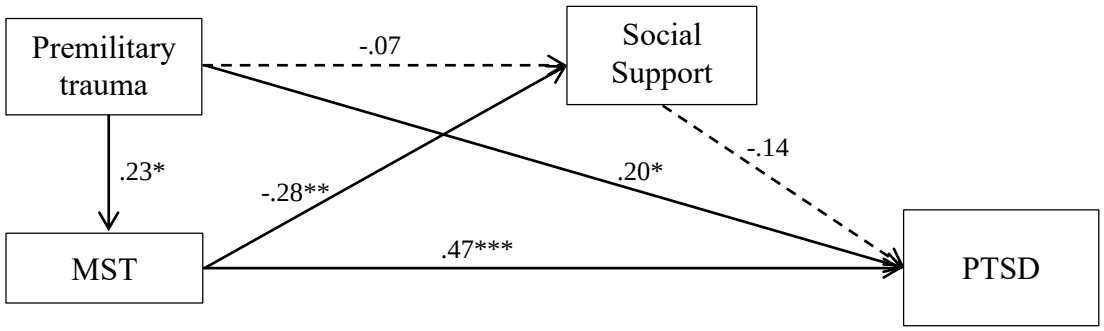

Figure 5. Standardized path coefficients for hypothesized model predicting current PTSD diagnosis. Non-significant paths are represented by dashed lines.
*p < .05, **p < .01, ***p < .001

Indirect effects from MST and premilitary trauma to PTSD diagnosis through social support were evaluated. However, since social support did not exhibit a significant effect on current PTSD diagnosis in this model, it was not a significant mediator of the relationship between MST and current PTSD diagnosis (β = .009, *SE* = .01, p = .472), nor was it a significant mediator of the relationship among premilitary trauma, MST, and current PTSD diagnosis (β = .009, *SE* = .01, p = .274).

The above model was also run using PTSD symptoms as the outcome variable, rather than PTSD diagnosis. Results were broadly similar, with the exception of the warzone injury demographic variable having a significant effect on PTSD symptoms, and perceived social support demonstrated a significant negative effect on PTSD symptoms. See Figure 6 for standardized path coefficients. Additionally, because perceived social support was a significant predictor of PTSD symptoms, results of this path analysis suggested that perceived social support does mediate the relationship between MST and PTSD symptoms (β = .08, *SE* = .03, p = .010). Consistent with the PTSD diagnosis model, perceived social support was not a significant mediator of the relationship between premilitary trauma and PTSD symptoms (β = .02, *SE* = .02,

p = .365) nor among premilitary trauma, MST, and PTSD symptoms (β = .02, SE = .01, p = .093).

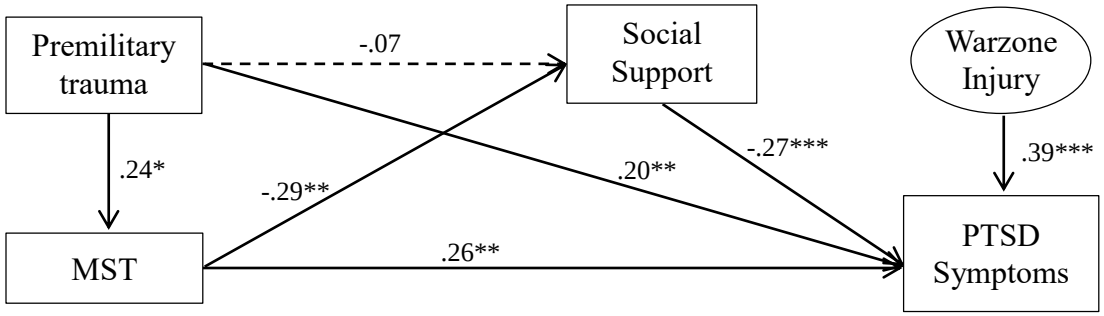

Figure 6. Standardized path coefficients for hypothesized model predicting PTSD symptoms. Non-significant paths are represented by dashed lines.
*p < .05, **p < .01, ***p < .001

Finally, the same model was run with PTSD symptoms as the outcome variable and interpersonal premilitary trauma rather than total premilitary trauma as an indicator variable. Significant relationships were identical to the model with total premilitary trauma, although standardized path coefficients suggest that the direct effects of interpersonal premilitary trauma on both PTSD symptoms (β = .13, SE = .07, p = .046) and MST (β = .22, SE = .10, p = .034) were weaker than those of total premilitary trauma.

Hypotheses 7-9

Finally, to evaluate the goodness-of-fit of the full etiological model proposed in Figure 3, this model was also entered as a probit model into M*plus* (Muthén & Muthén, 2015) due to categorical mediating variables (MST and postmilitary trauma). Theta parameterization was used rather than the default Delta parameterization because this allows residual variances for continuous latent response variables of the categorical dependent variables to be parameters in

the model and is generally a better fit with probit models (Muthén & Muthén, 2015). Model fit indices were then compared to Hu and Bentler's (1999) recommendations for fit indices and statistical values indicating a well-fitting model. These authors recommend reporting a combination of fit indices, such as the chi-square goodness of fit statistic (χ^2), comparative fit index (CFI), Tucker-Lewis Index (TLI), root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). The criteria for a well-fitting model were the CFI and/or TLI $\geq .95$, and RMSEA $< .08$ with a 90% confidence interval (Hu & Bentler, 1999). For models with categorical variables, the weighted root mean square residual (WRMR) has been evaluated and determined to be more powerful at detecting misspecified models than the SRMR (Yu, 2002). A cut-off of < 1.0 is recommended by Yu and was used in evaluating the models in the current study. The chi-square goodness-of-fit statistic (χ^2) is reported as suggested by Kline (2011); however, this value cannot be used for chi-square difference testing when using a weighted least squares with mean and variance adjustment (WLSMV) approach, as is used with categorical variables in M*plus*. For this reason, the chi-square goodness-of-fit statistic is reported but is not used to compare models.

Leverage and influence outliers for each model were identified by saving the values of Mahalanobis distance and Cook's D for each model and comparing each case's value to rule of thumb cutoffs. Cutoff values for Mahalanobis distance were calculated using the critical chi-square with $\alpha = .001$ and p (number of predictors; Aguinis, Gottfredson, & Joo, 2013). The cutoff value used for Cook's D was 1.0 (Cohen, Cohen, West, & Aiken, 2003). Model fit was then reviewed by dropping each outlying case one by one, and then again, without all of these outlying cases. As suggested by Aguinis et al. (2013), model fit statistics are reported for the final model with and without outliers in an effort to provide transparency for the reader. Outlying cases were left in the model as they were not found to be error outliers, and these

individuals were a part of the population of interest. In order to reduce the effect of outliers and any possible multivariate non-normality in the data, non-parametric bootstrapping procedures using bias-corrected confidence intervals (CIs) at 95% based on 5,000 bootstrap samples with replacement were used to estimate unstandardized path coefficients, standard errors, and indirect effects (Efron & Tibshirani, 1993).

PTSD symptoms was used as the outcome variable in this model. Demographic variables included in the initial model (see Figure 3) were age, years of education, number of deployments, rank (enlisted versus officer), race (White versus minority), marital status, and warzone injury. Initial model statistics suggested that age, education, number of deployments, rank, race, and marital status were not significant predictors of PTSD symptoms. All of these demographic control variables were removed, other than rank, which had previously demonstrated a significant effect on PTSD in logistic regression models. Review of fit statistics of this initial model, with only rank and warzone injury as demographic control variables, demonstrated good model fit, $\chi^2(11, N = 202) = 12.88, p = .302$. Fit indices suggested that the theoretical model provided a good fit to the data, CFI = .98, TLI = .96, RMSEA = .029 with 90% CI [.000, .082], and WRMR = .64.

Review of modification indices suggested a possible improvement in model fit by adding a path from aftermath of battle to MST. Theoretically, this path is consistent with research that has shown that MST is more common in warzones as opposed to non-warzones (Street, 2014). Additionally, the literature on revictimization suggests that traumas in general, even traumas that are not of an interpersonal nature, leave individuals vulnerable to later trauma (Finkelhor, Ormrod, & Turner, 2007). One explanation for this finding is that trauma of any kind can increase risk for the development of PTSD symptoms (e.g., avoidance, emotional numbing, and dissociation), which may play a moderating role in the relationship between early trauma and

revictimization (Fortier et al., 2009; Sandberg, Matorin & Lynn, 1999). Despite these theoretical arguments for adding a path between aftermath of battle and MST, information concerning whether MST or aftermath of battle experience occurred first was not available. As a result, it could not be determined that aftermath of battle experience exhibits a predictive effect on MST using the current sample, and this path was not added to the model.

Lastly, standardized path coefficients were examined for any non-significant paths. Non-significant paths included regression of PTSD symptoms on MST, and regression of social support on premilitary trauma, combat, and aftermath of battle. Given that premilitary trauma was also not significantly predictive of social support in the model tested in Hypotheses 4-7, the path from premilitary trauma to social support was removed for parsimony. Other non-significant paths were left in the model due to theory-driven hypotheses for these paths. As Kline (2011) indicates, theoretically suggested paths that are non-significant in one model may be better left in the model until replication can provide additional evidence for their removal. Final model fit was adequate, $\chi^2(12, N = 202) = 14.25$, $p = .285$. Fit indices suggested that the removal of the non-significant path between premilitary trauma and social support decreased model fit slightly, but still demonstrated a good fit to the data, CFI = 0.98, TLI = 0.95, RMSEA = .030 with 90% CI [.000, .081], and WRMR = .67. Standardized path coefficients and 95% confidence intervals were determined using non-parametric bootstrapping based on 5,000 bootstrap samples. All path coefficients and bias-corrected confidence intervals for this model are presented in Figure 7 and Table 7. Values for R^2 suggest that the model accounts for 52.7% variance in PTSD symptoms, 21.4% variance in postmilitary trauma, 15.2% variance in social support, and 7.6% variance in MST; all of these other than MST are significant at $p < .05$. The one identified outlier was removed, and model fit statistics were not suggestive of significant

differences, $\chi^2(12, N = 201) = 14.79$, $p = .253$, CFI = 0.97, TLI = 0.94, RMSEA = .034 with 90% CI [.000, .083], and WRMR = .68.

All possible indirect effects within the final model were evaluated. As shown in Table 7, there were four significant specific indirect effects, suggesting that social support significantly mediated the relationship between MST and PTSD symptoms as well as the relationship between aftermath of battle experiences and PTSD symptoms, that post-military trauma significantly mediated the relationship between premilitary trauma and PTSD symptoms, and that both MST and social support mediated the relationship between premilitary trauma and PTSD symptoms. Given that the model indicates no significant direct effect of MST on PTSD symptoms, the significant indirect effect suggests that the relationship between MST and PTSD symptoms is either fully mediated by social support, or is partially mediated by social support and other variables not measured in this study. The mediational relationship suggests that as MST was associated with lower current social support, participants were more likely to report more frequent and/or severe PTSD symptoms. The model suggests that the relationship between aftermath of battle and PTSD symptoms is partially mediated by social support, such that aftermath of battle is associated with increased PTSD symptoms due to a reduced level of social support. The mediational relationship among premilitary trauma, postmilitary trauma, and PTSD symptoms suggests that participants with premilitary trauma were more likely to report postmilitary trauma, and then these subjects, in turn, were more likely to report more frequent and severe PTSD symptoms than participants with premilitary trauma and no postmilitary trauma. The last significant indirect effect suggests that the effect of premilitary trauma on PTSD symptoms is mediated by the reduced social support that is related to experiencing MST, which is more likely for individuals with premilitary trauma.

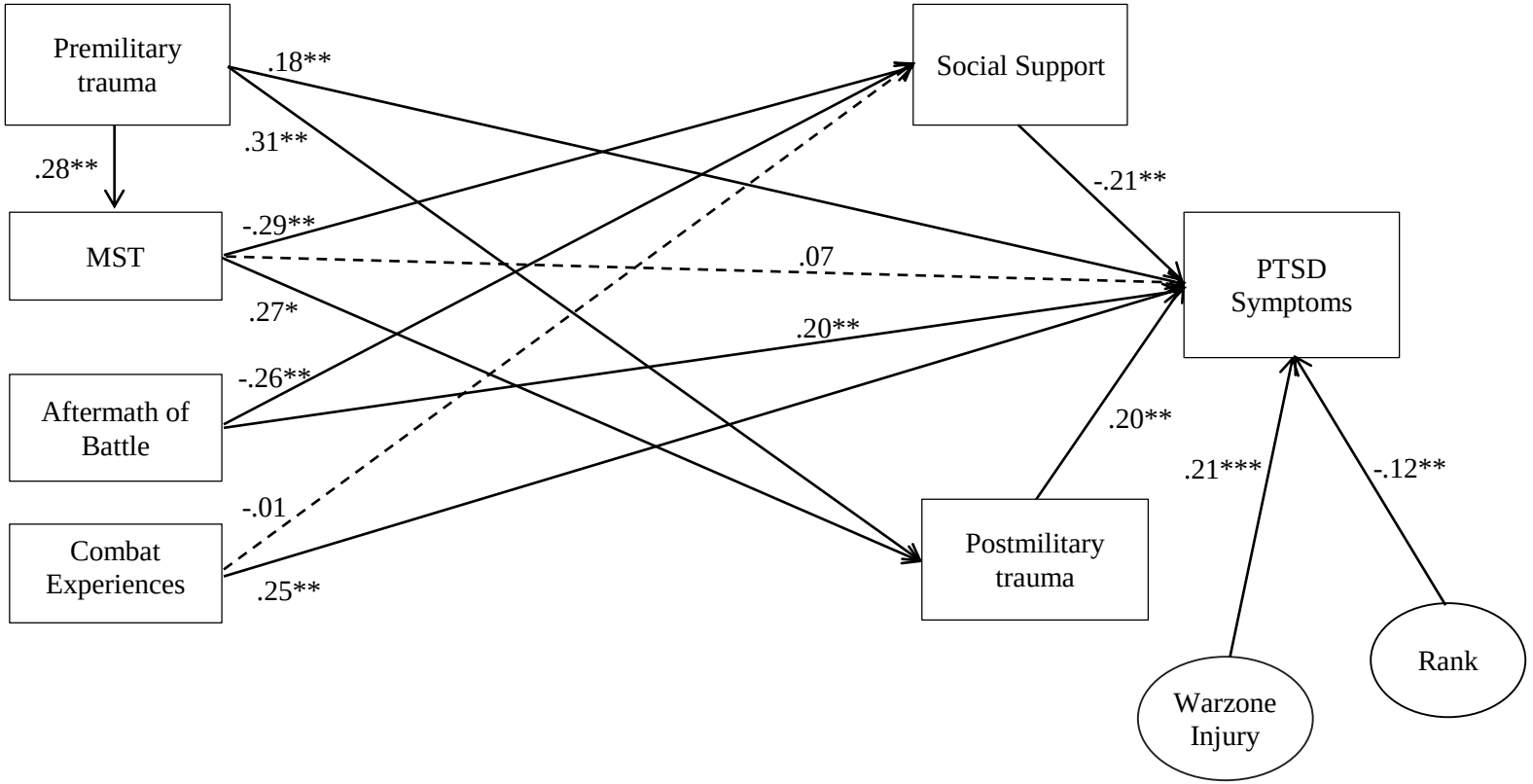

Figure 7. Final etiological model with standardized path coefficients. Dashed lines represent non-significant direct effects. Constrained paths have been removed.
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 7

Weighted Least Squares Estimates for Direct and Indirect Effects of Final Model

Path	*β*	*B*	*SE*	95% CI [*LL*, *UL*]
Direct Effects				
Support → PTSD	-.21	-0.31	0.07	[-0.52, -0.14]*
PostTrauma → PTSD	.19	6.97	0.07	[2.23, 12.01]*
MST → PTSD	.07	2.91	0.09	[-4.59, 9.40]
Combat → PTSD	.25	2.68	0.08	[0.98, 4.36]*
Aftermath → PTSD	.20	1.98	0.08	[0.44, 3.48]*
PreTrauma → PTSD	.18	2.46	0.06	[0.92, 4.02]*
Rank → PTSD	-.12	-18.85	0.05	[-31.03, -4.06]*
Wounded→ PTSD	.21	24.24	0.06	[11.40, 35.85]*
MST → Support	-.29	-7.67	0.09	[-12.16, -2.73]*
Combat → Support	-.01	-0.08	0.10	[-1.60, 1.32]
Aftermath → Support	-.25	-1.69	0.10	[-2.84, -0.31]*
PreTrauma → PostTrauma	.30	0.12	0.10	[0.03, 0.20]*
MST → PostTrauma	.27	0.29	0.13	[0.01, 0.60]*
PreTrauma → MST	.28	0.10	0.10	[0.02, 0.17]*
Significant Indirect Effects				
MST → Support → PTSD	.06	2.39	0.02	[0.99, 4.98]*
Aftermath → Support → PTSD	.05	0.25	0.03	[0.14, 1.17]*
PreTrauma → PostTrauma → PTSD	.06	0.81	0.03	[0.18, 1.92]*
PreTrauma → MST → Support → PTSD	.02	0.23	0.01	[0.06, 0.64]*

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; Support = social support; PostTrauma = postmilitary trauma; Combat = combat experiences; Aftermath = aftermath of battle experiences; PreTrauma = premilitary trauma.
*significant 95% confidence interval using bootstrapping with 5,000 bootstrapped samples.

CHAPTER IV

DISCUSSION

The present study expands upon previous research on PTSD in OEF/OIF/OND Veterans by incorporating MST into a predictive model with other PTSD risk and protective factors using a female Veteran sample. Results suggest that MST has a direct effect on PTSD diagnosis when included in a model with combat and aftermath of battle experiences and without social support, premilitary trauma, or postmilitary trauma. Additionally, results indicate that MST has both a direct and indirect effect through social support on PTSD symptoms when exposure to combat and aftermath of battle experiences are not included in the model. However, results suggest that, when all risk and protective factors are added to the model, MST only exhibits a significant indirect effect, and not a significant direct effect through social support on PTSD symptoms. Of note, the results of the models suggest that premilitary trauma (interpersonal and total premilitary trauma) has a direct effect on MST but not on social support. Rather, the relationship between premilitary trauma and social support is mediated by MST. Hypotheses that MST would moderate the relationship between combat experiences and PTSD diagnosis, and that current social support would mediate the relationship between premilitary trauma and PTSD diagnosis or PTSD symptoms, were not supported.

Hypotheses 1-3

It was hypothesized that, when entered into a regression model predicting current PTSD diagnosis, MST, combat experiences, and aftermath of battle experiences would each demonstrate a significant predictive effect on current PTSD diagnosis (Hypothesis 1). MST, combat experiences, and aftermath of battle were significantly and positively correlated with PTSD diagnosis. However, in contrast to expectations, when entered in the regression model, combat experiences did not have a unique significant direct effect on PTSD diagnosis, whereas

aftermath of battle and MST each had unique significant direct effects on PTSD diagnosis, indicating that the unique effects of MST and aftermath of battle may have been more predictive than that of combat experiences in the model that was tested. Given the potential that MST has to heighten individuals' perceptions of threat (Renshaw, 2011), and based on recent findings by Scott et al. (2014), it was expected that MST would moderate the relationship between combat experiences and PTSD by increasing the likelihood that combat experience is associated with a diagnosis of PTSD (Hypothesis 2). The interaction between MST and aftermath of battle was not expected to be similarly significant (Hypothesis 3). Results suggest that MST neither moderates the relationship between combat experiences and PTSD diagnosis, nor aftermath of battle experiences and PTSD diagnosis. These findings lend support to a recent study by Calhoun et al. (2016) in which no interaction effect between combat exposure and MST on PTSD symptoms was found in a sample of female OEF/OIF veterans. However, they contradict findings in a sample of female OEF/OIF veterans by Scott et al., who found that MST interacted with combat exposure such that women with high combat exposure and MST were more likely to report more severe PTSD symptoms than women with high combat exposure and no MST. The lack of significant interaction between MST and combat experiences found in the current study may indicate that perceived threat, which is typically heightened by MST, does not impact female veterans' experiences with combat or aftermath of battle. However, the lack of a significant interaction between MST and combat experiences in this study may also be reflective of the fact that combat experiences did not uniquely have a significant direct effect on PTSD diagnosis in the model tested. Therefore, while the data did not support this hypothesis, it should not be ruled out as a possibility for future studies.

An unexpected interaction was revealed between combat experiences and aftermath of battle experiences, such that higher than average levels of combat experiences reduced the

strength of the relationship between aftermath of battle experiences and PTSD diagnosis. Combat experiences (e.g., receiving enemy fire, firing one's weapon) are often considered to be more severe forms of trauma than aftermath of battle experiences (e.g., seeing or handling dead remains, witnessing prisoners of war) due to the increased threat to the individual's life and well-being (Mitchell et al., 2011). It is possible that the impact of combat experiences on the relationship between aftermath of battle and PTSD diagnosis may be because individuals who have experienced higher than average level of combat experiences are more likely to be impacted by these traumas than by exposure to the aftermath of battle. An alternative explanation may be that individuals exposed to high levels of combat experiences are somehow less vulnerable to PTSD symptoms related to aftermath of battle experiences. Perhaps the severity of combat experiences lessens the impact of aftermath of battle experiences. Additionally, some of the aftermath of battle experiences may have occurred as a part of combat. Given the high correlation between these variables (r = .67), it may be that multicollinearity masks the true effects of these variables.

Hypotheses 4-6

A significant negative association was expected between MST and perceived social support. Furthermore, the presence of MST was expected to be associated with lower levels of perceived social support beyond the contribution of interpersonal premilitary trauma scores. Similar results were expected for total premilitary trauma experiences (e.g., natural disasters, accidents, death of family members) as compared to interpersonal trauma experiences only (Hypothesis 4). As shown in Table 6, premilitary interpersonal trauma, total premilitary trauma, and MST each were significantly and negatively correlated with higher levels of social support. However, when entered into a model with MST, neither interpersonal premilitary trauma nor total premilitary trauma significantly predicted social support (see Table 6). On the other hand,

the hypothesis that MST would predict current perceived social support beyond the effects of premilitary trauma was supported.

Although it was expected that MST would have a direct effect on PTSD outcomes, it was also expected that perceived social support would partially mediate the relationship between MST and PTSD (Hypothesis 5). Results partially support this hypothesis. That is, social support partially mediated the relationship between MST and PTSD symptoms (see Figure 6); however, social support did not have a significant direct effect on PTSD diagnosis, and thus could not serve as a mediator between MST and PTSD diagnosis (see Figure 5). Although the results of the present study cannot be construed as causal, it is possible that MST may result in less perceived social support. Because individuals who experience MST may feel betrayed by their unit or superiors, they may have difficulty finding social support or feel apprehensive about seeking social support from their unit; for this reason, they may feel more alienated than those who do not experience MST and may also have a lower perceived social support network. In turn, perceiving less protective effects from social support may increase the likelihood of PSTD. The results of this study are consistent with literature suggesting that social support can act as a protective factor against the development of PTSD and PTSD symptoms, especially in a female veteran population (e.g., Brewin et al., 2000; Olff, Langeland, Draijer, & Gersons, 2007; Vogt, Smith, et al., 2011).

Interpersonal premilitary trauma experiences are frequently associated with reduced social support in the literature (e.g., Vranceanu et al., 2007); thus, it was hypothesized that the relationship between premilitary trauma and PTSD would be partially mediated by MST and social support (Hypothesis 6). There was no significant effect of premilitary trauma on current perceived social support. Therefore, no support was found for the hypothesis that social support would mediate the relationship between total premiliary trauma or interpersonal trauma and

PTSD symptoms or PTSD diagnosis. There are a number of possible explanations for this lack of association. One is that participants reported on premilitary trauma that had taken place prior to their enlistment in the military. The typical participant was about 36 years of age, thus, for most participants, premilitary trauma had occurred many years earlier. The measure for social support required participants to report their perceived satisfaction with their social support at the time of the interview. Given the length of time between premilitary trauma and current reports of social support, it is possible that participants were able to generate adequate social support by the time they returned from deployment, separated from the military, and/or had re-established themselves in civilian life.

As shown in Figure 5, in contrast to findings by Vranceanu et al. (2007), premilitary trauma was not associated with social support directly; however, premilitary trauma was associated with MST, further, MST was associated with social support. This finding supports a long line of research showing that early childhood trauma is associated with subsequent trauma, such as MST. For instance, studies of civilian women have demonstrated that between 50% and 70% of those experiencing childhood sexual abuse later experience sexual abuse as adults (Barnes, Noll, Putnam, & Trickett, 2009; see Classen, Palesh, & Aggarwal, 2005, for a review). Additionally, these results support the conservation of resources (COR) model (Hobfoll, 1989), which proposes that individuals with trauma exposure may be more vulnerable to subsequent traumatic events and may have fewer or less robust coping resources. The significant association of MST with social support may indicate that those women who experienced both premilitary trauma and MST had reduced social support and coping resources, compared with those who experienced premilitary trauma but did not experience MST. This alternative explanation is supported by research by Fortier et al. (2009), who found women who had experienced trauma and did not have strong social support networks were more prone to coping with adverse

experiences via avoidant coping mechanisms. Fortier et al. suggested that avoidant coping may exacerbate and maintain trauma symptoms, which has been shown to leave individuals vulnerable to verbal coercion in adulthood. Research regarding attachment styles, which are affected by early childhood traumatic experiences such as abuse and neglect, and later interpersonal functioning have demonstrated that anxious or resistant attachment styles can have detrimental effects on later independence, emotion regulation, and social skills (Stroufe, 2005). Furthermore, a study by Nurius, Norris, Young, Graham, and Gaylord (2000) found that previously victimized women were more likely to respond unassertively in an assault situation if the offender is known to the woman, due to the concern for negative social consequences, such as losing the relationship, rejection, or embarrassment. Given that the majority of MST is perpetrated by fellow service members known to the victim (Kimerling, Gima, Smith, Street, & Frayne, 2007), and that feared consequences of responding assertively include retaliation or demotion (Mengeling, Booth, Torner, & Sadler, 2015), it is likely that MST survivors would be prone to respond unassertively if they had previously been victimized.

Hypotheses 7-9

Based on theory and previous literature findings, a full etiological model of PTSD symptoms with all risk, protective, and demographic factors was evaluated (see Figure 3). The model predicted that premilitary trauma would have an indirect effect on PTSD through MST, social support, and postmilitary trauma (Hypothesis 7). It was further anticipated that premilitary trauma, combat experience, aftermath of battle exposure, and MST would all have direct effects on PTSD symptoms as well as indirect effects through social support (Hypothesis 8). Lastly, it was anticipated that postmilitary trauma would mediate the effects of premilitary trauma and MST on PTSD (Hypothesis 9). Demographic variables that significantly predicted PTSD (i.e., warzone injury and rank coded as enlisted vs. officer) were retained in the model.

Fontana, Schwartz, and Rosenheck's (1997) etiological model for the probability of PTSD among female Vietnam veterans suggested that childhood abuse, sexual trauma, and war trauma each contributed to PTSD risk, and that of these variables, only sexual trauma exhibited a direct effect on PTSD. As shown in Figure 7, in contrast to findings by Fontana et al. (1997), MST did not have a significant direct effect on PTSD symptoms in the current study, whereas premilitary trauma and combat experiences each demonstrated direct effects and were not mediated by social support in the model. Fontana et al. (1997) found mediational effects of low social support on the relationships between childhood abuse and PTSD and war trauma and PTSD, whereas the current study found no support for these indirect effects; rather, low social support served to fully mediate the relationship between MST and PTSD symptoms and to partially mediate the relationship between aftermath of battle experiences and PTSD symptoms. These findings are understandable given that combat experiences often take place in the presence of others and can therefore be shared experiences and processed as a unit, resulting in limited impact on one's social support network. On the other hand, aftermath of battle experiences and MST are more likely to be experienced in isolation, and stigma surrounding a struggle with these experiences may lead women to avoid discussing them with others. The discrepancy in the findings of the current study and Fontana et al. (1997) may suggest a significant difference in the experiences or characteristics of the current population of female OEF/OIF/OND veterans versus female Vietnam veterans. This is not entirely surprising, given that female Vietnam veterans served primarily as nurses or clerical staff, whereas women in the OEF/OIF/OND conflicts are assigned to roles susceptible to higher levels of exposure to combat (Street, Vogt, & Dutra, 2009). Fontana, Rosenheck, and Desai (2010) identified that female OEF/OIF veterans differed from female Vietnam veterans in that OEF/OIF veterans are younger, report lower levels of military sexual trauma, and have increased social support. In addition, increased numbers of

women serving in the military now compared to the Vietnam War may impact these results. For example, a larger number of female service members and an increase in those experiencing combat situations likely increases the availability of social support related to combat exposure. Current era female veterans may benefit from increased attention to and awareness of the risk for development of PTSD related to exposure to combat. Service members in current conflicts are more likely to be prepared for deployment through education about expectations and efforts to increase unit cohesion. These changes in the approach to warfare by the Department of Defense may have increased availability of social support for female veterans involved in combat during the Iraq and Afghanistan conflicts compared to Vietnam War era veterans. Alternatively, the discrepancy between results in the current study and that of Fontana et al. (1997) may be related to updated assessment measures and methods. For example, Fontana et al. (1997) used a retrospective measure of social support at return from deployment, rather than at the time of the interview, as in the current study. Given the climate of non-support at the return of service members in the Vietnam War, it is likely that social support measured in this way for Vietnam veterans has a distinct difference from current social support reported by OEF/OIF veterans.

Results of Hypotheses 4-6 (see Figure 6) and the final etiological model (reported in Figure 7 and Table 7) suggest that premilitary trauma does not have a significant direct effect on social support. Further, premilitary trauma did not have an indirect effect on PTSD symptoms via social support, as was expected. These results are contrary to findings from Vranceanu, Hobfoll, and Johnson (2007). Specifically, Vranceanu et al. found that civilian women with a history of childhood maltreatment reported smaller support networks and less satisfaction with these networks, and social support partially mediated the impact of multiple occurrences of childhood maltreatment on PTSD symptoms. It is important to note that Vranceanu et al. did not evaluate mediating effects of adult sexual trauma in their study. Results of the present study

suggest that premilitary trauma (i.e., trauma prior to the military) may not have the same association with current social support, but premilitary trauma was associated with increased risk of MST, which was, in turn, associated with reduced current social support. Perhaps veteran women with premilitary trauma exposure are able to find and create social support networks through their military experience, with the exception of those who experience MST. If this is the case, results suggest the importance of unit cohesion interventions, group therapy, and other methods of increasing social support among women who have experienced premilitary trauma. It is possible that these types of interventions may aid women with premilitary trauma to feel more belongingness and foster healthy connections with others, and may reduce their vulnerability to subsequent trauma, such as MST.

Results within the final etiological model are supportive of the hypotheses that aftermath of battle experiences would demonstrate a direct effect on PTSD symptoms, and would be significantly related to reduced social support. Given modification indices for the model that suggested a possible relationship between aftermath of battle experiences and MST, this relationship should be explored in future studies to see if it significantly impacts the relationships within the model. If it were possible to determine whether aftermath of battle exposure preceded MST, a significant relationship may reinforce the conservation of resources (COR) model (Hobfoll, 1989), which proposes that individuals who experience trauma may have fewer coping resources and may therefore be vulnerable to subsequent traumatic experiences than those with no prior trauma history. If this were the case, it may be expected that combat experiences would exhibit a similar predictive effect on MST, which was not suggested by the model. A possible explanation for this potential finding would be that the quality of combat experiences differs in some way from that of aftermath of battle experiences and premilitary trauma, perhaps in the impact on different symptom clusters of PTSD, in the way individuals cope with these different

trauma experiences, or in the prevalence of immediate support for individuals who have experienced these various types of trauma.

Partial support was found for the mediational effect of postmilitary trauma on the relationships between premilitary trauma and PTSD symptoms and MST and PTSD symptoms (Hypothesis 10). Although premilitary trauma exhibited a direct effect on PTSD symptoms, it additionally demonstrated an indirect effect through an increased risk in postmilitary trauma exposure, as anticipated. This finding is consistent with previous research that stressors prior to deployment are associated with PTSD symptoms through an increase in postdeployment stressors (Vogt, Smith, et al., 2011). On the contrary, despite the significant direct effect that MST had on postmilitary trauma, there was no significant indirect effect between MST and PTSD symptoms through postmilitary trauma. This result suggests that while MST may increase female veterans' vulnerability to postmilitary trauma, their risk for heightened PTSD symptoms is impacted to a much greater degree by social support, rather than having postmilitary trauma exposure.

Clinical Implications

Conceptual models such as the model in Figure 7 allow for the understanding of factors that may lead to the development of negative mental health outcomes given certain background characteristics, military experiences, and postmilitary experiences. This understanding makes it possible to develop or select clinical intervention approaches that target key variables for use with a specific population.

The results of this study suggest that when measuring perceived social support in female veterans post-deployment, social support may only be a protective factor in the development of MST-related PTSD symptoms, rather than traumas related directly to combat experiences. The findings of this study highlight the important role that social support plays for female MST

survivors and the importance of developing means for female veterans to feel more confident seeking social support following instances of MST. Trauma research demonstrates that positive social support, especially feeling able to disclose and process traumatic experiences with non-judgmental others soon after a trauma, can reduce likelihood of the development of PTSD symptoms, and that negative social support can increase likelihood of the development of PTSD symptoms (e.g., Borja, Callahan, & Long, 2006). Interventions to support MST survivors during deployment and limiting negative consequences of disclosure are steps that could be taken to boost MST survivors' resilience and reduce risk of the development of PTSD while these veterans are still in the military. It is notable that the Department of Defense Sexual Assault Prevention and Response Office (DoD SAPRO) was developed in 2005, immediately began working toward developing these types of interventions, and continues efforts to improve access to care and to reduce stigma associated with disclosure (DoD SAPRO, 2015). Post-military interventions aimed at decreasing shame and increasing trust in others and available social support, such as psychoeducation about MST prevalence, group interventions, and interpersonal interventions may be especially helpful for this population in addition to currently recommended PTSD-related evidence based psychotherapies (EBPs). For example, interpersonal approaches such as interpersonal psychotherapy (IPT; Klerman, Weissman, Rounsaville, & Chevron, 1984; Weissman & Markowitz, 1994; Weissman, Markowitz, & Klerman, 2000), dialectical behavioral therapy (DBT) skills (Linehan, 1993; Linehan, Tutek, Heard, & Armstrong, 1994), or Skills Training in Affect and Interpersonal Regulation (STAIR; Cloitre, Jackson, & Schmidt, 2016; Cloitre, Koenen, Cohen & Han, 2002; Hassija & Cloitre, 2015) may be useful interventions in helping MST survivors understand their patterns in interpersonal relationships and to learn how to resolve interpersonal conflicts and to form healthy relationships with others (Frank & Levenson, 2011), thereby increasing the veteran's social support network.

In addition to interventions post-MST, the current study highlights a specific group who is more vulnerable to MST and therefore may be supported by prevention efforts. Specifically, the final model suggests that women with premilitary trauma may be more vulnerable to being targets for MST. To be clear, this in no way suggests that these women are at fault for MST experiences. As outlined in the DoD SAPRO's most recent report (2016), prevention efforts should continue to involve education to all service members, such as perpetrator prevention and bystander intervention training. Similarly, since MST may happen to any service member, education regarding the reporting procedures and availability of specialized personnel trained to assist individuals presenting with MST set in place by DoD SAPRO should continue to be presented to all service members. Furthermore, the current study suggests that women with premilitary trauma may benefit from additional prevention efforts. Although the current study does not provide evidence for causal pathways of the revictimization process, previously proposed theories suggest that these women may benefit from targeted efforts to discuss strategies for coping with trauma and its symptoms (Fortier et al., 2009), to improve ability to recognize risky situations, and to increase assertive responses to unwanted behaviors (Nurius et al., 2000).

Limitations

This study faced several limitations. First is that the study was limited by its cross-sectional approach. Causal inferences cannot be made without the use of a longitudinal design, so it is not possible to assume from this model that any of the variables directly or indirectly cause any other variables. We can assume based on their definition that premilitary trauma occurred prior to military variables, and that these occurred prior to postmilitary variables. However, retrospective self-report is susceptible to bias. It may be that individuals with current PTSD or PTSD symptoms are more likely to view their premilitary experiences through a

negative lens and thus report premilitary trauma. Additionally, it was not possible to determine precedence among MST, aftermath of battle, and combat experiences with the measures and methods used. As a result, time-related conclusions regarding any associations among these variables cannot be drawn. A more accurate method would be a longitudinal study wherein participants report trauma and social support prior to deployment, then report various types of combat exposure and MST experiences as they occur, as well as social support related to these events, and then complete a post-deployment follow-up assessment.

Another limitation of this study was the limited sample size. Despite having a large pool of participants within the VISN 6 MIRECC database, the late inclusion of the Deployment Risk and Resilience Inventory (DRRI) as a measure of various combat experiences resulted in 213 fewer participants in the sample than if this measure had not been used. Excluding these participants who had not been administered the DRRI limited the use of PTSD diagnosis as a binary outcome variable for all analyses, as this requires larger sample size than a continuous outcome variable to have sufficient power. Despite this limitation to using the DRRI, evaluating effects of varying levels of combat exposure for female veterans was only possible with this dataset by using the combat experiences and aftermath of battle experiences subscales. Given that not all deployed female service members are exposed to combat experiences (e.g., taking enemy fire, returning fire) and can still develop PTSD through exposure to aftermath of battle, the limitation of the sample size was not as salient as utilizing the available data from the DRRI. Although several findings of this study were significant, it must be noted that non-significant results may be so due to low power.

Although the hypothesized model was based on theory and was found to be a good fit, a limitation of this study is that only one theoretical model was presented and reviewed. One of the primary limitations of structural equation modeling (SEM) is that there may be many

equivalent models or non-equivalent but equally well-fitting alternative models for the data (Tomarken & Waller, 2003). For example, alternative models may look at non-recursive pathways between variables or relationships between error variances that this model did not review.

An additional limitation of SEM that may apply to this study is that of omitted variables. Tomarken and Waller (2003) note that even perfectly fitting models may be limited by the omission of key variables that could affect parameter estimates and standard errors. Although this study attempted to control for key variables within the specified model, the etiological pathways of PTSD in female veterans are complicated, and there are almost certainly additional variables that were not considered or measured that may affect the goodness-of-fit of the model presented. For example, the DRRI measures additional aspects of deployment that might exhibit significant impacts on the development of PTSD, such as sense of preparedness, difficult living and working environment, perceived threat, concerns about life and family disruptions, or deployment social support. As these subscales were not administered to participants, it was not possible to include these various factors in the model. Similarly, the definition of MST used for this study did not incorporate sexual harassment as a potential risk factor for the development of PTSD and PTSD symptoms. Research has suggested that sexual harassment may put women at risk for sexual assault, and may also be predictive of PTSD symptoms due to its chronic, inescapable nature (Surís & Lind, 2008).

Another limitation of this study is that each of the variables within this study represent a homogenous group of individuals, whereas individual experiences within each variable may be heterogeneous. For example, the variable of social support is a broad category for several different types of social support, such as emotional, tangible, and informational support. Furthermore, social support may be received from a variety of sources, such as family, friends,

co-workers, unit members, or supervisors. In addition, social support was only measured as perceived social support at the time of the assessment, rather than at multiple points in time across the participants' warzone service. Although understanding that social support is a protective factor against the development of PTSD symptoms is helpful, we cannot make the assumption that all types of social support are equal in their protective roles. Social support is likely to vary across the participants' experience, and measuring it at only one point limits the conclusions that can be drawn regarding its protective nature. Similarly, using PTSD diagnosis and total scores for PTSD symptoms as an outcome variable ignores the heterogenous nature of participants' symptom presentations. PTSD as a DSM-5 diagnosis is composed of three symptom clusters, and using a total score for PTSD symptoms or the presence or absence of a PTSD diagnosis does not allow for a fine-grained understanding of specific PTSD symptoms that may be associated with variables in the model. Further, using a total score or a diagnosis for PTSD reduces the ability to make specific treatment recommendations based on the study results.

Lastly, the study was limited in the way that MST was measured. Participants were not provided with a measure specifically designed to evaluate their experience of MST, including severity of MST, perpetrator of MST, and when during service MST was experienced. Rather, the measure of MST used in the current study involved one item from each of two questionnaires that asked participants to indicate whether they had or had not experienced MST. Although this generated a reported rate of MST within the typical range for reporting MST, and may represent a more accurate rate of MST over studies relying on screening results when participants establish services within the Veterans Administration (VA), it limits the conclusions that can be drawn regarding differences between sexual harassment and abuse or about the severity of sexual trauma experienced by participants.

Future Directions

It would be helpful to replicate the findings of this study with another database of female OEF/OIF/OND veterans, especially one with a larger sample. There were several expected findings that were not supported in this study, and thus should be further explored. Additionally, a larger sample size would allow for PTSD diagnosis to be used as an outcome variable in path analysis, which would provide uniformity in the outcome variable used for replication studies.

Future studies should also take into consideration that male veterans are also returning from deployment with experiences of MST. Given the low reporting rates among male veterans with MST, this study was unable to look at gender differences in the predictive models. However, this work would be very helpful in determining what factors are more predictive of PTSD in male OEF/OIF/OND veterans, as well as how treatment considerations can be tailored to this population.

Although the dataset used for the current study included many important variables that made it possible to look at an etiological model for PTSD among female OEF/OIF/OND veterans, additional variables might be important to consider measuring when designing future studies. For example, perceived threat and deployment social support are two variables that could be measured using subscales of the DRRI. Furthermore, an improved measure of MST that includes severity of abuse, whether or not harassment was experienced, aspects of the perpetrator (e.g., fellow service member or non-service member, rank relative to that of the survivor, known or unknown to survivor), and when within military service MST was experienced would be a key addition to future studies.

Extensions of this study could also involve exploration of which types of social support, what degree of severity of MST, and what PTSD symptom clusters are more or less useful in prediction models. An example of this might be looking at whether the predictor variables in

this study have varying predictive effects on the separate symptom clusters of PTSD, versus PTSD as a homogenous diagnosis. This type of research can help to inform treatment decisions of clinicians who work with individuals presenting with pure combat exposure versus MST. Clinically useful follow-up studies might also evaluate whether PTSD symptom clusters mediate the relationships between MST and later social support, and what types of social support are most impacted, again informing treatment recommendations.

CHAPTER V

CONCLUSION

Given the increase in the number of women exposed to combat during the conflicts in Iraq and Afghanistan, researchers have become more concerned about the negative impact combat exposure might have on female veterans' mental health outcomes following deployment (see Zinzow et al., 2007 for a review). Additionally, the effects of MST on female veterans has been a growing area of interest for both researchers and the Department of Defense (DoD), given the high percentage of women reporting MST (e.g., Street et al., 2009; Surís et al., 2004; Yaeger et al., 2006). Few studies have looked at both combat variables and MST within female veterans returning from the OEF/OIF/OND conflicts (see Calhoun et al., 2016; Scott et al., 2014), despite the fact that these variables likely confound findings related to the development of PTSD, as women may have experienced one, none, or both of these stressful events during deployment. Furthermore, there have been no studies as of yet that have used SEM to look at developmental pathways of PTSD diagnosis or symptoms incorporating both combat-related trauma and MST. The aims of this study were to examine the relationships among MST and various types of combat exposure; to confirm prior research findings related to premilitary trauma, MST, and social support; and to evaluate etiological pathways of PTSD within a theory-specified model including pre-, peri-, and post-military risk and protective factors within a female OEF/OIF/OND veteran sample.

Although several limitations have been noted, results of the present study indicate that MST is a significant predictor of PTSD diagnosis, above and beyond the contribution of combat experiences or aftermath of battle experiences. Furthermore, results confirm previous revictimization research that suggests premilitary trauma can increase the likelihood that women will experience MST. The full etiological model explored in this study suggests differences in

mediational pathways to PTSD symptomatology for women who have experienced MST or aftermath of battle trauma compared to those who have experienced combat trauma. Combat trauma exhibited a strong direct effect on PTSD symptoms, whereas the effect of MST on PTSD symptoms was fully mediated by social support, and the effect of aftermath of battle trauma on PTSD symptoms was partially mediated by social support. Understanding these differences in more detail may lead to more effective, targeted, and nuanced treatment of female OEF/OIF/OND veterans who have deployment-related PTSD.

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VITA

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EDUCATION

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Old Dominion University, Norfolk, VA December 2014
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Principia College, Elsah, IL May 2002
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RESEARCH EXPERIENCE

Graduate Research Assistant, ODU Family Health Study January 2012 – May 2015
Department of Psychology, **Old Dominion University,** Norfolk, VA

Undergraduate Research Assistant, April 2010 – May 2011
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SELECTED PUBLICATIONS

Kelley, M. L., Hollis, B. F., Milletich, R. J., Cooke, C. G., Henson, J. M., & **Kurtz, E. D.** (2015). Childcare involvement, parenting satisfaction, and relationship satisfaction among fathers with substance use disorder and their non-substance-abusing partners. *Fathering, 13*, 115-129. doi: 10.3149/fth.1302.115

Kelley, M. L., Linden, A. N., Milletich, R. J., Lau-Barraco, C., **Kurtz, E. D.,** D'Lima, G. M., . . . Sheehan, B. E. (2014). Self and partner alcohol-related problems among ACOAs and non-ACOAs: Associations with depressive symptoms and motivations for alcohol use. *Addictive Behaviors, 39*, 211-218. doi: 10.1016/j.addbeh.2013.08.037

SELECTED PRESENTATIONS

Mastnak, J., & **Kurtz, E. D.** (2016, January).*Evidence-based psychotherapy treatments for PTSD.* Presented at the Siteman Cancer Center Health Psychology Seminar Series, St. Louis, MO.

Kurtz, E. D., & Kelley, M. L. (2015, August). *Effects of parental alcoholism and trauma exposure on depressive symptoms.* Poster presented at the 2015 Annual Convention of the American Psychological Association, Toronto, Canada.

Kurtz, E. D., & Kelley, M. L. (2014, November). *Do social support and resilience buffer the effects of personal trauma on depressive symptoms in a college population?* Poster presented at the 30th annual meeting of the International Society for Traumatic Stress Studies, Miami, FL.