The differences between war- and civilian-related traumatic events and the presentation of posttraumatic stress disorder and suicidal ideation in a sample of National Guard soldiers

by

Marta R. Prescott

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Epidemiological Science)
in The University of Michigan
2012

Doctoral Committee:

Professor Hal Morgenstern, Chair
Professor Allison E. Aiello
Professor Israel Liberzon
Professor Joseph R. Calabrese, University Hospitals Case Medical Center
Professor Sandro Galea, Mailman School of Public Health

Dedication

To my parents

Acknowledgements

I would like to thank my chair, Hal Morgenstern, for his time and expertise.

In addition, I would like to thank Sandro Galea who has been a constant source of support, knowledge and advice. I would also like to acknowledge my committee members, Allison Aiello, Israel Liberzon and Joseph Calabrese.

I want to acknowledge my colleagues at the Center for Social Epidemiology and Public Health and the Epidemiology Department at the University of Michigan who helped lay the foundation for my work and were with me from the start including Nancy Fleischer and Lauren Wallner. I also want to thank my colleagues at Columbia University who have helped tremendously in recent months including Sasha Rudenstine, Emily Goldmann, Maggie Paczkowski, Eric Roberts, Greg Cohen, Melissa Tracy, and Sabrina Hermosilla. I could not have completed this without the constant support and advice from Melissa Smiley and Patricia Wren for whom I am forever grateful. Finally, I am forever thankful for my family and friends who have supported me through these many years.

Table of Contents

List of Tables

List of Appendices

Abstract

Although posttraumatic stress disorder (PTSD) is considered a single condition, the heterogeneity of PTSD symptoms may impact PTSD diagnosis and the subsequent report of suicidal ideation. Given the differences between war- and civilian-related traumatic events, we first determined the presence of PTSD symptom heterogeneity between soldiers who experienced war- vs. civilian-related events. Second, we determined the utility of criterion A2 (fear, helplessness, and/or horror) for the diagnosis of PTSD after war- and civilian-related events. Third, we determined the role of traumatic event experiences in the report of suicidal ideation. We utilized a cross-sectional sample of 898 guard soldiers and assessed the participants' history of potentially traumatic events, the presence of PTSD symptoms and diagnosis, and the presence of suicidal ideation. Potentially traumatic events were classified as war- (assaultive, shocking, or the sudden unexpected death of someone close during the most recent deployment to a combat zone) or civilian-related (similar events in civilian life). We used the PTSD Checklist-17 to assess PTSD and the Patient Health Questionnaire-9 to assess suicidal ideation. For the first objective, we used logistic regression to estimate the association between event type (war vs. civilian) and each PTSD symptom for all participants (etiologic heterogeneity) and those with psychopathology after the event (clinical heterogeneity). For the second objective, we used logistic regression to examine

the association between criterion A2 and PTSD symptom criteria B-F by event type. For the third objective, we ran separate logistic regressions to examine the association of any event (any vs. non), as well as the event type (war vs. civilian), with suicidal ideation. We found that soldiers with war-related events were less likely to report re-experiencing symptoms as well as report criterion A2 than were those with civilian events. Few individuals who did not report criterion A2 developed the remaining PTSD symptom criteria. Additionally, we found that soldiers with war-related events were less likely to report suicidal ideation than were those with civilian events. We suggest that war-related events as compared to similar civilian events occur in contexts that may buffer some of the consequences of trauma.

Chapter 1

Introduction

1.1 Significance

At some point in their lifetime, 8-12% of the US population suffers from posttraumatic stress disorder (PTSD) [1-3]. In comparison, up to 18.7% of Vietnam veterans have had PTSD in their lifetime [1-4], and up to 19.9% of Operation Iraqi Freedom and Operation Enduring Freedom veterans had PTSD within a year of returning from deployment [5].

To have PTSD according to the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DMS-IV) a person must first experience a traumatic event, an event outside the realm of daily human existence that evokes fear, helplessness, and/or horror [6]. As a result of this event, the individual must also suffer from three clusters of symptoms: re-experiencing, avoidance, and hyperarousal [6]. The re-experiencing cluster of symptoms includes flashbacks and intrusive recollection of the event; the avoidance cluster of symptoms includes general numbness and increased lack of interest in activities and relationships; the hyperarousal cluster of symptoms includes the startle response, difficulty sleeping, and the inability to control emotions such as anger [6, 7]. To have PTSD, the individual must report either social or functional limitations because of the

symptoms [6]. In addition to suffering from the symptoms, those with PTSD also are more likely to have other health conditions such as depression, substance abuse, and poor physical health [8, 9].

Although the etiology of PTSD is complex, research consistently demonstrates that the circumstances of the event that triggers PTSD matter [1, 3]. For instance, among persons with PTSD, Chung et al. (2008) found that victims of assault (e.g., being raped, shot, tortured) had a different profile of PTSD symptoms than did those who experienced shocking events or the death of loved ones [10]. Wilcox et al. (2009) found a link between PTSD and attempted suicide for those who experienced assaultive events, but not for those who experienced other types of events [11].

The circumstances in which war-related events occur are different from those in civilian-related events and may affect the presentation of PTSD symptoms, as well as the health outcomes associated with PTSD. Soldiers are trained to expect war-related events and have a unique social support structure during the event [12-14]. Both of these circumstances may buffer the effect of war-related traumatic events on the presentation of certain PTSD symptoms, or the effect on the health outcomes related to PTSD. In contrast, war-related events often occur in places with harsh physical conditions and can be compounded by a loss of control [12, 15], which may contribute to more adverse consequences of war-related events.

There is a paucity of research that has compared PTSD symptoms and suicidal ideation related to PTSD between persons with war and civilian-related events. Therefore, I used a cross-sectional sample of Ohio Army National Guard soldiers to

address this question. The goal of this dissertation was to determine if war-related events as compared to civilian-related events had a distinct PTSD symptom profile (Aim 1), diagnostic differences (Aim 2) and distinct relationship to suicidal thoughts (Aim 3).

Since PTSD is recognized as a single condition, investigating its heterogeneity will have implications for epidemiologic research and clinical practice. Understanding the heterogeneity of PTSD will improve our understanding of the cause of PTSD and ways to mitigate the mental health consequences of trauma. Our work will also help researchers and clinicians understand how best to screen military populations and target interventions for those at risk for suicide.

1.2 Specific Aims and Hypotheses

Aim 1: Our first objective was to determine the presence of etiologic heterogeneity (differences among all who experienced an event) and clinical heterogeneity (differences among those with psychopathology) between soldiers who experienced war-related events and those who experienced similar events but in the context of civilian life.

Hypotheses:

Among all National Guard soldiers who experienced a potentially traumatic event, we hypothesize that soldiers who experienced war-related events will have more symptoms of re-experiencing and hyperarousal than will soldiers who experienced civilian-related events (etiologic heterogeneity). We also hypothesize that among those with psychopathology after the event, soldiers with war-related events will have more

symptoms of sleep-disturbance and hyperarousal than will those who experienced civilian-related events (clinical heterogeneity).

Aim 2: To determine the value of DSM-IV criterion A2—feelings of fear, helplessness, and/or horror after a potentially traumatic event—in the diagnosis of posttraumatic stress disorder (PTSD) in a sample of National Guard soldiers. Specifically, our objective was to examine whether soldiers not reporting criterion A2 are as likely to develop the other PTSD symptoms (criteria B-F, referred to as PTSD*) as are soldiers reporting criterion A2 after similar war-related or civilian-related events. We also determined how criterion A2 is of value to the diagnosis of PTSD by examining its positive and negative predictive value for PTSD.

Hypotheses:

First, we hypothesize that National Guard personnel who experienced war-related events will report symptoms of fear, helplessness, and horror less frequently than will those who experienced civilian-related events. Second, we hypothesize that among soldiers with war-related events, the prevalence of PTSD symptom criteria B-F will be similar for those with and without criterion A2, and the prevalence of PTSD will increase if criterion A2 were not required. Among soldiers with civilian-related events, however, few will have PTSD symptom criteria B-F if they do not report criterion A2, and the prevalence of PTSD will not change regardless of whether criterion A2 were required. Third, we hypothesize that among National Guard soldiers the report of criterion A2 will be a useful screening question for the remaining PTSD symptom criteria.

Aim 3: To determine the role of traumatic event experiences in the report of suicidal ideation, and the role of war- vs. civilian-related events in the report of suicidal ideation. Specifically, our objective was to determine if soldiers who experienced any event were more likely to report suicidal ideation than were those who did not experience an event; to determine among those without PTSD, if soldiers who experienced war-related events were more likely to report suicidal ideation than were those with civilian-related events; and to determine if the experience of a war event as compared to a civilian event modified the effect of PTSD on the report suicidal ideation.

Hypotheses:

We hypothesize that soldiers who experienced either a war or civilian potentially traumatic event will be more likely to report suicidal ideation than will those who do not experience any potentially traumatic events. Among those without PTSD, we hypothesize that soldiers who experienced war-related events will report suicidal ideation more frequently than will those who experienced civilian-related events. Finally, we hypothesize that the relation between PTSD and suicidal ideation is greater among soldiers who experienced war-related events than the relation among soldiers with civilian-related events.

1.3 Background

Posttraumatic stress disorder

As defined by the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV), a diagnosis of PTSD requires the presence of 7 criteria (A1, A2, B – F) [6]. First, an individual must experience traumatic event (criterion A1) as compared to a potentially traumatic event may or may not lead to PTSD [16]. He/she must also report feeling fear, helplessness, and/or horror at the time of the event (the stressor criterion, criterion A2). In addition to criterion A1 and A2, the individual must have at least one symptom of re-experiencing the event (criterion B), at least three symptoms of avoidance and numbness due to the event (criterion C), and at least two symptoms of hyperarousal (criterion D). S/he must also have that the symptoms for at least one month (criterion E) and report either social or functional impairment because of the symptoms (criterion F) [6].

War-related and civilian-related events

Several circumstances of war-related events may buffer the effects of traumatic events. First, soldiers in war are trained and prepared to experience extreme violence during duty, a factor that may positively influence the immediate and long-term consequences of trauma [13, 17, 18]. Second, studies have demonstrated that persons who experience occupational events may have a frame of mind during the event that protects them from the consequences of trauma [16, 17]. Third, support from fellow

soldiers (unit support) during war-related events may provide additional coping mechanisms after trauma [12, 13, 18].

War-related events also have many negative circumstances. Compared with civilians, combat veterans experience all eight of the traditional dimensions of trauma – threat to life and limb, severe physical harm or injury, receipt of intentional harm or injury, exposure to the grotesque, violent or sudden loss of someone close to you, witnessing or learning of violence to someone close to you, learning of exposure to a noxious agent and causing the death or severe harm to another – multiple times and for an extended duration [19]. War-related events also occur along with other dimensions of war-zone stress, which include environmental strain (e.g., lack of water, poor living conditions etc.), perception of threat of life, a loss of meaning or control, and extreme traumatic event exposure [12, 15].

War- and civilian-related events and the etiologic and clinical heterogeneity of PTSD symptoms

Heterogeneity of PTSD symptoms, or the variation in PTSD symptom patterns, consists of two aspects, etiologic heterogeneity and clinical heterogeneity. Studies examine etiologic heterogeneity by comparing PTSD symptoms among all who experienced trauma, and the objective of which is to understand the development of PTSD symptoms. In comparison, studies examine clinical heterogeneity by comparing PTSD symptoms among those with psychopathology after the trauma, and the objective of which is to understand symptom differences for more appropriate treatment of PTSD patients.

Studies suggest that certain potentially traumatic events are linked to distinct PTSD symptom profiles. Among Vietnam veterans, Laufer et al. (1985) examined the etiologic heterogeneity of PTSD and reported that combat was associated with symptoms of hyperarousal [20]. Among those with PTSD, Henigsberg et al. (2001) found that war veterans had more symptoms of hyperarousal than did persons who were raped [21]. Among those with severe psychopathology, Chung et al. (2009) found that victims of assault were more likely to report emotional numbing than persons who experienced non-assaultive events [10].

We are unaware of studies that have examined the etiologic or clinical heterogeneity of PTSD symptoms for those with war- vs. civilian-related events using the same source population. Therefore, for the first aim of my dissertation I will use a sample of National Guard soldiers to determine the presence of etiologic heterogeneity (symptom differences among all who experienced an event) and clinical heterogeneity (symptom differences among those with psychopathology) between soldiers who experienced war-related events and those who experienced similar events but in the context of civilian life.

War- and civilian-related events and Criterion A2

All PTSD cases have met 7 criteria (A1, A2, B – F) [6]. The stressor criterion (A2) was introduced in the DSM-IV and requires that a person felt fear, helplessness, and/or horror during or immediately after the event, and its role is to limit the events that qualify as traumatic [6, 16]. There are two central arguments against criterion A2. First, not all potentially traumatic events elicit criterion A2 [16, 22], and reactions including anger or concern for others may be more appropriate for certain events [17, 23]. Second,

there is concern that a substantial number of individuals develop all the PTSD symptoms, yet do not report fear, helplessness, and/or horror and therefore, are misdiagnosed [17]. Specifically, soldiers in the theater of war – persons who have been trained and prepared to face trauma as a result of their occupation – may not feel criterion A2 but perhaps concern for others [17, 24]. Moreover, considering the cultural acceptance of these roles, soldiers may be less likely to report feeling fear, helplessness, and/or horror even if they did experience these feelings because they were on duty [17, 24]. Regardless of the reason, this lack of reported fear and horror may not preclude later development of PTSD symptoms [17].

The evidence examining the association between the type of potentially traumatic event, criterion A2, and PTSD is mixed. Breslau and Kessler (2001) found that combat veterans were less likely to report criterion A2 compared to persons who experienced other types of events [25]. In contrast, Schnurr et al. (2002) found that persons who experienced war-related events were more likely to report criterion A2 compared to those who experienced other assaultive events [26]. Adler et al. (2008) demonstrated that among veterans the prevalence of PTSD was higher when criterion A2 was not required [17]. In contrast, Schnurr (2002) found that the prevalence of PTSD was similar regardless of whether criterion A2 was required [26].

For the second aim of this dissertation, I will examine the utility of criterion A2 and its association with PTSD symptoms separately for soldiers with war-related events and soldiers with civilian events. I will examine whether soldiers not reporting criterion A2 are as likely to develop the other PTSD symptoms (criteria B-F, referred to as PTSD*) as are soldiers reporting criterion A2 after similar war-related or civilian-related

events. I will also determined how criterion A2 is of value to the diagnosis of PTSD by examining its positive and negative predictive value for PTSD.

War- and civilian-related events and suicidal ideation

The experience of certain potentially traumatic events may also be associated with suicidal behavior [27]. For instance, using a sample of chronic PTSD patients, Tarrier et al. (2004) found that assault victims had a higher prevalence of suicidal thoughts than did persons who had experienced serious accidents [28]. Similarly, Wilcox et al. (2010) found that the relation between the event and suicidal ideation for those who experienced assaultive events (e.g., being shot, stabbed) was greater than the relation among those who experienced non-assaultive events [11].

The potentially traumatic event that triggers PTSD may also affect the well-known association between PTSD and suicidal ideation [29]. Wilcox et al. (2009) found a positive association between PTSD due to assaultive events and attempted suicide, and no association between PTSD due to non-assaultive events and attempted suicide [11]. Using a military sample, Davidson et al. (1990) found different associations between PTSD and suicidal ideation depending on the type of military experience; Vietnam veterans with PTSD were more likely to have suicidal ideation at the time of the survey than were World War II veterans with PTSD [30].

Given the few number of studies that have examined the role of traumatic events in the report of suicidal ideation, additional research is needed. For the third aim of this work, I will examine if soldiers who experienced any event were more likely to report suicidal ideation than were those who did not experience an event; to determine among

those without PTSD, if soldiers who experienced war-related events were more likely to report suicidal ideation than were soldiers with civilian-related events; and to determine if the experience of a war event as compared to a civilian event modified the effect of PTSD on the report suicidal ideation.

1.4 Public health significance

As only one form of PTSD is currently recognized, demonstrating the heterogeneity of PTSD could have implications for epidemiologic research, as well as clinical practice. Understanding this heterogeneity will inform our research on the development of psychopathology allowing us to more accurately suggest interventions to mitigate the effects of trauma and war. Specifically aims 2 and 3, could help epidemiologists pinpoint how best to screen military populations and the general population for those at high risk for psychopathologies, as well as suicide risk. Additionally, I suggest that this work contributes to future clinical approaches to PTSD because it will allow us to more fully understand symptom presentation and therefore, allow more confident diagnosis of the disorder in military populations.

Chapter 2

PTSD symptom differences after war-related and civilian-related potentially traumatic events in military personnel

Abstract

Objective: Although some studies have suggested that the profile of PTSD symptoms may be different if the sentinel traumatic event is experienced in civilian or in war-related contexts, few studies have assessed this in the same sample. Our objective was to determine the presence of etiologic heterogeneity (symptom differences among all who experienced an event) and clinical heterogeneity (symptom differences among those with psychopathology) between soldiers who experienced war-related events and those who experienced similar events but in the context of civilian life.

Methods: Using a cross-sectional sample of 898 soldiers from the Ohio Army National Guard, we assessed history of potentially traumatic events and the presence or absence of all 17 PTSD symptoms, PTSD symptom criteria (A2-F), and PTSD. Potentially traumatic events were classified as war-related (assaultive, shocking, or the sudden unexpected death of a friend or loved one during the most recent deployment to a combat zone) or civilian-related (similar events in civilian life). We used the PTSD Checklist-17 PTSD symptoms to assess PTSD symptoms for criteria B-D. Logistic regression was used to estimate the association between event type (war vs. civilian) and each PTSD

symptom for all participants who reported potentially traumatic events. After restricting the population to those with psychopathology (e.g., a DSM-IV diagnosis of PTSD) after the event, we used logistic regression to estimate the association between event type (war vs. civilian) and each PTSD symptom.

Results: Among all who experienced an event, we found that soldiers with war-related events reported criterion A2 (adjusted odds ratio (OR) = 0.46; 95% confidence interval (CI): 0.29, 0.73), intrusive memories of the event (adjusted OR=0.53; 95% CI: 0.34, 0.84) and psychological reactivity when reminded of the event (adjusted OR=0.62; 95% CI: 0.39, 0.98) less frequently than did those who had experienced a civilian-related event. Among soldiers with psychopathology after the event, we found soldiers with war events reported physiological reactivity more frequently than those with civilian-related events (adjusted OR=3.48; 95% CI: 1.34, 9.01).

Conclusions: We found evidence of etiologic heterogeneity of PTSD, and that soldiers with war-related events were less likely to report intrusive memories, report psychological reactivity, meet criterion B, and meet criterion A2 than were those with civilian events. We also found evidence of clinical heterogeneity, that those with war-related PTSD were more likely to have physiological reactivity. These differences in symptom patterns may have implications for the treatment of soldiers with PTSD. In addition, these clinical differences in symptom presentation may suggest differences in comorbidity accompanying PTSD symptoms linked to different traumatic event exposure that warrant further investigation.

2.1 Introduction

Officially recognized as a condition in 1980, posttraumatic stress disorder (PTSD) affects 8-12% of the United States population at some point in their lives [1-3]. According to the Diagnostic and Statistical Manual of Mental Disorders 4th Edition (DSM-IV), to have PTSD an individual must experience a potentially traumatic event (an event that may or may not lead to psychopathology [16], criterion A1) in which s/he felt fear, helplessness, and/or horror (criterion A2). The individual must also have at least 1 symptom of re-experiencing the event (criterion B), at least 3 different symptoms of avoidance and numbness when reminded of the event (criterion C), and at least 2 different symptoms of hyperarousal (criterion D). In addition, to have PTSD s/he must experience the symptoms for at least one month and report that the symptoms caused either social or functional limitations [6].

Although PTSD is considered a single condition, evidence suggests that the disorder is heterogeneous [6, 10, 21, 30, 31]. Studies have shown that the experience of certain events is linked to distinct patterns of PTSD symptoms, also known as heterogeneity of PTSD [10, 21, 31]. For instance, among those most affected by a traumatic event, Chung et al. (2008) found that victims of assaultive violence (e.g., being raped, shot, tortured) were more likely to report symptoms of numbness than were persons who experienced shocking events (e.g. car accident) or the death of loved ones [10].

The experience of war-related events as compared to civilian-related events may result in heterogeneity of PTSD considering the differences in the circumstances between these events. When soldiers experience war-related events they are in a unique frame of

mind because of their training [12, 17, 24]. In addition, war-exposed individuals have support from their unit during and after the events [12, 18, 32, 33]. Both mental preparation and unit support may buffer the immediate and long-term mental health consequences of potentially traumatic events [12, 17, 18, 33]. In contrast, the context in which war-related events occur – poor environmental conditions, a loss of control, and extended potentially traumatic event exposure – may exacerbate the effects of war-related events. Therefore, the circumstances of war-related events could diminish or elevate the prevalence of certain PTSD symptoms relative to the symptom prevalence after civilian-related events [12, 15, 19].

The few studies that have examined the heterogeneity of PTSD between those with war- and civilian-related events found that exposure to war was associated with symptoms of re-experiencing (cluster of symptoms for criterion B) and hyperarousal (cluster of symptoms for criterion D). Using a sample of patients in a burn unit, Gaylord et al. (2004) found that people hospitalized because of combat were more likely to report symptoms of re-experiencing and hyperarousal than were those hospitalized for other events [34]. In a study of those with PTSD, Henigsberg et al. (2001) found that combat veterans had more symptoms of hyperarousal than victims of sexual abuse [21]. Brinker et al. (2008) used a sample of Native American veterans and found that those with combat-related PTSD had more symptoms of hyperarousal, re-experiencing, and avoidance than did those with non-combat PTSD [35].

Studies that have compared PTSD symptoms for people who experience war as compared to civilian-related events are limited in three ways: 1) virtually all work has examined treatment-seeking populations, 2) compared groups from separate source

populations, 3) focused on one or a few types of potentially traumatic events (e.g., burn injuries only), and 4) focused on one aspect of PTSD symptom heterogeneity.

Selection bias is a concern in studies that sample from treatment-seeking populations, or from different source populations. For example, if people with war-related events are more likely to receive treatment for PTSD than those with civilian events, and the sample is pulled from those receiving treatment, the estimate of effect may be distorted. In general, selection bias is always a concern when samples are compared from two different source populations. Therefore, to reduce the risk of selection bias, studies should use a single non-clinical source population to select its sample, where selection of participants is not affected by the probability of seeking treatment.

Studies that have compared people with war- and civilian-related events, and included one type of potentially traumatic event (e.g. burn injuries) are not generalizable [34]. We agree with previous work that analyses should examine people with similar events to control for the severity of the event (e.g., car accident in war vs. car accident in civilian life) and therefore, examine the effect of contextual differences between war- and civilian-related events. Studies, however, need to compare a wider range of potentially traumatic events (e.g., all assaultive events, all shocking events) to generalize their findings to a larger population.

We suggest that there are two aspects of heterogeneity in PTSD symptoms, etiologic and clinical heterogeneity, and studies thus far have focused on clinical heterogeneity [21, 34, 35]. Etiologic heterogeneity refers to the distinct pattern of PTSD symptoms between those who experience different potentially traumatic events. In

comparison, clinical heterogeneity refers to the distinct pattern of PTSD symptoms among all who need treatment. While the objective of examining etiologic heterogeneity is to estimate the effect of certain potentially traumatic events on PTSD, the objective of examining clinical heterogeneity is to determine whether PTSD profiles differ between people whose psychopathology was precipitated by a war or civilian-related event. In other words, while we examine etiologic heterogeneity to understand the cause or etiology of PTSD, we examine clinical heterogeneity to understand the presence of co-morbidities and more appropriate treatments for those with PTSD. Similar to Kelley et al. (2009), we argue that studies need to examine both the clinical and etiologic heterogeneity in PTSD symptoms between people with war and civilian events [31].

Considering these limitations, we propose to understand the association between potentially traumatic events (war vs. civilian) and the heterogeneity in PTSD symptoms using a sample of military personnel. Among all soldiers who experienced an event, we hypothesize that soldiers with war-related potentially traumatic events will be more likely to report symptoms of re-experiencing and hyperarousal than will soldiers with civilian-related events (etiologic heterogeneity). Among soldiers with psychopathology after the event, we hypothesize that those who experience war-related events will be more likely to report sleep-disturbances and hyperarousal than will those with civilian-related events (clinical heterogeneity).

2.2 Methods

Sample and Population

The source population was soldiers from the Ohio Army National Guard

(OHARNG) enrolled between June 2008 and July 2009 who participated in the baseline data collection of the OHARNG Mental Health Initiative. This initiative is a prospective cohort study of 2,616 OHARNG members, which involves annual data collection on home life, deployment experiences, and mental health. All members of the OHARNG between June 2008 and July 2009 were informed of the study through an opt-out card. Of those who did not return an opt-out card (N=10,082), there were 6,514 (64.6%) numbers with the correct home or cell phone number of possible participants. Of these numbers, the final example excluded those who did not want to participate (N=1364), those who were not contacted (N=2316), retired (N=187), or ineligible (e.g., hard of hearing; N=31). The final sample size was 2,616 and the participation rate was 43.2% (fraction who consented to a survey (2616+187) out of all the correct numbers minus the ineligible (6514-31).

For this analysis, our study population was soldiers of the OHARNG Mental Health Initiative who experienced war-related potentially traumatic events only (N=250) and soldiers who experienced civilian-related potentially traumatic events only (N=648, Total sample N=898). Based on our need to identify if the event occurred in the war-zone or civilian life, we only included certain categories of events (Appendix Table 1): assaultive events (e.g., being stabbed), shocking events (e.g., car accident), or the sudden death of friends or loved ones. Therefore, we excluded the category of events that could have occurred at home while the soldier was deployed (i.e., learning about the sexual assault of a friend). To assure that each group (war vs. civilian) was mutually exclusive, for the war-related event group we included only soldiers who experienced at least one of the three categories of events during their most recent deployment to a combat setting and

had not experienced these events outside of this deployment. For the civilian-related event group, we included only soldiers who experienced one of the three categories of events and had deployed no more than once to a non-combat setting. Those in the civilian-event group could have been deployed once because we collected full event information on the most recent deployment. Criterion D symptoms of PTSD cannot be linked to a specific event (e.g., insomnia or have had trouble falling or staying asleep) and therefore, we excluded soldiers who experienced both types of potentially traumatic events [6]. Finally, we also excluded individuals who did not answer 100% of the questions used either as outcome variables, exposures, or covariates in the models (0.1%).

Our main exposure of interest was whether a soldier experienced a war-related or civilian-related potentially traumatic event. In the survey, we asked participants about two types of potentially traumatic event experiences: civilian events and deployment-related events. First, we asked participants if they experienced any event from a list of 18 potentially traumatic events that could have occurred during their civilian lives (e.g., rape, natural disaster, death of a loved one). The list of events was based on the life events checklist from the Clinical Administered PTSD Scale and the Detroit Area Study [3, 36]. We then asked participants if they experienced any event from a list of 30 potentially traumatic events that could have occurred during their most recent deployment to a combat zone. The list of deployment-related potentially traumatic events was collected from the Deployment Risk and Resilience Inventory, a tool used frequently in military populations to examine deployment conditions in relation to mental health [32, 37]. To have a war-related event in our study, individuals must have experienced at least one of

the 30 potentially traumatic events during their most recent deployment, been deployed to a combat setting, and had not experienced any civilian-related events. To have a civilian-related potentially traumatic event, individuals must have experienced at least one of the 18 events and never been deployed or only deployed once (as we collected full information on this deployment).

The main outcomes of interest were each of the 17 core PTSD symptoms according to the DSM-IV (Appendix Table 2): 5 symptoms of re-experiencing the event, 7 symptoms of avoidance and numbness about the event, and 5 symptoms of hyperarousal [6]. Using the approach of Breslau et al. (2004), we identified PTSD symptoms with relation to a participant's "worst" potentially traumatic event [3]. We asked an individual to identify the worst event s/he had experienced – an event from among the 18 civilian experiences or 30 deployment experiences [38]. After selecting what s/he reported was their "worst" potentially traumatic event, PTSD symptoms were then assessed in relation to this index event using the PTSD checklist civilian version [39]. For example, a participant was asked if s/he had "repeated, disturbing memories, thoughts, or images of this stressful experience--either not at all, a little bit, at least some of the time, quite a bit, or all the of the time" (symptom B1). This method of questioning was used for all symptoms. We assessed these symptoms using the PTSD checklist civilian version (PCL-17), a standardized assessment used frequently in both military and civilian populations [3, 39, 40]. We followed the scoring rules of the PCL-17 and the DSM-IV [6] to categorize the presence of each symptom. To have had a symptom, a person experienced the problem "at least some of the time," "quite a bit," or "all of the time" [6].

In addition to the presence of each symptom, we examined the probability a PTSD criterion was met (A2-F) as well as the DSM-IV diagnosis of PTSD. To have PTSD according to the DSM-IV, an individual had to report intense fear and hopelessness after the event (criterion A2), at least 1 symptom of re-experiencing the event (criterion B), at least 3 symptoms of avoidance and numbing (criterion C) and at least 2 symptoms of hyperarousal or hypervigilance (criterion D) [6]. In addition, the individual had to report the symptoms lasted for at least 1 month (criterion E) and caused significant social or functional impairment (criterion F) [6]. We did not examine the presence of criterion A1 as 100% of participants in our study population experienced a potentially traumatic event. Furthermore, we did not examine the presence of criterion A2-B and PTSD when we restricted to those with psychopathology after the event, as virtually 100% of those soldiers had these criteria and a diagnosis of PTSD.

Statistical analysis

For our first hypothesis, we estimated the effect of war-related vs. civilian-related events on PTSD symptoms (etiologic heterogeneity) among all participants who reported a potentially traumatic event (N=898). We used logistic regression to estimate the effect of potentially traumatic event type (war vs. civilian) on each of the 17 PTSD symptoms, on each of the PTSD symptom criteria (A2, B, C, D, E and F) and a diagnosis of PTSD.

In the adjusted models, we included potential confounders as covariates that were identified based on their known association with our exposure and outcome. The following potential confounders were included as indicator variables in the final models: sex, age (18-24(reference), 25-34, 35-44, 45+), marital status (married (reference), formerly married, never married), number of potentially traumatic events ever

experienced (1-3 events (reference), 4-6, seven or more), history of depression before the date of the potentially traumatic event, history of alcohol abuse before the date of the event, and if the event occurred more than 5 years ago. Since we wanted to compare the circumstance of the event (war vs. civilian), not necessarily the severity of the event, we included an indicator variable to identify the category of the potentially traumatic event (an assaultive event (reference), a shocking event or the sudden death of a loved one) (Appendix Table 3). Depression was defined using the Patient Health Questionnaire 9, and alcohol abuse was assessed using the MINI [41, 42].

For our second hypothesis, we examined whether PTSD symptoms varied for soldiers with psychopathology after a war-related vs. civilian event (clinical heterogeneity). For this objective, we used logistic regression to compare the prevalence of each PTSD symptom for those with war- vs. civilian-related events. To assure that our sample was representative of those who may present for treatment, these models were limited to soldiers with psychopathology in two different ways: those in the "highest severity group" according to latent class analysis (explained in greater detail below (N=106)) and those with the DSM-IV definition of PTSD (N=65) [10, 31, 43].

Latent class analysis attempts to identify similar groups of people based on their report of the 17 PTSD symptoms; the "highest severity group" describes those individuals who have the highest probabilities of reporting the 17 PTSD symptoms and corresponds to those with the greatest severity of PTSD [43]. To identify this group we followed the method of Breslau et al. (2005) and Chung et al. (2009) and used latent class analysis (LCA), specifying the presence of 3 classes separately for those with war and civilian events [10, 43]. The three classes, commonly reported in populations that face

potentially traumatic events, are the "highest severity group", the "intermediate severity group", and the "minimal disturbance group" or those with the very lowest probabilities of reporting PTSD symptoms [43]. After running the LCA, we identified individuals in the "highest severity group" using the posterior probabilities produced from the LCA. These probabilities are an individual's likelihood of membership in each class calculated using Bayes' theorem (along with the model parameters and the individual's responses to the 17 PTSD symptoms) separately for those with war vs. civilian potentially traumatic events. We then assigned soldiers to the class for which they had the highest posterior probability.

2.3 Results

Table 1 displays the prevalence of each PTSD symptom, PTSD symptom criteria, and PTSD status by type of event; and the association between event type (war vs. civilian) and each PTSD symptom, PTSD symptom criteria, and PTSD status for the entire sample. Adjusting for potential confounders, soldiers who experienced war-related events reported the following symptoms less frequently than did soldiers with civilian events: intrusive memories of the event (adjusted odds ratio (OR)=0.534; 95% confidence interval (CI): 0.341, 0.835) and psychological reactivity when reminded of the event (adjusted OR=0.619; 95% CI: 0.389, 0.984). Soldiers with war-related events also met criterion A2 (adjusted OR=0.460; 95% CI: 0.290, 0.729) and criterion B (adjusted OR=0.564; 95% CI: 0.363, 0.874) less frequently than did those with civilian events.

Table 2 displays the prevalence of each PTSD symptom by event type (war vs. civilian), and the association between potentially traumatic event type and PTSD

symptoms among those in the "highest severity group" from the latent class analysis and those with DSM-IV PTSD. Among those in the "highest severity group", soldiers with war-related events reported physiological reactivity more frequently (crude OR=3.48; 95% CI: 1.34, 9.01) than did those with civilian events. Among those with the DSM-IV diagnosis of PTSD, those with war-related events were more likely than those with civilian events to report physiological reactivity (crude OR=4.42; 95% CI 1.13, 17.2) feel emotionally numb (crude OR=3.40; 95% CI: 1.14, 13.4), and have exaggerated startle (crude OR=4.42; 95% CI: 1.13, 17.2).

2.4 Discussion

We found etiologic heterogeneity of PTSD between soldiers who experienced war- and civilian-related events; those with war-related events reported intrusive memories (B1), reported psychological reactivity (B4), met criterion B, and met criterion A2 less frequently than did soldiers with civilian events. We also found clinical heterogeneity of PTSD between soldiers who had psychopathology after war- and civilian-related events; soldiers with war-related events reported physiological reactivity (B5) more frequently when reminded of the event than did those with civilian events.

Soldiers who experienced war-related events were less likely to report certain re-experiencing symptoms, B1 and B4, and meet criterion B than were those with civilian-related events. This finding is contrary to our original hypothesis and inconsistent with the study by Gaylord et al. (2009) [31, 34]. Using a sample of burn unit victims, those authors found that hospitalized combat veterans had more symptoms of re-experiencing traumatic events and hyperarousal than did hospitalized civilians. We believe that our

findings differed from those of Gaylord et al. because their study included a larger proportion of participants with PTSD, whereas our study included everyone who experienced a potentially traumatic event. In addition, Gaylord et al. did not account for important potential confounders including the total number of events ever experienced and the history of mental health before the event.

Soldiers with war-related events may be protected from certain PTSD symptoms for two reasons. First, civilian events may be more traumatic. Although we compared similar types of events (i.e., assaultive events in war vs. assaultive events in civilian lives), it is possible that civilian events were more traumatic than war events were in our study. Second, soldiers with war-related events have multiple factors that may reduce the prevalence of PTSD such as being mentally prepared for events, having unit support at the time of the events, and receiving treatment upon returning from deployment [12, 24, 44, 45]. Though all soldiers complete basic training, deployed soldiers expect a certain amount of trauma while on duty and therefore, may be more mentally prepared during war-related events than are soldiers during civilian events [24]. This mental preparation may create a lower perceived threat of the event, a well-known factor that increases the risk for PTSD symptoms, and thus reduce the prevalence of certain PTSD symptoms [12, 33, 37]. Unit support, or the social interaction with fellow soldiers, may also buffer the short term and long-term effects of trauma experienced during combat by helping soldiers cope more effectively to trauma [12, 18, 33]. Finally, mental health treatment options may differ between soldiers with war-related and civilian-related events. In the National Guard, Tricare and the veteran's affairs services are only offered to soldiers returning from an active duty deployment, and those who have not deployed mainly rely on their

civilian employers insurance [46]. Therefore, it is possible that soldiers with war-related events have greater access to and utilization of mental health services, which in turn reduce the prevalence of certain PTSD symptoms [45]. The mechanisms through which the re-experiencing symptoms are buffered by these factors as well as linked to other mental health outcomes are unknown. Since the re-experiencing cluster of symptoms has been linked to other conditions such as suicidal ideation [47, 48] and alcohol abuse [49], it will be fruitful to further examine the implications of these symptom patterns.

Soldiers who experienced war-related potentially traumatic events also were less likely to report fear, helplessness, and/or horror directly after the event (criterion A2) than were those with civilian-related events. This relation between exposure to war and criterion A2 has been reported by other studies [17, 25]. In a community-based study, Breslau and Kessler (2001) found that 33.8% of soldiers who experienced war-related events reported criterion A2 as compared to 70.4% of civilians who experienced a natural disaster [25]. One possible explanation for this relation between war exposure and A2, similar to the reasons given above, is that soldiers do not experience fear, helplessness, and/or horror because they are trained to face war-related events [17, 24]. As another possible explanation, because of the culture of the military, soldiers may be less likely to report feeling fear, helplessness, and/or horror, even if these emotions were experienced during a war-related event [16, 17, 25]. Based our findings, we plan to further examine the role of criterion A2 and the later development of PTSD symptoms between those with war-related events and civilian events.

Among soldiers with psychopathology after the event, we consistently found that those with war-related events reported physiological reactivity to reminders of the event

(B5) more frequently than did soldiers with civilian-related events. This high prevalence of rapid heart rate, high blood pressure, or increased body temperature when reminded of the event may be symptomatic of an elevated stress response for those with combat-related PTSD [50]. Implications of such a stress response are not well understood and may include increased actions of aggression or violence, as well as poor physical health later in life [9, 51, 52]. Studies should examine if increased physiological reactivity may be a possible mechanism by which those with war-related PTSD have an increased rate of poor physical health over those with war exposure alone [52].

Among those with DSM-IV PTSD, soldiers with war-related events were more likely to report exaggerated startle and feeling emotionally numb than were those with civilian-related events. While we did not find this association in the psychopathology group from the latent class analysis, 84% of those with war-related events reported this symptom compared to 54% of those with civilian events. Exaggerated startle may indicate another neurobiological manifestation of war-related events, similar to the presentation of physiological reactivity, and more work is necessary to understand why the elevated prevalence is only evident among those with PTSD [53]. Studies have also suggested that avoidance symptoms (emotional numbness) may be pronounced in those with chronic PTSD and therefore, further exploration of the chronicity of PTSD after war-related and civilian-related events is warranted [54].

There were several limitations to this study. Because our analyses were cross-sectional and based self-reports of previous potentially traumatic events, reporting may have been influenced by the subsequent occurrence of PTSD symptoms. Such misreporting could have led to bias in estimating the effect of event type on the

occurrence of PTSD symptoms. In addition, the cross-sectional design could have resulted in selection bias if both a symptom and type of event were associated with the selection or participation of eligible soldiers in the Ohio National Guard. Unfortunately, these two possible sources of bias are difficult to assess in this study. To prevent these problems, future studies would need to be conducted prospectively by observing potentially traumatic events and the occurrence of PTSD symptoms during the course of follow-up. This type of design, however, may not be practical in most populations or settings. Finally, our findings are limited to Ohio National Guard personnel; thus, we may not be able to generalize the results to non-military populations.

Conclusion

As PTSD at this time is recognized as a single entity, demonstrating that there are different presentations of the condition could have implications for future research and clinical practice. For clinicians, understanding that those with war-related PTSD may have more symptoms of physiological reactivity could inform treatment for these individuals. For epidemiologists, it is important to understand the mechanisms by which the context of war may affect the development of PTSD. It is possible, and should be the subject of further inquiry, that differences in patterns of co-morbidity among those who experience war vs. civilian related traumatic events may explain some of the clinical differences observed here.

Table 2.1: The prevalence (#(%)) of each PTSD symptom, PTSD symptom criteria, and PTSD by type of event (war vs. civilian); and the association (crude and adjusted* odds ratio (OR) and 95% confidence interval (CI)) between the type of event and each PTSD symptom, PTSD symptom criteria, and PTSD.

Symptoms of PTSD	**Total (# (%))**	**War event (#(%))**	**Civilian event (#(%))**	**Crude OR (95%CI)**	**Adjusted OR* (95%CI)**
Criterion A2 Fear, hopelessness or horror	595 (66.3)	148 (59.2)	447 (69.0)	0.650 (0.481,0.897)	0.460 (0.290,0.729)
Criterion B symptoms	436 (48.6)	105 (42.0)	331 (51.1)	0.690 (0.514, 0.925)	0.564 (0.363, 0.874)
Intrusive memories (B1)	336 (37.5)	84 (33.6)	252 (39.0)	0.799 (0.588, 1.09)	0.534 (0.341,0.835)
Nightmares (B2)	173 (19.3)	57 (22.8)	116 (17.9)	1.36 (0.952, 1.94)	0.953 (0.564,1.61)
Flashbacks (B3)	129 (14.4)	46 (18.4)	83 (12.8)	1.54 (1.04, 2.28)	0.783 (0.439,1.39)
Psychological reactivity (B4)	300 (33.4)	68 (27.2)	232 (35.8)	0.665 (0.482, 0.917)	0.619 (0.389,0.984)
Physiological reactivity (B5)	133 (14.8)	61 (24.4)	72 (11.1)	2.58 (1.77, 3.76)	1.38 (0.782,2.43)
Criterion C	167 (18.6)	45 (18.0)	122 (18.8)	0.942 (0.646, 1.37)	0.779 (0.453, 1.34)
Avoid thinking about event (C1)	275 (30.7)	70 (28.2)	205 (31.6)	0.843 (0.618, 1.18)	0.700 (0.439,1.12)
Avoid activities (C2)	179 (20.0)	47 (18.9)	132 (20.4)	0.906	0.642

				(0.626, 1.31)	(0.377,1.09)
Trouble remembering (C3)	92 (10.3)	20 (8.0)	72 (11.1)	0.694 (0.413, 1.16)	0.716 (0.354,1.45)
Diminished interest (C4)	104 (11.6)	36 (14.4)	68 (10.5)	1.41 (0.915, 2.17)	0.892 (0.471,1.69)
Detached from people (C5)	145 (16.2)	47 (18.9)	98 (15.1)	1.29 (0.883, 1.90)	0.789 (0.452,1.38)
Feeling emotionally numb/restricted affect (C6)	117 (13.1)	37 (14.9)	80 (12.4)	1.25 (0.818, 1.89)	0.785 (0.425,1.45)
Foreshortened future (C7)	85 (9.5)	29 (11.7)	56 (8.7)	1.38 (0.862, 2.22)	0.883 (0.450,1.73)
Criterion D	232 (25.8)	100 (40.0)	132 (20.4)	2.55 (1.86, 3.50)	1.62 (0.998, 2.64)
Insomnia (D1)	172 (19.2)	70 (28.1)	102 (15.7)	2.08 (1.47, 2.94)	1.23 (0.732, 2.07)
Irritability (D2)	155 (17.3)	65 (26.1)	90 (13.9)	2.17 (1.51, 3.10)	1.14 (0.665,1.94)
Concentration problems (D3)	144 (16.0)	55 (22.0)	89 (13.7)	1.75 (1.21, 2.54)	1.23 (0.705, 2.14)
Hyper-vigilance (D4)	258 (28.8)	100 (40.0)	158 (24.5)	2.01 (1.48, 2.74)	0.870 (0.548, 1.38)
Exaggerated startle (D5)	148 (16.5)	75 (30.0)	73 (11.3)	3.32 (2.31, 4.77)	1.29 (0.746, 2.21)
Criterion E symptoms for 1 month	199 (22.2)	74 (29.6)	125 (19.3)	1.75 (1.26, 2.45)	1.05 (0.638, 1.73)
Criterion F social or functional impairment	234 (26.1)	77 (30.8)	157 (24.2)	1.38 (1.00, 1.90)	0.827 (0.516, 1.33)

DSM-IV PTSD	65 (7.2)	26 (10.4)	39 (6.0)	1.81 (1.08, 3.05)	1.30 (0.61, 2.80)
Total	**898**	**250 (27.8)**	**648 (72.4)**		

*Odds ratios were adjusted for sex, age, marital status, # of potentially traumatic events ever experienced, history of depression before the potentially traumatic event, history of alcohol abuse before the event, the category of index event experienced (an assaultive event (reference), a shocking event or the sudden death of a loved one), and if the event occurred < 5 years ago.

Table 2.2: The prevalence (#(%)) of each PTSD symptom by type of event (war vs. civilian), and the association (crude OR and 95% CI) between the type of event and each PTSD symptom among those in the highest severity group according to latent class analysis (LCA), and among those with DSM-IV PTSD.

Symptoms of PTSD	**Total (# (%))**	**War event (#(%))**	**Civilian event (#(%))**	**Highest severity group, crude OR (95%CI)**	**DSM-IV PTSD, crude OR (95%CI)**
Criterion B symptoms					
Intrusive memories (B1)	98 (91.6)	41 (93.2)	57 (90.5)	1.44 (0.340, 6.09)	**
Nightmares (B2)	85 (79.4)	39 (88.6)	46 (73.0)	2.88 (0.974, 8.53)	1.74 (0.531, 5.68)
Flashbacks (B3)	71 (66.4)	30 (68.2)	41 (65.1)	1.15 (0.507, 2.61)	1.57 (0.535, 4.59)
Psychological reactivity (B4)	93 (86.9)	39 (88.6)	54 (85.7)	1.30 (0.404, 4.18)	5.15 (0.595, 44.5)
Physiological reactivity (B5)	75 (70.1)	37 (84.1)	38 (60.3)	3.48 (1.34, 9.01)	4.42 (1.13, 17.2)
Criterion C symptoms					
Avoid thinking about event (C1)	98 (91.6)	40 (90.9)	58 (92.1)	0.862 (0.218, 3.41)	1.28 (0.110, 14.9)
Avoid activities (C2)	85 (79.4)	34 (77.3)	51 (81.0)	0.800 (0.311, 2.06)	2.47 (0.472, 12.9)
Trouble remembering (C3)	48 (44.9)	15 (34.1)	33 (52.4)	0.470 (0.212, 1.04)	1.16 (0.433, 3.10)
Diminished interest (C4)	71 (66.3)	30 (68.2)	41 (65.1)	1.15 (0.507, 2.61)	3.29 (1.04, 10.4)
Detached from people (C5)	84 (78.5)	36 (81.8)	48 (76.2)	1.41 (0.538, 3.68)	3.87 (0.774, 19.3)

Feeling emotionally numb/restricted affect (C6)	69 (64.5)	31 (70.5)	38 (60.3)	1.57 (0.690, 3.57)	3.40 (1.14, 13.4)
Foreshortened future (C7)	52 (48.6)	18 (40.9)	34 (54.0)	0.590 (0.271, 1.29)	1.00 (0.373, 2.68)
Criterion D symptoms					
Insomnia (D1)	82 (76.6)	37 (84.1)	45 (71.4)	2.11 (0.797, 5.61)	3.17 (0.799, 12.6)
Irritability (D2)	83 (77.6)	38 (86.4)	45 (71.4)	2.53 (0.914, 7.02)	3.56 (0.903, 14.0)
Concentration problems (D3)	89 (83.2)	39 (88.6)	50 (79.4)	2.03 (0.666, 6.17)	3.87 (0.774, 19.3)
Hyper-vigilance (D4)	88 (83.0)	37 (84.1)	51 (82.3)	1.14 (0.404, 3.22)	3.17 (0.799, 12.6)
Exaggerated startle (D5)	80 (74.8)	37 (84.1)	43 (53.8)	2.46 (0.935, 6.46)	4.42 (1.13, 17.2)
Total	**106**	**44 (41.5)**	**62 (58.5)**	**106**	**65**

** 100% of soldiers who experienced war-related events experienced this symptom and OR were not calculated

Chapter 3

Is DSM-IV Criterion A2 important to the diagnosis of posttraumatic stress disorder (PTSD) among soldiers with either war-related or civilian-related traumatic events?

Abstract

Objective: Criterion A2, the feelings of fear, helplessness, and/or horror, are required to have posttraumatic stress disorder (PTSD) after a potentially traumatic event. Studies, have suggested, however, that the report of criterion A2 depends on the event experienced and that a substantial number of people without A2 have all the remaining PTSD symptoms. Our objective was to determine the value of DSM-IV criterion A2—feelings of fear, helplessness, and/or horror after a potentially traumatic event—in the diagnosis of posttraumatic stress disorder (PTSD) in a sample of National Guard soldiers after war- and civilian-related events. We examined whether soldiers not reporting criterion A2 are as likely to develop the other PTSD symptom criteria (criteria B-F, referred to as PTSD*) as are soldiers reporting criterion A2 after similar war-related or civilian-related events. We also further explored the utility of criterion A2 in the diagnosis of PTSD after war- or civilian-related events by examining the probability of a PTSD diagnosis given the report of criterion A2 (positive predictive value) and the

probability of a negative PTSD diagnosis given the lack of criterion A2 (negative predictive value).

Methods: Using a cross-sectional sample of 898 soldiers from the Ohio Army National Guard, we examined their history of potentially traumatic events and PTSD symptoms. Potentially traumatic events were classified as war-related (assaultive, shocking, or the sudden unexpected death of a friend or loved one during the most recent deployment to a combat zone) or civilian-related (similar events in civilian life). PTSD symptoms were assessed using the PTSD Checklist-17. Logistic regression was used to estimate the association between criterion A2 and the prevalence of PTSD*, separately for soldiers with war-related and civilian-related events. We then calculated the positive predictive value of criterion A2 (the proportion of PTSD* cases among all who reported criterion A2) and negative predictive value (the proportion those without PTSD* who did not report criterion A) of criterion A2 for the remaining PTSD symptom criteria (B-F).

Results: Criterion A2 was reported more frequently by soldiers who experienced a civilian-related event than by those who had experienced a war-related event (adjusted odds ratio (OR) = 2.00; 95% confidence interval (CI): 1.26,3.19). Only three soldiers not reporting criterion A2 after potentially traumatic events (all war-related) had PTSD*, which is only 1% of all participants without criterion A2. Criterion A2 had excellent negative predictive value (99%) for the absence of the remaining PTSD symptom criteria (B-F).

Conclusions: Inclusion of criterion A2 in the diagnosis of PTSD had little or no effect on the prevalence of this condition among Ohio National Guard soldiers who reported

similar war-related or civilian-related potentially traumatic events. Our results suggest, however, that the diagnosis of PTSD can be made more efficient in soldiers with reported traumatic events by first screening for criterion A2, then subjecting only positives to the other criteria (i.e., series testing).

3.1 Introduction

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) defines posttraumatic stress disorder (PTSD) by the presence of 7 criteria (A1, A2, B – F) [6]. An individual must experience a potentially traumatic event (an event that may or may not lead to PTSD [16], criterion A1) and report feeling fear, helplessness, and/or horror at the time of the event (the stressor criterion, criterion A2). As a result of this event, the individual must have at least one symptom of re-experiencing the event (criterion B), at least three symptoms of avoidance and numbness (criterion C), at least 2 symptoms of hyperarousal (criterion D), a one month minimum duration of symptoms (criterion E), and social and/or functional impairment because of the symptoms (criterion F) [6].

Prior to the DSM-IV, DSM-III defined PTSD without the stressor criterion, and to have PTSD individuals need only "have an event outside the usual range of human experience" (criterion A) followed by the PTSD symptom criteria B-F [55]. Criterion A2 was added to the DSM-IV when population-based studies found that most people experienced at least one potentially traumatic event in their lifetime, and therefore, these events were not outside the usual range of human experience [1, 3]. Criterion A2's role was to limit the range of qualifying, potentially traumatic events by requiring that the

event elicit a unique response ("fear, helplessness, and/or horror") that was in turn associated with other PTSD symptom criteria (B-F) [3, 23, 25].

Since its inception, critics have cited two faults with criterion A2: the probability of reporting A2 depends on the type of event [25, 56]; and in certain populations, criterion A2 is not an appropriate requirement for PTSD [16, 17]. Regarding the first criticism, the feelings of "fear, helplessness and/or horror" may not adequately capture the range of emotions that occur during an event. Therefore, persons who experience certain potentially traumatic events will not report criterion A2 because the events elicit other emotions such as anger, grief, sadness or guilt [16, 17, 23, 56, 57]. As for the second criticism, opponents of criterion A2 argue that individuals who experience certain events may not report criterion A2, but still develop all the other PTSD symptom criteria (criteria B-F). Therefore, criterion A2 is an unnecessarily stringent requirement that underestimates the true prevalence of PTSD in certain groups [17, 58, 59].

Based on these two criticisms, there are serious concerns about whether criterion A2 is appropriate for soldiers who face war [17, 59]. Persons prepared for potentially traumatic events may suppress the feelings of terror, helplessness, and/or horror during an occupational event, and instead may feel anger, concern for others, or develop feelings of fear after the event [17, 24, 58, 59]. Moreover, soldiers in the theater of war may not divulge that they felt fear, helplessness, and/or horror during the event because of the culture of their job [17]. Despite the reason for not reporting criterion A2, critics are concerned that soldiers may still develop all of the remaining PTSD symptom criteria (B-F, which we will now refer to as PTSD*) and therefore, the soldiers are misdiagnosed [17].

The evidence is inconclusive on whether persons who experienced war-related events report fear, helplessness, and/or horror less frequently than do persons who experience civilian events. Breslau and Kessler (2001) found that combat veterans had a lower prevalence of criterion A2 than did persons who experienced other types of potentially traumatic events [25]. In contrast, Schnurr et al. (2002) found in a sample of World War II and Korean War veterans that those who experienced combat were more likely to report criterion A2 compared to those who experienced disasters or serious illness [26]. Further investigations are necessary to understand how criterion A2 is reported among those with war-related versus civilian-related events.

The evidence is limited on whether an appreciable number of veterans are misdiagnosed for PTSD because they do not report criterion A2. Using a military sample, Adler et al. (2008) demonstrated that the proportion of OIF veterans who had PTSD* was similar for those with (11.9%) and without (7.5%) criterion A2 ($p=0.36$) [17]. Accordingly, the prevalence of PTSD in the total sample was higher when A2 was not required (2.5% vs. 8.4%) [17]. In contrast, the evidence from studies in the general population suggests that few are misdiagnosed when they do not report criterion A2 [25, 60]. Breslau and Kessler (2001) found that only 1% of individuals without criterion A2 had PTSD* and therefore, the prevalence of PTSD was similar regardless of whether criterion A2 was required [25]. In a cross-national analysis of 21 countries, Kamar et al. (2010) estimated that eliminating the requirement of criterion A2 minimally changed the prevalence of PTSD (3.64% to 3.69%) [22]. These studies collectively suggest that while requiring criterion A2 may affect the prevalence of PTSD for combat veterans, it may not affect the prevalence of PTSD for the general population. A comparison of the effect of

requiring A2 on the prevalence of PTSD for those with war-related and civilian-related events is warranted.

If criterion A2 is unsuitable as a requirement for PTSD, it may be more useful as a tool to screen out those unlikely to have PTSD [17, 26]. Schnurr et al. (2002) demonstrated that although the presence of criterion A2 did not predict the remaining PTSD symptom criteria (B-F) (low positive predictive value), the *absence* of criterion A2 was highly predictive of the *absence* of the remaining PTSD symptom criteria (high negative predictive value). Therefore, the authors suggested that criterion A2 may be more useful as a question to screen out those unlikely to have PTSD [26]. Studies should further investigate if criterion A2 may be used as a tool question to identify people unlikely to develop PTSD.

We propose to use a cross-sectional sample of Ohio National Guard soldiers to assess the relationship between potentially traumatic events (war vs. civilian), the report of criterion A2, and the prevalence of PTSD. First, we hypothesize that National Guard personnel who experienced war-related events will report symptoms of fear, helplessness, and/or horror less frequently than will those who experienced civilian-related events. Second, we hypothesize that among soldiers who experienced war-related events, the prevalence of PTSD* will be similar for those with and without criterion A2, and the prevalence of PTSD will increase if criterion A2 were not required. Among soldiers with civilian-related events, however, few will have PTSD* if they do not report criterion A2, and the prevalence of PTSD will not change if criterion A2 were not required. Third, we hypothesize that among National Guard soldiers the report of criterion A2 will be a useful screening question for PTSD.

3.2 Methods

Study population and survey

The Ohio Army National Guard Mental Health Initiative (OHARNG MHI) is a longitudinal study of 2,616 soldiers who are representative of the Ohio Army National Guard. The source population for the OHARNG MHI was members of the Guard who were serving between June 2008 and July 2009. Participants were invited to join through mail and given the opportunity to opt-out of the study. Our total participant pool (N=10,082) included those who did not opt-out through mail and had a correct telephone numbers listed with the Guard. From these, the final sample was 2,616, and excluded those who did not want to participate (N=1,364), those with incorrect numbers (N=3,568), and those who were never contacted (N=2,316), retired (187), or ineligible (e.g., could not speak English, or hard of hearing; N=31), resulting in a participation rate of 43.2%. Each year, this cohort participates in hour-long computer assisted telephone interviews that assess deployment experiences and mental health status.

For this work, our study population consisted of soldiers who completed a baseline interview with the OHARNG MHI and experienced war-related potentially traumatic events only (N=648) or civilian-related potentially traumatic events only (N=250). Since we needed to identify where events occurred (war or civilian lives), we excluded events that could have occurred at home while they were deployed (e.g., learning about the rape of a friend or relative). Therefore, we included three categories of events: assaultive (e.g., raped), shocking (e.g., natural disaster), and the sudden death of a friend or loved one (full list of events Appendix Table 1). For the war-related event

group, we included only soldiers who were deployed most recently to a combat zone and experienced one of the three categories of events. In addition, they could not have experienced any of these events outside of the deployment. For the civilian-related event group, to assure they had never experienced a war-related potentially traumatic event, we included only those who had never been deployed, or were deployed once (as we collected full information on their most recent deployment). In addition, they had to experience one of the three categories of events. We excluded soldiers who had experienced both war- and civilian-related events (N=217) because certain symptoms (e.g., D1) cannot be linked to a single event when more than one occurred. We also excluded individuals with incomplete data on any outcome, exposure, or other covariate of interest (0.1%).

The exposure of interest was whether soldiers reported feeling fear, helplessness, and/or horror (criterion A2) during or immediately after their self-selected worst event. In the survey, we assessed participants' experiences from a list of 30 potentially traumatic events that could have occurred during their most recent deployment and 18 possible events outside of this deployment [3, 32]. Participants were then asked to select their "worst" event during deployment as well as their "worst" event outside of this deployment. The criterion A2 symptom was then asked in relation to their worst events. For example, if the participant experienced 15 events during their most recent deployment, they were asked to pick the worst; criterion A2 symptoms were asked about that event. To assess criterion A2, we asked participants two questions: Did they feel fear or horror during or immediately after this specific event (yes/no); and did they feel

helplessness as a result of the event (yes/no). Criterion A2 was met if they answered, "yes" to either question.

The main outcome of interest was the presence of criteria B-F, which was labeled PTSD* and each of the B-F criteria individually [6]. DSM-IV defines the PTSD symptom criteria B-F as follows: at least one symptom of re-experiencing the event (criterion B), at least three symptoms of avoidance and numbness (criterion C), at least 2 symptoms of hyperarousal (criterion D), a one-month minimum duration of symptoms (criterion E), and social and/or functional impairment because of the symptoms (criterion F) [6]. Symptoms for criteria B-D were assessed using the PTSD checklist (PCL-17, civilian version), a validated and frequently used instrument [39]. Similar to criterion A2, all the PTSD symptoms were asked in relation to the self-selected "worst" event that they experienced during their most recent deployment or civilian life. Following the scoring rules of the DSM-IV and the PCL-17, to have had the symptom in question, the individual had to report that the symptom occurred "at least some of the time" when asked about the frequency on a five-point scale: 1=not at all; 2=a little bit; 3=at least some of the time; 4=quite a bit; and 5 = all of the time [6, 39]. All symptoms for criteria B-D were scored in a similar manner. To assess criterion E we asked the duration of the symptoms (less than a month, 1-3 months, 4-6 months, more than 6 months), and for criterion F we asked if the symptoms interfered with work or social activities (yes/no).

Statistical analysis

To assess our first hypothesis, we examined the frequency of fear, helplessness, and/or horror (criterion A2) by event type (war vs. civilian-related). We then used

logistic regression to estimate the effect of event type on the report of criterion A2, adjusting for potential confounders treated as indicator variables in the model: age (18-24(reference), 25-34, 35-44, 45+), sex, marital status (married (reference), formerly married, never married), number of other potentially traumatic events during deployment or in civilian life (1-3(reference), 4-6, 7+), the category of potentially traumatic event selected as the "worst" (assaultive (reference), shocking event, and the sudden death of a loved one), and whether the event occurred more than 5 years ago (Appendix Table 5).

To assess our second hypothesis, we compared the prevalence of PTSD* for soldiers with and without criterion A2, stratified by event type (war- vs. civilian-related). Logistic regression was used to estimate the association between criterion A2 and the prevalence of PTSD*.

To assess our third hypothesis, we calculated the total positive predictive value (total number of PTSD* cases over the number of persons that reported criterion A2) and the negative predictive value (total number of non-cases over the number of persons not reporting A2).

In sensitivity analysis, we ran the final adjusted logistic models excluding those who experienced the sudden unexpected death of a loved one, since this event may not have been classified correctly. We also ran all adjusted logistic models excluding those whose main event occurred more than five years ago, since evidence suggests that the relationship between criterion A2 and PTSD symptom criteria (B-F) varies depending on the time since the event [44]. Finally, we ran adjusted logistic models examining the relationship between event type (war vs. civilian) and criterion A2, excluding soldiers

who experienced their civilian-related event before entering the military. We wanted to examine if the relation between event type and criterion A2 remained when the sample included only soldiers who had experienced basic training before the event.

3.3 Results

Table 3.1 lists the prevalence of criterion A2 by event type (war vs. civilian) and the association between event type and criterion A2. We found that 648 (72.2%) reported a civilian event and 250 (27.8%) reported a war-related event. Those who experienced civilian-related events compared to war-related events were more likely to report criterion A2 (crude odds ratio (OR) = 1.53; 95% confidence interval (CI): 1.13, 2.07). Adjusting for potential confounders, soldiers who experienced civilian-related events were more likely to report A2 than were those with war-related events (adjusted OR = 2.00; 95% CI: 1.26, 3.19).

Table 3.2 lists the prevalence of each PTSD criterion (B-F) and PTSD* by event type (war vs. civilian) and report of criterion A2, and lists the association between criterion A2 and each PTSD criterion (B-F) as well as PTSD* by event type. Criterion A2 was associated with all PTSD symptom criteria for both war-related and civilian-related events. The strongest association with criterion A2 was for criterion E (at least 1 month duration) among participants reporting war-related events (crude OR = 4.80; 95% CI: 2.46, 9.36) and for criterion C (avoidance) among participants reporting civilian-related events (crude OR = 5.14; 95% CI: 2.76, 9.58). Among soldiers who experienced war-related events, only 3 people (2.9%) who did not report criterion A2 had PTSD*, compared to 17.6% who reported criterion A2 (crude OR = 7.03; 95% CI: 2.07, 23.9).

Consequently, the prevalence of PTSD for soldiers who experienced war-related events was similar when criterion A2 was and was not required (10.4% vs. 11.6%). No one who experienced civilian-related events had PTSD* if they did not criterion.

In our work the positive predictive value of criterion A2 was 9.6% (57/595 = 0.96, or 57 cases of PTSD* out of 595 who reported criterion A2). In contrast, the *absence* of criterion A2 was highly predictive of the *absence* of PTSD with a negative predictive value of 99.0% (300 non cases out of the 303 who did not report criterion A2).

We did not find that our results changed when we excluded those who had experienced the sudden unexpected death of a loved one, those who experienced the potentially traumatic event more than five years ago, or those whose civilian events occurred before they entered the military (Appendix Table 4).

3.4 Discussion

We found that soldiers who experienced war-related events reported "fear, helplessness, and/or horror" at the time of the event less frequently than did those who experienced civilian-related events. When we stratified by event type, the prevalence of PTSD symptom criteria B-F was rare in persons who did not report criterion A2, and the prevalence of PTSD constant regardless of whether criterion A2 was required. Criterion had a high negative predictive value for PTSD symptom criteria (B-F).

Our findings, consistent with our first hypothesis, are supported by other studies that found that combat veterans reported criterion A2 less frequently than did persons

who experienced other events [16, 25]. Breslau and Kessler (2001) demonstrated that combat veterans reported A2 less frequently than persons who experienced other events such as natural disasters (33.8 vs. 70.0%)[25]. Similarly, Creamer et al. (2005) found that persons who experienced combat were least likely to report criterion A2 compared to those with other experiences [24]. Our prevalence estimates are lower than those reported by Schnurr et al. (2002), who found that over 70% of combat veterans from WWII and the Korean conflict reported criterion A2 [26]. Their sample, however, was comprised of men from earlier wars (with a greater time period between the exposure and data collection) whereas ours included men and women from more recent wars.

We suggest that combat veterans may not report feeling “fear, helplessness, and/or horror" in the theater of war because they are trained to experience an occupational event [17, 24]. As Creamer et al. (2005) explained, soldiers may not report these specific emotions during a combat-related event because the emotions put themselves and others in danger [24]. Our work is evidence that the relation between combat and criterion A2 is not only due to preparedness and training, but because the event occurs while on-duty [24, 61]. We demonstrated this effect of an occupational event because we used an entirely military population with some level of training, and in sensitivity analysis when everyone had experienced basic training before their event (war or civilian) the relation between event type and criterion A2 remained.

We found, contrary to our second hypothesis, that few soldiers without criterion A2, developed the remaining PTSD symptom criteria (B-F), and the prevalence of PTSD changed little depending on whether criterion A2 was required. This finding conflicts with the results of Adler et al. (2008), who found a considerable prevalence of PTSD

among combat veterans when criterion A2 was not required. Methodological differences in sample and data collection may account for this difference. While our sample came from a representative sample of Ohio National Guard soldiers, Adler et al. (2008) examined a single, active duty brigade who recently returned from Iraq. Although National Guard and active duty soldiers face similar deployment related events [62], it is possible that the experiences of the single brigade are not comparable to those of the National Guard. Furthermore, Adler et al. (2008) had a higher proportion of persons with PTSD because they only included soldiers who scored worse on at least one of five clinical mental health measures. Our results, consistent with community-based studies, suggest that the inclusion of criterion A2 did little to change the prevalence of PTSD [22, 25].

Based on the high negative predictive value of criterion A2, found in multiple other studies [26, 44, 58, 63], we suggest that criterion A2 would be useful as a screening question in series testing for PTSD [26]. Series testing is when two screening tests are applied in succession, both of which must be positive, to identify probable cases of a disease [64]. The purpose of series testing is to improve the efficiency of a diagnostic test and increase the overall specificity [64]. Others have argued that criterion A2 should be dropped from a diagnosis of PTSD and used instead to screen out those who are unlikely to have PTSD [26, 44]. We suggest, however, that criterion A2 would be most useful if used with the remaining PTSD symptom criteria in series testing to make a diagnosis. Specifically, criterion A2 would need to be positive followed by the remaining PTSD symptoms to diagnose a probable case, and thus increasing further the

specificity of a PTSD diagnosis [26]. Therefore, we do not suggest eliminating criterion A2 as others have suggested [44] but instead continue to use it as a criterion in series .

There were several important limitations to this study that arise from the use of self-reports and the cross-sectional design. Recall bias could be an issue if those who experienced war-related or civilian-related events reported criterion A2 differently. While there is no evidence to assume this recall bias, our results must be reviewed with this possibility in mind. Selection bias may also have occurred if criterion A2 and potentially traumatic event experiences were related to participation in the parent study. Future prospective studies should examine our findings and account for the possible recall and selection bias by capturing information shortly after the event and subsequent PTSD symptoms during follow-up. As we included only very specific types of events, our results may not be generalizable to all event types. Our study findings are limited to Ohio National Guard soldiers and more work should be done to examine other military populations as well as civilian populations. As we excluded those who had missing data in our study, and therefore possibly biased, these results need to be replicated using multiple imputation.

Conclusion

We found that soldiers were less likely to report criterion A2 if they experienced war-related potentially traumatic events than if they experienced civilian-related events. The report of criterion A2, however, did not affect the overall prevalence of the remaining PTSD symptom criteria (B-F). Considering the very high negative predictive

value of criterion A2, we suggest that criterion A2 would be better used in series with the remaining PTSD symptoms to diagnose PTSD.

Table 3.1: The prevalence (#(%)) of criterion A2 by type of event (war vs. civilian), and the association (crude and adjusted* (OR) and 95% CI) between the type of event and criterion A2.

Event type	Total Sample Number (%)	Number (%) Reporting Criterion A2	Crude OR (95% CI)	Adjusted OR* (95% CI)
War	250(27.8)	148(59.2)	1	1
Civilian	648(72.2)	447(69.0)	1.53(1.13, 2.07)	2.00 (1.26, 3.19)
Total	898 (100)	595 (66.3)		

*Model is adjusted for sex, age, marital status, number of events ever experienced, history of PTSD before the event, history of alcohol abuse before the event, the category of index event (assaultive (reference), shocking event, or the sudden death of a loved one), and if the event occurred more than five years ago

Table 3.2: The prevalence (# (%)) of each PTSD criterion (B-F) and PTSD* (all B-F criteria) by event type (war vs. civilian) and criterion A2 (reported vs. not reported); and the association (crude OR; 95% CI) between criterion A2 and each PTSD criterion by event type

	War-related event			Civilian-related event		
	Criterion A2		Crude OR	Criterion A2		Crude OR
PTSD criterion	**No**	**Yes**	**(95%CI)**	**No**	**Yes**	**(95%CI)**
Re-experiencing (B)	25(24.5)	80(54.1)	3.06(2.08, 6.31)	60(29.9)	271(60.6)	3.62(2.53, 5.17)
Avoidance I	7(6.9)	38(25.7)	4.68(2.00, 11.0)	12(6.0)	110(24.6)	5.14(2.76, 9.58)
Hypervigilance (D)	22(21.6)	78(52.7)	4.05(2.29, 7.18)	15(7.5)	117(26.2)	4.40(2.49, 7.75)
Duration of 1 month (E)	13(12.8)	61(41.2)	4.80(2.46, 9.36)	18(9.0)	107(23.9)	3.20(1.88, 5.44)
Functional impairment (F)	16(15.7)	61(41.2)	3.77(2.02, 7.05)	19(9.5)	138(30.9)	4.28(2.56, 7.15)
PTSD* (criteria B-F)	3(2.9)	26(17.6)	7.03 (2.07, 23.9)	0(0)	31(6.9)	Undefined
Total	102(40.8)	148(59.2)		201(31.0)	447(69.0)	

Chapter 4

The effect of war- and civilian-trauma on suicidal ideation among Ohio Army National Guard soldiers

Abstract

Objective: Suicide is one of the leading causes of death in young adults, and some studies have suggested a link between the experience of trauma and suicide. We aimed to determine the role of traumatic event experiences in the report of suicidal ideation and then the role of war- vs. civilian-related traumatic events in the report of suicidal ideation. Specifically, our objective was to determine if soldiers who experienced any event were more likely to report suicidal ideation than were those who did not experience an event; to determine among those without PTSD, if soldiers who experienced war-related events were more likely to report suicidal ideation than were soldiers with civilian-related events; and determine if the experience of a war event as compared to a civilian event modified the effect of PTSD on the report suicidal ideation.

Methods: We assessed potentially traumatic events, mental health, and suicidal ideation using a cross-sectional sample of 1252 soldiers from the Ohio Army National Guard. Potentially traumatic events were classified as war-related (assaultive,

shocking, or the sudden unexpected death of a friend or loved one during the most recent deployment to a combat zone) or civilian-related (similar events in civilian life). Post-traumatic stress disorder (PTSD) was assessed with the PTSD Checklist-17, and suicidal ideation was assessed with the Patient Health Questionnaire-9. We first compared the prevalence of suicidal ideation in soldiers who experienced a potentially traumatic event to those who never experienced an event. Second, we used logistic regression to assess the relation between potentially traumatic event type (war vs. civilian) and suicidal ideation among those without post-traumatic stress disorder (PTSD). Third, we used stratified logistic regression models to examine if the type of potentially traumatic event changed the relation between PTSD and suicidal ideation.

Results: Soldiers who experienced a potentially traumatic event were more likely to report suicidal ideation than soldiers who never experienced an event (p-value <0.01). Among soldiers without PTSD, we found that those who experienced civilian potentially traumatic events were more likely to report suicidal ideation than soldiers who experienced war-related events (adjusted odds ratio (OR)=2.41; 95% confidence interval (CI): 1.05, 5.52). We found that the relation between war-related PTSD and suicidal ideation (adjusted OR=3.03; 95% CI: 0.74, 12.4) was similar to the relation between civilian-related PTSD and suicidal ideation (adjusted OR=3.21; 95% CI: 1.12, 9.17) among men.

Conclusion: We found, overall, that experiencing any potentially traumatic event increased the odds of suicidal ideation. In particular, among those who did not develop PTSD, we found that soldiers who experienced a potentially traumatic event in their civilian lives had higher odds of suicidal ideation than did those who experienced war-

related potentially traumatic events. We did not find that the type of potentially traumatic event modified the relation between PTSD and suicidal ideation. While focus on the risk of suicidal ideation among soldiers with war-related events is important, research and treatment should also consider the effects of events that may occur during their civilian lives.

4.1 Introduction

In the United States, suicide is the second leading cause of death among young adults aged 25-34 and one of the top five causes of death among adults aged 35-54 [65]. It is well known that psychopathology, and posttraumatic stress disorder (PTSD) in particular, is positively associated with suicidal behavior (suicidal ideation, attempted and completed suicide) [24, 66-68]. There is growing evidence, however, that experiencing potentially traumatic events, events that may or may not lead to psychopathology or PTSD [16], also is associated with suicidal behavior [27]. In addition, several studies have demonstrated that certain types of potentially traumatic events (e.g., rape, natural disaster) have a stronger association with suicidal behavior than do other events [11, 28, 30, 60]. Using a sample of chronic PTSD patients, Tarrier et al. (2004) found that victims of crime had a higher prevalence of suicidal thoughts than did persons who had serious accidents [28]. Wilcox et al. (2010) found a relation between PTSD and suicidal ideation for victims of assaultive events (e.g., being shot, stabbed), but not for persons who experienced non-assaultive events [11].

There are central differences in the circumstances surrounding war- and civilian-related events that may be associated with suicidal behaviors. Soldiers are trained to

expect war-related events and have unit support, a unique social support structure, during the event [12, 22, 69]. Both of these circumstances may buffer the mental health consequences of war-related trauma. In contrast, war-related events occur in extreme environmental conditions (e.g. lack of water, extreme heat) and are often compounded by a loss of meaning or control [12, 15], contributing to more adverse consequences of war-related events. Despite the differences between war- and civilian-events, we are unaware of studies that have examined the relation between these events and suicidal behavior.

There are two main pathways by which the experience of specific potentially traumatic events can lead to suicidal ideation, one of the largest predictors of completed suicide and a commonly used marker for suicide risk [67, 70]. First, there may be a direct link between the type of potentially traumatic event and suicidal ideation (i.e., assaultive events lead to more suicidal ideation than non-assaultive events). Second, the type of potentially traumatic event may change the relationship between PTSD and suicidal ideation (i.e., modifies the relation between PTSD and suicidal ideation).

Evidence is inconclusive on whether specific potentially traumatic events are directly linked to suicidal ideation. As mentioned above, Tarrier et al. (2004) used a sample of chronic PTSD patients and demonstrated that victims of crime had a higher prevalence of suicidal ideation than did persons who experienced a serious accident [17]. Using a sample of Vietnam veterans, Fontana et al. (1992) found that those who "killed or were unable to prevent the death or injury of others" had a greater prevalence of suicidal ideation than did victims of violence [60]. In contrast, among those who never developed PTSD, Wilcox et al. (2009) did not find a link between the type of event and suicidal ideation [11].

Few studies have examined if the type of event that purportedly triggers PTSD modifies the association between PTSD and suicidal ideation [67, 68, 71]. Wilcox et al. (2009) found a positive association between PTSD and attempted suicide for victims of assault, but found no association for persons who experienced non-assaultive events [11]. Using a military sample, Davidson et al. (1990) found different associations between PTSD and suicidal ideation depending on the type of military experience [30]. Specifically, the authors reported that Vietnam veterans with PTSD were more likely to have suicidal ideation at the time of the survey than were World War II veterans with PTSD [26]. Considering few studies have examined if the type of event that triggers PTSD modifies the relation between PTSD and suicidal ideation, additional research is needed.

We propose to examine the relationship between potentially traumatic events (war vs. civilian) and suicidal ideation in a sample of National Guard soldiers. First, we hypothesize that soldiers who experience either a war or civilian potentially traumatic event will be more likely to report suicidal ideation than will those who do not experience any potentially traumatic events. Second, among those without PTSD, we hypothesize that soldiers who experience war-related events will report suicidal ideation more frequently than will those who experience civilian-related events because of the difficult context within which war-related events occur. Finally, we hypothesize that the relation between PTSD and suicidal ideation will be greater among soldiers with war-related events than it will among soldiers with civilian-related events [71].

4.2 Methods

Study population and survey

The source population was men and women who served in the Ohio Army National Guard (OHARNG) between June 2008 and July 2009 and participated in the baseline survey of the OHARNG Mental Health Initiative (OHARNG MHI). The OHARNG MHI is a 10-year prospective cohort study of guard soldiers that collects information on deployment experiences, life events and mental health status via annual computer-assisted telephone interviews. The purpose of OHARNG MHI is to identify and estimate the effects of risk factors for mental health problems in National Guard soldiers. Soldiers were first alerted to the study through mail and given the opportunity to opt out of the study. Individuals who did not make this request and had a telephone number listed (N=10,082) received telephone calls to detail the purpose and procedure of the study and gave their consent to participate. The final sample was 2,616, excluding those who did not want to participate (N=1364), those with incorrect numbers (N=3568), and those who were never contacted (N=2316), retired (187), or ineligible (e.g., could not speak English, or hard of hearing; N=31). The final participation rate was 43.2% (fraction who consented to a survey (2616+187) among all correct numbers minus the disqualified (6514-31). Interviews occurred between November 2008 and November 2009.

For this analysis, the study population was those who never experienced a potentially traumatic event (N=139); those who experienced a potentially traumatic event during their most recent deployment to a combat zone (N=250); those who experienced a civilian-related event (N=648); and those who experienced both types of events (N=215). Since we categorized events based on the context in which they occurred (war or civilian

life), we excluded events that could have occurred at home though the soldiers was deployed (e.g., learning about the car accident of a friend). Therefore, we only included individuals who experienced an assaultive event (e.g., being shot or stabbed), a shocking event (e.g., car accident or explosion), or the sudden death of a friend or loved one (full list of events in Appendix Table 1). For the war-related event group, we only included soldiers who were deployed most recently to an area of conflict and experienced one of the three categories of events during this deployment. For the civilian-related event group, we only included soldiers who had deployed no more than once (as we collected full information on their most recent deployment) and experienced one of the three categories of events. Although we included soldiers who experienced both types of events (war and civilian) to address our first hypothesis, we excluded them from all other analyses involving a diagnosis of PTSD because we could not definitively link the criterion D symptoms of PTSD (e.g., presence of insomnia or trouble falling asleep) to an event when both occurred. We also excluded individuals who did not answer questions on the outcome of interest, the exposures of interest, or the covariates we used to adjust for potential confounders (0.1%).

The main outcome of interest was whether the individual reported ever having suicidal thoughts – feeling that they would be better off dead or wanting to hurt themselves. We assessed this using the Patient Health Questionnaire (PHQ-9), a frequently used and validated instrument [41].

The main exposure of interest was whether someone experienced a war- or civilian-related potentially traumatic event and if they reported PTSD symptoms from these events. We first classified individuals based on their potentially traumatic event

experience: those who did not experience any potentially traumatic events; those who experienced a war-related event during their most recent deployment; those who experienced a civilian-related event; and those who experienced both types of events. To classify participants into these categories, we asked about the occurrence of 30 potentially traumatic events from their most recent deployment to a combat zone and 18 civilian potentially traumatic events outside of their most recent deployment. For the war-related event group, we included soldiers who experienced an assaultive attack (e.g., being shot or stabbed), a shocking event (e.g., car accident) or the sudden death of a loved one (e.g., fellow soldier or friend, Appendix Table 1). They were also deployed most recently to an area of conflict. For the civilian-related event group, we included soldiers who experienced an assaultive attack, a shocking event or the sudden death of a friend or relative and were deployed no more than once (as we collect full information on the most recent deployment).

Next we determined whether soldiers developed PTSD. Similar to Breslau et al. (1998), we linked the PTSD symptoms to the self-selected "worst" event among the war-related or civilian-related events [3]. In the survey, after we gathered information concerning potentially traumatic event history, we asked the participant to select the "worst" event that occurred during his/her most recent deployment to a conflict zone (war-related) and the "worst" outside of this deployment (civilian-related). PTSD symptoms were then assessed with respect to the "worst" potentially traumatic events (Appendix Table 1). For example, if a participant said "being shot" was the worst event then s/he was asked how often they were bothered by "repeated, disturbing memories, thoughts, or images of this stressful experience" (symptom B1). To have a symptom, a

participant had to be bothered "at least some of the time" when asked if they were bothered "not at all, a little bit of the time, at least some of the time, most of the time, nearly all the time" [39]. We assessed PTSD symptoms using the PTSD checklist (PCL-17, civilian version), a validated and frequently used instrument in both military and civilian populations [39]. To have PTSD according to the DSM-IV criteria, an individual had to report intense fear and hopelessness after the event (criterion A2), at least 1 symptom of re-experiencing the event (criterion B), at least 3 symptoms of avoidance and numbing (criterion C), and at least 2 symptoms of hyperarousal or hypervigilance (criterion D). In addition, the individual had to report the symptoms lasted for at least 1 month (criterion E) and caused significant social or functional impairment (criterion F) [6].

Statistical analysis

First, we examined the total number and percent of individuals who reported ever having suicidal thoughts for our entire study group. We compared those who ever experienced a potentially traumatic event (N=1113; sum of those who experienced a war-related (N=250), civilian-related (N=648) or both events (N=215)) to those who never experienced a potentially traumatic event (N=139). We then limited the analyses to those with either war-related or civilian-related events (N=898) and compared specific event exposure groups: those who experienced an event and never developed PTSD (N=833) (categorized as war-related or civilian-related), and those who developed PTSD (N=65) (categorized as war-related or civilian-related).

Second, to identify and estimate the effect of the type of potentially traumatic event (war vs. civilian) on suicidal ideation, we limited the analysis to those who experienced a war- or civilian-related potentially traumatic event and never developed PTSD (N=833). We used logistic models to estimate the effect of the type of potentially traumatic event (war-related event (reference level) and civilian-related event) on suicidal ideation [11]. Models were run with covariates to adjust for potential confounders, explained in greater detail below.

Third, we estimated whether and to what extent the type of potentially traumatic event modified the odds ratio for the association between PTSD status and suicidal ideation among men who experienced either a war or civilian-related potentially traumatic event (N=721). We limited this analysis to men because none of the 15 women who experienced a war-related event reported suicidal ideation. We stratified individuals into whether or not they experienced a war-related potentially traumatic event only (N=222) and civilian-related potentially traumatic event only (N=499). For each stratum, we used logistic regression to estimate the effect of PTSD on the prevalence of suicidal ideation. We ran a series of models including covariates to account for potential confounders to examine the overall relation between PTSD and suicidal ideation. Additionally, we ran a logistic model for all men who experienced war- and civilian-related events and included an interaction term to examine the if the type of event modified the relationship between PTSD and suicidal ideation on the multiplicative scale.

The following variables, treated as indicator variables, were included in the models as potential confounders: sex, age (18-24(reference), 25-34, 35-44, 45+), marital status (married (reference), formerly married, never married), history of depression

before the event, history of alcohol abuse before the event, potentially traumatic event history (1-3 events (reference), 4-6, seven or more), the category of event used to assess PTSD symptoms (assaultive (reference), shocking event, sudden death of a friend or loved), and if the event occurred more than five years ago. Depressive disorder was defined according to the PHQ-9 and a history of alcohol abuse was defined by the MINI International Neuropsychiatric Interview (MINI) [41, 42]. Since we wanted to compare the context of the event and not necessarily the severity of the events themselves (e.g. car accident in war vs. car accident in civilian life), we included an indicator variable to identify the category of the event (assaultive, shocking event, or sudden death of a loved one). As none of the 14 men who experienced the sudden death of a loved one in war reported suicidal ideation, these 14 individuals were excluded from the stratified analysis examining the effect of PTSD on suicidal ideation. To examine how characteristics of the potentially traumatic event may have confounded our estimates, initial models included demographics, mental health history and potentially traumatic event history. Additional models included covariates for category of event (e.g., assaultive, shocking event, sudden death of a loved one) and whether the event occurred more than five years ago.

We ran a series of sensitivity analyses on our final models. As suicidal ideation is included as a possible symptom of the PHQ-9 definition of depressive disorder, we ran models using a definition of depressive disorder that excluded suicidal ideation as a possible symptom (PHQ-8). To determine if marital status was an intermediate between PTSD and suicidal ideation and therefore, if we over-adjusted for a possible intermediate, we ran a model excluding all indicators of marital status and then a model with a variable

indicating whether they had ever been married. We then ran all final models excluding those who experienced a sudden death of a loved one, as these potentially traumatic events may not have been categorized as we intended. For example, soldiers who reported the sudden death of a friend during their most recent deployment may have had a friend die at home. Finally, we reran the stratified model with civilian-related potentially traumatic events with an indicator to identify if a soldier had ever been deployed.

To inform the discussion of our findings we calculated the fraction of individuals who developed either alcohol abuse or depression after before and after the event used to assess PTSD symptoms for those with war vs. civilian events. All analyses were carried out using SAS 9.2.

4.3 Results

Table 4.1 shows the proportion of participants with potentially traumatic event exposures and the prevalence of suicidal ideation by potentially traumatic event exposure category. The overall prevalence of suicidal ideation was 9.0% (N=113). Only 1.4% of persons who never experienced a potentially traumatic event reported a history of suicidal ideation as compared to 10.0% of those who experienced an event ($p<0.01$). Among those who either experienced a war- or civilian-related potentially traumatic event, 30.8% of those who developed PTSD reported suicidal ideation compared to 8.3% who experienced a potentially traumatic event and did not develop PTSD ($p<0.01$). Among those who experienced an event and did not develop PTSD (N=833), suicidal ideation was similar between those who experienced war-related (6.7%) and civilian-related

(8.9%) events (p=0.31). Among those who developed PTSD, 19.2% of those who experienced war-related events and 38.5% who experienced civilian-events had suicidal ideation (p= 0.10).

Table 4.2 shows the association between the type potentially traumatic event (war vs. civilian) and suicidal ideation among soldiers who experienced either a war or civilian event but did not develop PTSD. In the unadjusted model there was little difference in the prevalence (or odds) of suicidal ideation by type of potentially traumatic event (crude odds ratio (OR)=1.36; 95% confidence interval CI 0.749-2.45). Once we adjusted for potential confounders, the overall difference in the odds of suicidal ideation for civilian-related compared to war-related events increased (adjusted OR=2.11; 95% CI: 1.04-4.28). Once we adjusted for possible confounders including characteristics of the potentially traumatic event, the difference remained (adjusted OR=2.41; 95% CI: 1.05-5.52).

Table 4.3 shows the estimated association between PTSD status and suicidal ideation by type of potentially traumatic event among male participants who reported either a war or civilian related event. Among soldiers with war-related events, there was a positive unadjusted association between PTSD and suicidal ideation (crude OR=3.63; 95% CI: 1.18-11.2) that remained when we accounted for potential confounders (adjusted OR=3.03; 9% CI: 0.740-12.4). For the civilian events, there was a positive association between PTSD status and suicidal ideation among soldiers with civilian potentially traumatic events in crude models (crude OR=4.48; 95% CI: 1.74-11.6), and the final the model adjusting for all potential confounders (adjusted OR=3.21; 95% CI: 1.12-9.17). In the combined model using an interaction term to examine effect measure modification, we did not find evidence of effect measure modification on the multiplicative scale

between the relation of PTSD and suicidal ideation due to the type of event (war vs. civilian) (p-value =0.23).

In sensitivity analyses (Appendix Table 6), we did not find that various definitions of our potential confounders or study population appreciably altered the magnitude of the estimates of the association between potentially traumatic event type and suicidal ideation or the estimates of the association between PTSD and suicidal ideation stratified by event type.

Soldiers who experienced civilian-related events had a lower prevalence of depression and alcohol abuse before their "worst" event (5.9% and 15.3%) than did those with war-related events (10.7% vs. 36.2%). In addition, the prevalence of depression and alcohol abuse after the potentially traumatic event was similar for soldiers who experienced war-related (depression: 10.4%, alcohol abuse: 12.4%) or civilian-related events (depression: 7.2%, alcohol abuse: 15.1%).

4.4 Discussion

We found that soldiers who experienced potentially traumatic events in their military or civilian life reported suicidal thoughts more frequently than did those who did not experience either type of event. In particular, soldiers who experienced civilian-related events were more likely to report suicidal ideation than were soldiers who experienced war-related events. When we stratified by the event the soldier experienced, we found a constant, positive association between PTSD and suicidal ideation.

The experience of a potentially traumatic event, either war- or civilian-related, was associated with suicidal ideation. Our finding is consistent with the results of a recent cross-national analysis [27]. Stein et al. (2010) used the World Health Organization Mental Health Surveys – nationally representative surveys from low-, middle- and high-income countries – to estimate the association between potentially traumatic event experience and suicidal ideation, adjusting for potential confounders [27]. The authors found that the experience of one or more potentially traumatic event was associated with subsequent suicidal ideation [27]. The authors also estimated that eliminating the experience of traumatic events would reduce the prevalence of suicidal ideation by 15.4% [27].

We found, contrary to our second hypothesis, that soldiers who experienced civilian-related events reported suicidal ideation more frequently than did soldiers who experienced war-related events. Evidence of a link between event type and suicidal ideation has been found elsewhere [60, 72]. In their cross-national analysis, Stein et al. (2010) also examined the odds of suicidal ideation for specific event types. Those authors reported that experiencing combat was not associated with suicidal ideation, yet experiencing sexual violence was associated with suicidal ideation after adjusting for mental health and demographics [27]. Using a sample of chronic PTSD patients, Tarrier et al. (2004) found that sexual assault victims had a higher prevalence of suicidal behavior than did those who experienced an accident [28]. In contrast to our work, other studies have reported a lack of an association between the type of potentially traumatic event and suicidal ideation [11, 59]. Wilcox et al. (2010) did not find an association between event type (assaultive vs. non-assaultive) and suicidal ideation adjusting for

PTSD. There were, however, methodological differences between our work and this study that might explain this discrepancy. The authors examined female college students, adjusted for potential intermediates (co-morbid conditions), and did not adjust for the total number of potentially traumatic events experienced, which is a well-known confounding factor in this association [73, 74]. Panagioti (2011) also reported a lack of an association between the type of potentially traumatic event and suicidal behavior, but the authors used a convenient sample, only 94 patients in a clinical setting, which limited their level of inference [71].

There are four possible reasons to explain why soldiers with civilian-related events were more likely to report suicidal ideation than were those with war-related events: 1) civilian events were more severe than war events, 2) a bias due to the "healthy-warrior effect", 3) social support, and 4) treatment differences after the event. While we attempted to compare similar potentially traumatic events (i.e., assaultive events in war to assaultive events in civilian life), it is possible that civilian events were more severe overall. Therefore, to confirm these findings more work needs to compare the same events in the context of war and civilian life (e.g., being shot in war and being shot in civilian life).

The healthy-warrior effect is a second possible reason for the difference in the prevalence of suicidal ideation between war and civilian-related events. The healthy-warrior effect is similar to the healthy-soldier effect or healthy-worker effect: within the military, soldiers who deploy are inherently healthier than soldiers who do not deploy [55, 75, 76]. In short, soldiers with health conditions or do not have the constitution suitable for deployment are informally screened out during training; thus, there is an

underlying health difference between deployed and non-deployed soldiers. This difference may then be compounded because deployed soldiers have complete training and more psychological preparedness for potentially traumatic events than those who are not. In our study, this bias may be present because 84% of soldiers who had civilian-related events were never deployed and possibly a pool of individuals who were informally screened-out. We found, however, that soldiers who experienced civilian events had a lower proportion of both depression and alcohol abuse before their index event than did those with war-related events, suggesting a lack of healthy-warrior bias. More studies should examine the effect of potentially traumatic events (war vs. civilian) on suicidal ideation among all who have been deployed, assuring a lack of healthy-warrior bias.

Unit support may be a third reason that suicidal ideation is more prevalent among soldiers who experienced civilian-related events than among those with war-related events. Social support, in general, is a well-known protective factor against the mental health consequences of potentially traumatic events. Unit support, in particular, is a support system for soldiers during deployment that reduces the risk of psychopathology and suicidal ideation after war [12, 48, 69]. Therefore, soldiers who are with their unit, both during and after the event, may have lower odds of suicidal ideation compared to soldiers who experience events in their civilian lives. Future work should examine how unit support may affect the risk of suicidal ideation over-time among those who experience war-related events.

Mental health treatment differences also may explain the higher prevalence of suicidal ideation among soldiers who experience civilian-related as compared to those

who experienced war-related events. Use of psychotropic drugs, duration of care, and increased use of mental health services are linked to lower suicidal behaviors in military populations [56]. In the National Guard specifically, veterans' health services are only provided for soldiers returning from active-duty deployment [46]. Therefore, soldiers who experienced war-related potentially traumatic events have greater access to and use of mental health services than do soldiers who have experienced civilian-related events [44]. While there is an important association between war-related events and suicidal ideation, research, interventions, and mental health services should also focus on soldiers who experience events in their civilian lives.

We found a positive association between PTSD and suicidal ideation, a finding that has been confirmed in multiple studies [66, 68, 70, 77]. Contrary to our third hypothesis, we did not find that this association differed between soldiers who experienced war- and civilian-related potentially traumatic events. Similarly, Stein et al. (2010) found that various types of potentially traumatic events (e.g., combat, sexual abuse, accident) did not modify the association between PTSD and suicidal ideation [57]. Our results suggest that regardless of the event that triggers PTSD, there is an overall positive relation between PTSD and suicidal ideation.

Although we found a positive association between PTSD and suicidal ideation, different pathways between PTSD and suicidal ideation may exist depending on the type of potentially traumatic event. Panagioti (2011) recently proposed two pathways through which PTSD is linked to suicidal behavior: one where the increased severity of social and physical impairment affects suicidal ideation, and the other where the severity of depression affects suicidal ideation. To appropriately examine these pathways separately

for war- and civilian-related events, however, longitudinal data is necessary to identify direct and indirect pathways accounting for co-morbid conditions.

This study had several important limitations. Although we attempted to make the potentially traumatic events as comparable as possible, it is possible that civilian-related events are simply not comparable to war-related events. Studies should compare identical events (i.e., compare those shot in war to those shot in civilian life) to see if they find similar results. Our results have limited generalizability. Though suicidal ideation is one of the greatest risk factors for suicide [67, 70], the results from this study may not translate to the relationship between potentially traumatic events and completed suicide. In addition, we limited the study to those who experienced specific potentially traumatic events (e.g., assaultive, shocking) and therefore, these results may not be generalizable to other types of potentially traumatic events, or to those who experienced multiple types of these events (war and civilian). This work is also limited to National Guard soldiers and may not be generalizable to active duty military or civilian populations. We also limited this work to those without missing information, which could have lead to a bias of our estimates. To confirm these findings, future analyses should be performed using multiple imputation analysis. As the history of suicidal ideation was rare overall, our reported 95% CIs are fairly wide, making the precision of estimates limited.

The study was cross-sectional and based on self-report, and both recall bias and selection bias are a concern. Although there is no evidence that those with suicidal ideation will remember PTSD symptoms for war-related or civilian-related events differently, possible recall bias must be considered when examining the results. Selection bias may have occurred if suicidal ideation and potentially traumatic event experience

were related to the participation in the parent study; therefore, prospective studies should be used to examine and account for this bias. As final limitation, we were not able to confirm that ideation always preceded PTSD and future, longitudinal studies should examine if our findings are reproducible using the proper temporal relationship between PTSD and suicidal ideation.

Conclusion

This work highlights the complex relationship between traumatic events and suicidal ideation. Soldiers who experience any potentially traumatic event are more likely to have suicidal thoughts than those who do not. However, those with civilian-related events are more likely to have suicidal ideation than are soldiers with war-related events. That soldiers with civilian-related potentially traumatic events are more likely to have suicidal thoughts is an important finding given the recent concern about the increasing suicide rates in the military [78]. More work is necessary to elucidate the reasons for this upward trend and how to mitigate the consequences of war, in National Guard and Reserve soldiers. Interventions that aim to reduce risk of suicide in this group may need to focus both on war experiences but also experiences that National Guard soldiers face in their daily lives.

Table 4.1: The prevalence (#(%)) of potentially traumatic events experiences, and the prevalence (# (%)) of those with suicidal ideation by event exposure categories.

Categories of exposure	**Total Sample #(%)**	**Suicidal Ideation #(%)**
No events	139 (11.1)	2 (1.4)
Any potentially traumatic event*	1113 (88.9)	111 (10.0)
Total	***1252***	***113 (9.0)***
Experienced event and no PTSD	833 (80.3)	69 (8.3)
War-related	224 (24.9)	15 (6.7)
Civilian-related	609 (67.8)	54 (8.9)
Experienced event and developed PTSD	65 (7.5)	20 (30.8)
War-related	26 (2.9)	5 (19.2)
Civilian-related	39 (4.3)	15 (38.5)
Total	***898***	***89 (9.9)***

*This category included those who experienced both a war- and civilian-related potentially traumatic event (N=215). These participants were not included when we examined the association of event type (war vs. civilian) on suicidal ideation.

Table 4.2: The association (crude and adjusted (OR); 95% (CI)) between the type of event (war vs. civilian) and suicidal ideation among those who experienced either a war or civilian event and did not develop PTSD.

Predictors	**Crude OR (95% CI) N=833**	**Adjusted OR (95% CI) N=833**	**Adjusted OR (95% CI) N=833**
Event types			
War event only (reference)	1	1	1
Civilian event only	1.36 (0.749, 2.45)	2.11 (1.04, 4.28)	2.41 (1.05, 5.52)
Gender			
Male		1	1
Female		0.539 (0.247, 1.18)	0.501 (0.229, 1.10)
Age			
18-24		1	1
25-34		0.697 (0.322, 1.51)	0.701 (0.320, 1.54)
35-44		0.957 (0.389, 2.35)	0.960 (0.378, 2.43)
45+		0.831 (0.255, 2.70)	0.854 (0.259, 2.82)
Marital Status			
Married		1	1
Formerly married		1.48 (0.553, 3.93)	1.44 (0.535, 3.89)
Never married		1.03 (0.485, 2.19)	1.05 (0.491, 2.24)
Number of potentially traumatic events			
1 - 3		1	1
4 - 5		0.913 (0.428, 1.95)	0.863 (0.403, 1.85)
7 or more		1.89 (0.983,3.63)	1.87 (0.971, 3.59)
History of depressive disorder before the event			
No		1	1
Yes		7.12 (3.58,14.2)	7.27 (3.60,14.7)
History of alcohol disorder before the event			
No		1	1
Yes		0.61 (0.297,1.25)	0.641 (0.308,1.34)
Type of potentially traumatic event with relation to PTSD symptoms			
Assaultive			1
Shocking			0.455 (0.219, 0.947)
Sudden death of a friend			0.677 (0.336, 1.37)
Potentially traumatic event occurred more than 5 years ago			
No			1
Yes			1.08 (0.591,1.99)
-2 log likelihood	474.8	434.2	429.5

Table 4.3: The association (crude and adjusted (OR); 95% (CI) between PTSD status and suicide ideation by type of event (war vs. civilian) among male participants who reported experiencing war or civilian-related events.

	War-related			Civilian-related		
Predictors	**Crude OR (95% CI) N=222**	**Adjusted OR (95% CI) N=222**	**Adjusted OR (95% CI) N=222**	**Crude OR (95% CI) N=499**	**Adjusted OR (95% CI) N=499**	**Adjusted OR (95% CI) N=499**
PTSD						
No	1	1	1	1	1	1
Yes	3.63 (1.18,11.2)	3.82 (1.01,14.4)	3.03 (0.740,12.4)	4.48 (1.74,11.6)	3.35 (1.20,9.40)	3.21 (1.12,9.17)
Age						
18-24		1	1		1	1
25-34		2.02 (0.359,11.4)	2.87 (0.430,19.1)		0.881 (0.355, 2.18)	0.819 (0.326, 2.06)
35-44		3.03 (0.471, 19.5)	3.65 (0.480, 27.8)		0.925 (0.301, 2.84)	0.819 (0.255, 2.63)
45+		1.90 (0.128, 28.2)	2.29 (0.138, 38.1)		0.830 (0.208, 3.31)	0.742 (0.181, 3.04)
Married						
Currently		1	1		1	1
Formerly		2.67 (0.635, 11.2)	3.05 (0.707, 13.2)		2.22 (0.680, 7.25)	2.11 (0.644, 6.92)
Never married		1.79 (0.445, 7.22)	1.66 (0.383, 7.15)		0.828 (0.332, 2.06)	0.859 (0.341, 2.162)
Number of potentially traumatic events						
1-3		-	-		1	1
4-5		1	1		0.652 (0.267, 1.59)	0.625 (0.255, 1.53)
7 or more		2.86 (0.490, 16.7)	5.52 (0.824,		2.07 (1.02, 4.22)	2.01 (0.972, 4.15)

			37.0)			
History of depressive disorder						
No		1	1		1	1
Yes		12.9 (3.80, 43.5)	13.7 (3.79, 49.5)		5.27 (2.08, 13.4)	6.17 (2.32, 16.4)
History of any alcohol abuse						
No		1	1		1	1
Yes		0.283 (0.0820, 0.981)	0.243 (0.0660, 0.899)		0.780 (0.324, 1.88)	0.886 (0.360, 2.18)
Type of potentially traumatic event with relation to PTSD symptoms						
Assaultive			1			1
Shocking			0.210 (0.051, 0.860)			0.682 (0.266, 1.75)
Sudden death of a friend			-			0.994 (0.414, 2.39)
Potentially traumatic event occurred more than 5 years ago						
No			1			1
Yes			0.284 (0.0420, 1.92)			1.51 (0.756, 3.02)
-2 log likelihood	130.1	105.2	97.8	325.6	301.0	298.4

Chapter 5

Conclusion

This dissertation examined the differences between war- and civilian-related events and its relation with the presentation of PTSD symptoms, diagnosis of PTSD and suicidal ideation. Using a sample of soldiers who participated in the baseline data collection of a 10-year longitudinal cohort (Ohio Army National Guard Mental Health Initiative), we assessed three main questions. First, we examined the heterogeneity of PTSD, both etiologic and clinical, between soldiers who experienced war- and civilian-related events. Second, based on the presence of etiologic heterogeneity of PTSD symptoms, we investigated the role of criterion A2 in the diagnosis of PTSD after war- and civilian-related events. Third, we explored how different potentially traumatic events (war vs. civilian) were related to suicidal ideation. In this chapter we discuss the conclusion from each chapter, discusses how we compare with past studies, and use epidemiologic data to explain our findings.

In chapter 2 we determined if the context of war-related potentially traumatic events when compared to civilian events was associated with the prevalence of PTSD symptoms (re-experiencing, avoidance and hyperarousal) in a population-based sample of military personnel. We demonstrated the presence of etiologic heterogeneity of PTSD, as soldiers who experienced a war-related event were less likely to meet criterion A2, meet

criterion B, report intrusive memories, and report psychological reactivity than were soldiers with civilian-related events. We suggested that certain circumstances of war-related events might have helped soldiers better cope with the mental health consequences of traumatic events as compared to soldiers who experienced the event in civilian life. Specifically, we described how mental preparation for an event, support from fellow unit members, and access to mental health care services may account for the reduced prevalence of certain symptoms [12, 13, 33, 37]. We also found evidence of clinical heterogeneity of PTSD among soldiers with psychopathology after war-related and civilian-related events; soldiers with war-related events reported physiological reactivity more frequently when reminded of the event than did those with civilian events. We explained how physiological reactivity to reminders of the event may be a biological manifestation of combat trauma and how its presence may indicate other physical conditions. Both the etiologic and clinical heterogeneity in symptom patterns may have implications for the treatment of soldiers with PTSD.

In chapter 3 we extended our work and determined the value of DSM-IV criterion A2—feelings of fear, helplessness, or horror after a potentially traumatic event—in the diagnosis of posttraumatic stress disorder (PTSD). Specifically, we examined whether soldiers not reporting criterion A2 were as likely to develop the other PTSD symptoms (criteria B-F) as were soldiers reporting criterion A2 after similar war-related or civilian-related events. We found that those with war-related events were less likely to report criterion A2 than were those with civilian events. We found, however, that few individuals who did not report criterion A2 had the remaining PTSD symptom criteria, and that the prevalence of PTSD did not depend on the requirement of A2. We suggested

that the lower reporting of criterion A2 for soldiers with war compared to civilian events was the combination of being trained and experiencing an occupational event. Considering the high negative predictive value, we suggested that criterion A2 should not be dropped and would be most useful as the first screen in series testing. Our study suggests that the inclusion of criterion A2 in the diagnosis of PTSD had little or no effect on the prevalence of this condition among Ohio National Guard soldiers who reported similar war- or civilian-related potentially traumatic events. We suggest that the diagnosis of PTSD can be made more efficient in soldiers with reported traumatic events by first screening for criterion A2, then subjecting only positives to the other criteria (i.e., series testing).

In chapter 4 we examined the relation between event type (war- vs. civilian-related) and suicidal ideation in a sample of National Guard soldiers. We found that soldiers who experienced potentially traumatic events in their military or civilian life reported suicidal thoughts more frequently than did those who did not experience either type of event. In particular, soldiers who experienced civilian-related events were more likely to report suicidal ideation than were soldiers who experienced war-related events. When we stratified by the event the soldier experienced, we found a constant, positive association between PTSD and suicidal ideation, adjusting for potential confounders. While focus on the risk of suicidal ideation among soldiers with war-related events is important, research and treatment should also consider the effects of events that may occur during their civilian lives.

There are several important limitations of this work. Our sample was cross-sectional, and therefore, selection bias is a concern when we discuss the validity of our

estimates. Selection bias, in general, occurs when those selected for the study have a different relationship between exposure and disease than the source population for which we are trying to draw conclusions [79]. In our work, selection bias may be a concern because of the self-selection of individuals to participate in the parent study. If the relation between event experiences and our outcomes were different for soldiers who chose to participate in the parent study than those who chose not to participate, we may have participation bias. The only way to confirm a lack of participation bias is to compare the relation between the exposure and disease in those who did not participate in the parent study. While we are unable to do this, as an approximation, studies often compare the demographics between those who chose to participate and not; the parent study sample was comparable to the Ohio Army National Guard which suggests a lack of underlying difference [80]. Selection bias is also a concern because this work selected certain participants from all who participated in the parent study. In this instance, if there was a factor that was related to selection for either war or civilian-events that was also related to any of our outcomes, our estimates may have been biased. Healthy warrior bias, a type of selection bias mentioned in chapter 4, is a concern throughout all of our work [75]. In this scenario, healthier soldiers are the ones deployed to combat, and when we selected participants based on their deployment status (84% of those with civilian-events had never been deployed), we may have distorted the relation between event type and all health outcomes. When we examined the prevalence of mental health before the experience of the index event (deployment related or civilian), we found that those with war-related events had a higher prevalence of both depression and alcohol disorder. Although this calculation does not eliminate the possibility of healthy warrior bias, it

suggests that those with war-related events were not inherently healthier than our civilian group. To eliminate the possibility of healthy-warrior bias, all analyses should be replicated using a population of entirely deployed individuals.

Information bias also is a concern considering our data came from cross-sectional, retrospective self-reports. Recall bias could have distorted our estimate of effect if the memory of traumatic experiences was different because of their PTSD status, or if soldiers with war-related events were more or less likely to remember symptoms than those with civilian-related events. This bias is a concern in military studies because of the overlap between traumatic brain injury (TBI), amnesia, and PTSD [81]. Specifically, the presence of TBI and amnesia may preclude individuals from remembering symptoms or circumstances of the event [82]. Studies suggest, however, that TBI and amnesia do not necessarily preclude the detection of PTSD symptoms because reaction to the event may appear unconsciously (e.g. physiological reactivity, sleep disturbances) [81]. Additionally, studies suggest that TBI and amnesia do not preclude the memory of a traumatic event because a large fraction of those with TBI have partial amnesia and many reconstruct the events through friends and family [81]. Moreover, TBI may be present to the same extent among those with civilian-related events (e.g. motor vehicle accidents) [82]. Regardless, the presence of TBI among those with either war-related or civilian-related events may have distorted our estimates and therefore, prospective studies using clinical data are warranted. The incorrect classification of soldiers with either war-related or civilian-related events is another source of information bias. Misclassification of the event, however, would likely be non-differential with respect to disease as the misclassification is unrelated to either PTSD symptoms or suicidal ideation. We

attempted to limit this misclassification in all three chapters by including categories of events that could not have occurred outside of the context we classified (e.g. assaultive events). The "sudden death of a friend or loved one", which was included because of the high proportion of soldiers who may experience this while deployed, may have been misclassified. In sensitivity analyses in chapter 3 and 4, however, we found our results did not change when we eliminated soldiers who discussed PTSD symptoms related to that event, which suggests that differential misclassification of this group did not alter the direction or estimate of effect.

Another limitation of using cross-sectional work is the risk of temporal ambiguity. This is of particular concern in chapter 4 because suicidal ideation was examined at any point, and therefore, could have started at any point before the potentially traumatic event in question. Prospective studies that examine the relation between potentially traumatic events and suicidal ideation are necessary.

The results from our study have limited generalizability. We examined a specific group of soldiers and therefore, our findings may not be valid for other military populations including active duty and other reserve forces. Because we wished to make exclusive comparisons, we selected individuals who only experienced war-related or civilian-related events and therefore, these estimates may not be valid for those who experience multiple types of these events. Further investigation is warranted to examine how the context of the event in other military populations as well as civilian populations.

In all our work, there is a fundamental limitation in the manner in which PTSD symptoms were assessed. We are only able to examine PTSD symptoms if someone had

ever experienced a potentially traumatic event. Based on the current definition of PTSD, symptoms of PTSD are linked to an event and therefore, if none are experienced we did not assess the symptoms. In future studies, to more thoroughly examine the heterogeneity of PTSD, it may be fruitful to compare PTSD heterogeneity among those who never experienced a potentially traumatic event. Finally, due to the cross-sectional nature of the data we were unable to confirm the co-morbidity of all Axis I conditions among those with PTSD in our study which may play a role in the presentation of PTSD symptoms and association with PTSD and suicidal ideation.

Ultimately, this work demonstrated the presence of PTSD heterogeneity because of different contexts of traumatic events and that certain factors for military events may allow soldiers to better cope with traumatic event experiences as compared to soldiers who experience similar events in their civilian lives. Understanding the heterogeneity of PTSD is important and will improve how we recognize and treat this relatively new condition. We suggest that while similar events may occur between two people, the context within which it occurs may create distinct presentations of PTSD symptoms. These distinct presentations then also may be related not only to co-morbidities of those with PTSD.

While the mental health consequences of war-related traumatic events are severe, we suggest that war-related events occur with unique circumstances as compared to those similar civilian-related events. We suggest that the unique circumstances such as unit support, efficient training and mental health services effectively buffer some of the mental health consequences of war for soldiers returning from overseas. In light of this, we suggest that improving the networks of units, continual training for deployment,

addressing the impact of mental preparation and extending health services may further reduce the mental health impact of trauma for soldiers. Additionally, soldiers should be treated with the recognition that their entire life course may affect their mental state. Overall, future studies are necessary to further investigate the distinct presentations of PTSD but also how war-related and civilian-related events can be better treated. This work will help to direct research on the etiology of PTSD and help understand ways to better mitigate the effects of war on returning veterans.

Appendices

Appendix Table 1: List of potentially traumatic events

War-related events
Assaultive
Being injured or wounded during combat
Being mugged, held up, or threatened with a weapon
Being raped
Experiencing another kind of sexual assault or unwanted sexual contact as a result of force, threat of harm, or manipulation
Being attacked by terrorists, insurgents, or civilians
Being in a vehicle that was under fire
Receiving 'friendly' incoming fire from small arms, artillery, rockets, mortars, or bombs
Firing your weapon at the enemy
Receiving hostile incoming fire from small arms, artillery, rockets, mortars, bombs, or I.E.D.'s
Encountering land or water mines or booby traps
Engaging in battle in which your unit suffered casualties
Experiencing combat
Caused serious injury, harm or death to someone else
Killing or thinking you have killed someone in combat
Shocking events
Being in a fire or explosion
Being in a serious transportation accident (for example a serious car or motor vehicle crash, boat accident, plane crash)
Being diagnosed with a life-threatening illness or had a serious operation
Witnessing someone being killed or seriously injured
Unexpectedly discovered a dead body
Witnessing severe human suffering
Exposure to toxic substances (for example, dangerous chemicals, radiation)
Personally witnessing someone from your unit or an ally unit being seriously wounded or killed
Personally witnessing soldiers from enemy troops being seriously wounded or killed
Seeing enemy soldiers after they had been severely wounded or disfigured in combat
Seeing the bodies of dead Americans or allies
Seeing Americans or allies after they had been severely wounded or disfigured in combat
Seeing civilians after they had been severely wounded or disfigured

Seeing the bodies of dead civilians
Seeing the bodies of dead enemy soldiers

Sudden unexpected death of a loved one

Civilian events

Assaultive
Being in a fire or explosion
Being raped
Experiencing another kind of sexual assault or unwanted sexual contact as a result of force, threat of harm, or manipulation
Being shot or stabbed
Being held captive, tortured, or kidnapped
Being mugged, held up, or threatened with a weapon
Causing serious injury, harm or death to someone else
Being badly beaten up

Shocking event
Being in a serious transportation accident (for example a serious car or motor vehicle crash, boat accident, plane crash
Experiencing a natural disaster - for example, a fire, flood, earthquake - in which you were hurt or your property was d
Having a child of yours diagnosed as having a life-threatening illness
Being diagnosed with a life-threatening illness or had a serious operation
Experiencing any other kind of serious accident or injury
Witnessing someone being killed or seriously injured
Witnessing severe human suffering
Unexpectedly discovered a dead body
Having a serious operation
Exposure to toxic substances (for example, dangerous chemicals, radiation)

Sudden unexpected death of a loved one

Appendix Table 2: Symptoms of posttraumatic stress disorder according to the Diagnostic and Statistical Manual of Mental Disorders IV.

Criterion B – Symptoms of persistently re-experiencing the traumatic event
B1 – Recurrent or intrusive memories of the event
B2 – Recurrent distressing dreams of the event
B3 – Acting or feeling as if the traumatic event were recurring
B4 – Intense psychological distress to cues that remind them of the event
B5 – Physiological reactivity on exposure to cues that remind them of the event
Criterion C – Symptoms of persistent avoidance of stimuli associated with the traumatic event
C1 – Efforts to avoid thinking or have feelings about the event
C2 – Efforts to avoid activities, places or people that remind them of the event
C3 – Inability to recall an important aspect of the traumatic event
C4 – Markedly diminished interest or participation in activities
C5 – Feeling detached from people
C6 – Feeling emotionally numb or having restricted effect
C7 – Having a feeling of foreshortened future (does not expect marriage, career or kids)
Criterion D – Symptoms of hyperarousal
D1 – Difficulty falling or staying asleep
D2 – Irritability or outbursts of anger
D3 – Difficulty concentrating
D4 – Hyper-vigilance
D5 – Exaggerated startle

Appendix Table 3: The distribution (# (%)) of selected characteristics by type of potentially traumatic event (war vs. civilian) and the crude association (crude OR and 95% CI) between each characteristic and type of event by category of each characteristic.

Selected characteristic	Total (# (%))	War-related event (#(%))	Civilian-related event (#(%))	Crude OR (95%CI)
Gender				
Male	734 (81.7)	235 (94.0)	499 (77.0)	1
Female	164 (18.3)	15 (6.0)	149 (23.0)	0.214 (0.123, 0.372)
Age				
18-24	392 (43.7)	42 (16.8)	350 (54.0)	1
25-34	253 (28.2)	108 (43.2)	145 (22.4)	6.21 (4.14, 9.31)
35-44	179 (19.9)	77 (30.8)	102 (15.7)	6.29 (4.07, 9.73)
45+	74 (8.2)	23 (9.2)	51 (7.9)	3.76 (2.09, 6.76)
Marital status				
Married	371 (41.3)	150 (60.0)	221 (34.1)	1
Formerly married	69 (7.7)	25 (10.0)	44 (6.8)	0.837 (0.491, 1.43)
Never Married	458 (51.0)	75 (30.0)	383 (59.1)	0.289 (0.209, 0.398)
Total traumatic events				
1-3	276 (30.7)	15 (5.4)	261 (40.2)	1
4-6	224 (24.9)	26 (10.4)	198 (30.6)	0.052 (0.030, 0.091)
7+	398 (44.3)	209 (83.6)	189 (29.2)	0.119 (0.075, 0.187)
Worst traumatic event				
Non-assaultive	657 (73.2)	113 (45.2)	544 (84.0)	1
Assaultive	241 (26.8)	137 (54.8)	104 (16.1)	6.34 (4.58, 8.78)
Time since main traumatic event				
≤ 5	574 (63.9)	218 (87.2)	356 (54.9)	1
> 5	324 (36.1)	32 (12.8)	292 (45.1)	0.179 (0.120, 0.268)
History of depression before event				
No	828 (92.2)	222 (88.8)	606 (93.5)	1
Yes	70 (7.8)	28 (11.2)	42 (6.5)	1.82 (1.10, 3.00)
History of alcohol abuse before event				
No				
Yes				
PTSD				
No	833 (92.8)	224 (89.6)	609 (93.9)	1
Yes	65 (7.2)	26 (10.4)	39 (6.02)	1.81 (1.08, 3.05)
Total	**898**	**250 (27.8)**	**648 (72.4)**	

Appendix Table 4: Sensitivity analyses of the association (adjusted OR; 95%CI) between event type (war vs. civilian) and criterion A2; and sensitivity analysis of the association (adjusted OR; 95% CI) between criterion A2 and PTSD symptom criteria (B-F) by event type.

Population	Adjusted OR* (95% CI)) between event type (war vs. civilian) and criterion A2	For war-related events, adjusted OR* (95% CI)) criterion A2 and PTSD (all B-F criteria)	For civilian-related events, adjusted OR * (95% CI)) criterion A2 and PTSD (all B-F criteria)
Excluding those who experienced the sudden death of a loved one	3.21 (1.79, 5.76)	6.58 (1.92, 22.6)	+
Excluding those who had an event more than five years ago	1.78 (1.02, 3.11)	5.53 (1.60, 19.1)	+
Excluding those who experienced the civilian-related event before training	2.07 (1.15, 3.74)	-	-

*Models were adjusted for sex, age, marital status, total number of events experienced, category of event used to assess PTSD, and if the event had occurred more than 5 years ago.

+Could not calculate OR because no soldiers developed PTSD criterion B-F who did not report criterion A2.

Appendix Table 5: The distribution (N and %) of selected characteristics, the number(%) reporting criterion A2 by category of each characteristic, and the association (crude odds ratio (OR) and 95% CI) between each characteristic and criterion A2

Characteristic	Total Sample Number (%)	Number (%) Reporting Criterion A2	Crude OR (95% CI)
Gender			
Male	734 (81.7)	468 (63.8)	1
Female	164 (18.3)	127 (77.4)	1.95(1.31, 2.90)
Age			
18-24	392 (43.7)	260 (66.3)	1
25-34	253 (28.2)	164 (64.8)	0.936(0.671,1.30)
35-44	179 (19.9)	122 (68.2)	1.09(0.745,1.59)
45+	74 (8.2)	49 (66.2)	0.995(0.588,1.68)
Marital status			
Married	371 (41.3)	239 (64.2)	1
Formerly married	69 (7.7)	45 (65.2)	1.04(0.604,1.78)
Never married	458 (51.0)	311 (67.9)	1.17(0.875,1.56)
Number of events experienced			
1-3	276 (30.7)	161 (58.3)	1
4-6	224 (24.9)	164 (73.2)	0.664(0.483,0.913)
7+	398 (44.3)	270 (67.8)	1.30(0.901,1.86)
History of depression			
No	719 (80.1)	454 (63.1)	1
Yes	179 (19.9)	143 (78.8)	2.17(1.47,3.20)
History of alcohol disorder			
No	489 (54.5)	315 (64.4)	1
Yes	409 (45.6)	280 (68.5)	1.20(0.907,1.59)
More than 5 years since event			
No	574 (63.9)	358 (62.4)	1
Yes	324 (36.1)	237 (73.2)	1.64(1.22,2.21)
Assaultive event			
No	657 (73.2)	430 (65.5)	1
Yes	241 (26.8)	165 (68.6)	1.15(0.836,1.57)
Event type			
War	250(27.8)	148(59.2)	1
Civilian	648(72.2)	447(69.0)	1.53(1.13,2.07)
Total	898 (100)	595 (66.3)	

Appendix Table 6: Sensitivity analysis of the estimate of association (adjusted OR; 95% CI) between event type (war vs. civilian) and suicidal ideation, and sensitivity analysis of the association (adjusted OR; 95% CI) between PTSD and suicidal ideation stratified by event type.

Sensitivity analysis	Adjusted OR (95% CI) between potentially traumatic event and suicidal ideation among those without PTSD	For war-related events, adjusted OR (95% CI) between PTSD and suicidal ideation	For civilian-related events, adjusted OR (95% CI) between PTSD and suicidal ideation
Using the PHQ-8 instead of the PHQ-9 to define history of depression before the event	2.45 (1.07,5.59)	2.71 (0.699,10.5)	3.19 (1.21, 9.04)
Not including indicator for marriage	2.43 (1.07, 5.53)	2.59 (0.686,9.77)	3.27 (1.16,9.19)
Including only indicator for "ever married"	2.43 (1.07, 5.55)	2.70 (0.698, 10.4)	3.30 (1.17, 9.30)
Removing the events that included "sudden death of a friend or loved one"	2.64 (0.999, 6.97)	3.03 (0.740, 12.4)	2.37 (0.600, 9.40)
Including an indicator for whether or not the soldier has been deployed	-	-	3.10 (1.09, 8.87)

*Models were adjusted for sex, age, marital status, total number of events experienced, category of event used to assess PTSD, and if the event had occurred more than 5 years ago.

Note: Each row describes the alterations to the final models while the column describes the final model used in each estimation method.

Bibliography

1. Kessler, et al., *Posttraumatic stress disorder in the National Comorbidity Survey.* Archives of General Psychiatry, 1995. **52**(12): p. 1048.
2. Friedman, M.J., T.M. Keane, and P.A. Resick, *Handbook of PTSD : science and practice*2007, New York: Guilford Press. 592.
3. Breslau, N., et al., *Trauma and posttraumatic stress disorder in the community: the 1996 Detroit Area Survey of Trauma.* Archives of General Psychiatry, 1998. **55**(7): p. 626-632.
4. Kulka, R.A., *Trauma and the Vietnam War generation : report of findings from the National Vietnam veterans readjustment study*. Brunner/Mazel psychosocial stress series. Vol. 18. 1990, New York: Brunner/Mazel. 322.
5. Hoge, C.W., et al., *Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care.[see comment].* New England Journal of Medicine, 2004. **351**(1): p. 13-22.
6. American Psychiatric, A., *Diagnostic and Statistical Manual of Mental Health Disorders*. Vol. Fourth Edition, Text Revision. 2000, Washington, DC: American Psychiatric Association.
7. Keane, T., A. Marshall, and C. Taft, *Posttraumatic stress disorder: etiology, epidemiology, and treatment outcome.* Annual review of clinical psychology, 2006. **2**(Journal Article): p. 161.
8. Keane and Kaloupek, *Comorbid psychiatric disorders in PTSD. Implications for research.* Annals of the New York Academy of Sciences, 1997. **821**(Journal Article): p. 24.
9. Schnurr, P.P., A. Spiro, and A.H. Paris, *Physician-diagnosed medical disorders in relation to PTSD symptoms in older male military veterans.* Health psychology, 2000. **19**(1): p. 91-97.
10. Chung and Breslau, *The latent structure of post-traumatic stress disorder: tests of invariance by gender and trauma type.* Psychological medicine, 2008. **38**(4): p. 563.
11. Wilcox, H., C. Storr, and N. Breslau, *Posttraumatic stress disorder and suicide attempts in a community sample of urban american young adults.* Archives of General Psychiatry, 2009. **66**(3): p. 305.
12. King, Gudanowski, and Vreven, *Alternative representations of war zone stressors: relationships to posttraumatic stress disorder in male and female Vietnam veterans.* Journal of abnormal psychology, 1995. **104**(1): p. 184.
13. King, L.A., et al., *Risk factors for mental, physical, and functional health in Gulf War veterans.* Journal of rehabilitation research and development, 2008. **45**(3): p. 395.
14. Vasterling, J., et al., *PTSD symptom increases in Iraq-deployed soldiers: Comparison with nondeployed soldiers and associations with baseline*

symptoms, deployment experiences, and postdeployment stress. Journal of Traumatic Stress, 2010. **23**(1): p. 41.
15. Fontana and Rosenheck, *A model of war zone stressors and posttraumatic stress disorder.* Journal of Traumatic Stress, 1999. **12**(1): p. 111.
16. Weathers, F.W. and T.M. Keane, *The Criterion A problem revisited: controversies and challenges in defining and measuring psychological trauma.* J Traum Stress, 2007. **20**(2): p. 107-121.
17. Adler, A.B., et al., *A2 diagnostic criterion for combat-related posttraumatic stress disorder.* J Traum Stress, 2008. **21**(3): p. 301-308.
18. Pietrzak, R.H., et al., *An examination of the relation between combat experiences and combat-related posttraumatic stress disorder in a sample of Connecticut OEF,ÄìOIF Veterans.* Journal of psychiatric research, (0).
19. Weathers, F., B. Litz, and T. Keane, *Military Trauma*, in *Traumatic Stress: From Theory to Practice*1995, Plenum: New York, New York. p. 103.
20. Laufer, Brett, and Gallops, *Dimensions of posttraumatic stress disorder among Vietnam veterans.* Journal of nervous and mental disease, 1985. **173**(9): p. 538.
21. Henigsberg, V. Folnegović-Smalc, and Moro, *Stressor characteristics and post-traumatic stress disorder symptom dimensions in war victims.* Croatian medical journal, 2001. **42**(5): p. 543.
22. Karam, E.G., et al., *The Role of Criterion A2 in the DSM-IV Diagnosis of Posttraumatic Stress Disorder.* Biological psychiatry, 2010. **68**(5): p. 465-473.
23. Kilpatrick, D.G., et al., *Posttraumatic stress disorder field trial: Evaluation from the PTSD construct - Criteria A through E*, in *DSM-IV sourcebook*, T.A. Widiger, et al., Editors. 1998, American Psychiatric Association: Washington, D.C. p. 803.
24. Creamer, M., A.C. McFarlane, and P. Burgess, *Psychopathology following trauma: The role of subjective experience.* Journal of affective disorders, 2005. **86**(2-3): p. 175-182.
25. Breslau and Kessler, *The stressor criterion in DSM-IV posttraumatic stress disorder: an empirical investigation.* Biological psychiatry, 2001. **50**(9): p. 699.
26. Schnurr, P.P., et al., *Trauma in the Lives of Older Men; Findings from the Normative Aging Study.* Journal of Clinical Geropsychology, 2002. **8**(3).
27. Stein, D., et al., *Cross-national analysis of the associations between traumatic events and suicidal behavior: findings from the WHO World Mental Health Surveys.* PLoS One, 2010. **5**(5): p. e10574-e10574.
28. Tarrier, N. and L. Gregg, *Suicide risk in civilian PTSD patients--predictors of suicidal ideation, planning and attempts.* Social psychiatry and psychiatric epidemiology, 2004. **39**(8): p. 655.
29. Jakupcak, M., et al., *Posttraumatic stress disorder as a risk factor for suicidal ideation in Iraq and Afghanistan War veterans.* Journal of Traumatic Stress, 2009. **22**(4): p. 303.
30. Davidson, J.R., et al., *Symptom and comorbidity patterns in World War II and Vietnam veterans with posttraumatic stress disorder.* Comprehensive psychiatry, 1990. **31**(2): p. 162-170.

31. Kelley, L.P., et al., *A Comparison of PTSD Symptom Patterns in Three Types of Civilian Trauma.* Journal of Traumatic Stress, 2009. **22**(3): p. 227.
32. King, L.A., et al., *Deployment Risk and Resilience Inventory: A Collection of Measures for Studying Deployment-Related Experiences of Military Personnel and Veterans.* Military Psychology, 2006. **18**(2): p. 89.
33. Pietrzak, R.H., et al., *Psychological resilience and postdeployment social support protect against traumatic stress and depressive symptoms in soldiers returning from Operations Enduring Freedom and Iraqi Freedom.* Depression and anxiety, 2009(Journal Article).
34. Gaylord, K., J. Holcomb, and M. Zolezzi, *A comparison of posttraumatic stress disorder between combat casualties and civilians treated at a military burn center.* The Journal of trauma, 2009. **66**(4 Suppl): p. S191-S195.
35. Brinker, M., et al., *Severity of combat-related posttraumatic stress disorder versus noncombat-related posttraumatic stress disorder: a community-based study in American Indian and Hispanic veterans.* Journal of nervous and mental disease, 2007. **195**(8): p. 655.
36. Blake, D.D., et al., *The development of a clinician-administered PTSD scale.* Journal of Traumatic Stress, 1995. **8**(Journal Article).
37. Vogt, D., *Deployment stressors and posttraumatic stress symptomatology: comparing active duty and National Guard/Reserve personnel from Gulf War I.* Journal of Traumatic Stress, 2008. **21**(1): p. 66.
38. Breslau, N., et al., *Trauma exposure and posttraumatic stress disorder: a study of youths in urban America.* Journal of Urban Health, 2004. **81**(4): p. 530-544.
39. Weathers, F.W., J.A. Huska, and T.M. Keane, *PCL-C for DMS-IV*1991, Boston: National Center for PTSD - Behavioral Science Division.
40. Riddle, J.R. *Millennium Cohort: the 2001-2003 baseline prevalence of mental disorders in the U.S. military*. 2007. **60**, 192.
41. Kroenke, K., R.L. Spitzer, and J.B. Williams, *The PHQ-9: validity of a brief depression severity measure.* Journal of general internal medicine, 2001. **16**(9): p. 606-613.
42. Sheehan, D.V., et al., *The Mini-International Neuropsychiatric Interview (M.I.N.I.): The Development and Validation of a Structured Diagnostic Psychiatric Interview for DSM-IV and ICD-10.* Journal of clinical psychology, 1998. **59**(Supl 20): p. 22-33.
43. Breslau, N., et al., *The structure of posttraumatic stress disorder: latent class analysis in 2 community samples.* Archives of General Psychiatry, 2005. **62**(12): p. 1343.
44. Friedman, M.J., et al., *Considering PTSD for DSM-5.* Depression and anxiety, 2011. **28**(9): p. 750-769.
45. Zivin, K., et al., *Suicide Mortality Among Individuals Receiving Treatment for Depression in the Veterans Affairs Health System: Associations with Patient and Treatment Setting Characteristics.* American Journal of Public Health, 2007. **97**(12): p. 2193.
46. Griffith, J., *Citizens Coping as Soldiers: A Review of Deployment Stress Symptoms Among Reservists.* Military Psychology, 2010. **22**(2): p. 176-206.

47. Bell, J. and E. Nye, *Specific symptoms predict suicidal ideation in Vietnam combat veterans with chronic post-traumatic stress disorder.* Military medicine, 2007. **172**(11): p. 1144-1147.
48. Lemaire, C.M., *Factors associated with suicidal ideation in OEF/OIF veterans.* Journal of affective disorders, 2011. **130**(1-2): p. 231-8.
49. Maguen, S., *PTSD subclusters and functional impairment in Kosovo peacekeepers.* Military medicine, 2009. **174**(8): p. 779-85.
50. Weiss, S.J., *Neurobiological alterations associated with traumatic stress.* Perspectives in psychiatric care, 2007. **43**(3): p. 114-22.
51. Boscarino, J.A., *A prospective study of PTSD and early-age heart disease mortality among Vietnam veterans: implications for surveillance and prevention.* Psychosomatic medicine, 2008. **70**(6): p. 668.
52. McFarlane, A.C., *The long-term costs of traumatic stress: intertwined physical and psychological consequences.* World psychiatry, 2010. **9**(1): p. 3-10.
53. Morgan, C., 3rd, et al., *Exaggerated acoustic startle reflex in Gulf War veterans with posttraumatic stress disorder.* Am J Psychiatry, 1996. **153**(1): p. 64-68.
54. Marshall, R., et al., *Symptom patterns associated with chronic PTSD in male veterans: new findings from the National Vietnam Veterans Readjustment Study.* Journal of nervous and mental disease, 2006. **194**(4): p. 275-278.
55. American Psychiatric, A., ed. *Diagnostic and Statistical Manual of Mental Disorders*. 3 ed. 1987: Washington, DC.
56. Brunet, A., et al., *The Peritraumatic Distress Inventory: a proposed measure of PTSD criterion A2.* Am J Psych, 2001. **158**(9): p. 1480-1485.
57. Bovin, M.J. and B.P. Marx, *The importance of the peritraumatic experience in defining traumatic stress.* Psychological bulletin, 2011. **137**(1): p. 47-67.
58. Brewin, Andrews, and Rose, *Fear, helplessness, and horror in posttraumatic stress disorder: investigating DSM-IV criterion A2 in victims of violent crime.* Journal of traumatic stress, 2000. **13**(3): p. 499.
59. Brewin, C.R., et al., *Reformulating PTSD for <I>DSM-V</I>: Life after Criterion A.* J Traum Stress, 2009. **9999**(9999): p. n-a.
60. Kilpatrick, D.G., H.S. Resnick, and R. Acierno, *Should PTSD Criterion A be retained?* J Traum Stress, 2009.
61. Adler, A.B., C.A. Castro, and D. McGurk, *Time-driven battlemind psychological debriefing: a group-level early intervention in combat.* Military medicine, 2009. **174**(1): p. 21-28.
62. Riddle, J., et al., *The millennium Cohort Study: a 21-year prospective cohort study of 140,000 military personnel.* Military medicine, 2002. **167**(6): p. 483.
63. Bedard-Gilligan, M. and L.A. Zoellner, *The utility of the A1 and A2 criteria in the diagnosis of PTSD.* Behaviour research and therapy, 2008. **46**(9): p. 1062-1069.
64. Mausner, J.S. and A.K. Bahn, *Epidemiology; an introductory text*1974, Philadelphia: Saunders. xi, 377 p.
65. Centers for Disease Control and Prevention, N.C.f.I.P.a.C. *Web-based Injury Statistics Query and Reporting System (WISQARS)*. [cited 2011 April 19]; Available from: http://www.cdc.gov/ncipc/wisqars.

66. Panagioti, M., P. Gooding, and N. Tarrier, *Post-traumatic stress disorder and suicidal behavior: A narrative review.* Clinical psychology review, 2009. **29**(6): p. 471.
67. Mann, J.J., et al., *Classification trees distinguish suicide attempters in major psychiatric disorders: a model of clinical decision making.* The Journal of clinical psychiatry, 2008. **69**(1): p. 23-31.
68. Krysinska, K. and D. Lester, *Post-traumatic stress disorder and suicide risk: a systematic review.* Archives of Suicide Research, 2010. **14**(1): p. 1-23.
69. O'Donnell, M.L., et al., *Should A2 be a diagnostic requirement for posttraumatic stress disorder in DSM-V?* Psychiatry research, 2010. **176**(2-3): p. 257-260.
70. Jakupcak, M., et al., *Hopelessness and suicidal ideation in iraq and afghanistan war veterans reporting subthreshold and threshold posttraumatic stress disorder.* The Journal of nervous and mental disease, 2011. **199**(4): p. 272-275.
71. Panagioti, M., P. Gooding, and N. Tarrier, *Post-traumatic stress disorder and suicidal behavior: A narrative review.* Clin Psychol Rev, 2009. **29**(6): p. 471-82.
72. Tarrier, N. and L. Gregg, *Suicide risk in civilian PTSD patients--predictors of suicidal ideation, planning and attempts.* Social psychiatry and psychiatric epidemiology, 2004. **39**(8): p. 655-661.
73. Breslau, et al., *Previous exposure to trauma and PTSD effects of subsequent trauma: results from the Detroit Area Survey of Trauma.* The American Journal of Psychiatry, 1999. **156**(6): p. 902.
74. Breslau, Davis, and Andreski, *Risk factors for PTSD-related traumatic events: a prospective analysis.* The American Journal of Psychiatry, 1995. **152**(4): p. 529.
75. Larson, G., R. Highfill-McRoy, and S. Booth-Kewley, *Psychiatric diagnoses in historic and contemporary military cohorts: combat deployment and the healthy warrior effect.* American Journal of Epidemiology, 2008. **167**(11): p. 1269.
76. McLaughlin, R., L. Nielsen, and M. Waller, *An evaluation of the effect of military service on mortality: quantifying the healthy soldier effect.* Annals of Epidemiology, 2008. **18**(12): p. 928.
77. Hawton, K. and K. van Heeringen, *Suicide.* The Lancet, 2009. **373**(9672): p. 1372-1381.
78. Kuehn, B.M., *Military Probes Epidemic of Suicide.* JAMA: The Journal of the American Medical Association, 2010. **304**(13): p. 1427-1430.
79. Rothman, K.G., Sander, *Modern Epidemiology*. 2 ed1998, Philadelphia: Lippincott-Raven.
80. Calabrese, J.R., *PTSD comorbidity and suicidal ideation associated with PTSD within the Ohio Army National Guard.* The Journal of clinical psychiatry, 2011. **72**(8): p. 1072-8.
81. Vasterling, J.J., M. Verfaellie, and K.D. Sullivan, *Mild traumatic brain injury and posttraumatic stress disorder in returning veterans: Perspectives from cognitive neuroscience.* Clinical psychology review, 2009. **29**(8): p. 674-684.

82. Bryant, R.A., *Posttraumatic stress disorder and mild brain injury: controversies, causes and consequences.* Journal of clinical and experimental neuropsychology, 2001. **23**(6): p. 718-28.