COMBAT BLUES: DEPRESSION AND POST TRAUMATIC STRESS IN COMBAT

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ABSTRACT

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by Jonathan Kochert

Combat deployments are a difficult time for the military personnel who are sent in support of them. These deployments consist of many stressors that may result in negative psychological outcomes in the individuals who are deployed. It is estimated that between 11% to 17% of military personnel who have been sent in support of the recent combat operations in Iraq and Afghanistan are at risk of developing PTSD (posttraumatic stress disorder) and/or depression (Hoge, Castro, Messer, McGurk, & Cotting, 2004). As such, there is a growing need to gain an understanding of how to reduce the risk of PTSD and depression in military personnel in combat. This study takes a step in addressing this by attempting to gain a better understanding how PTS (posttraumatic stress symptoms) and depression, trend over time and are influenced by combat exposure and various resources (morale, unit cohesion, and perceptions of positive deployment benefits) during combat.

This study follows a cohort of 181 National Guardsmen from the Midwestern United States throughout their 10-month deployment in Afghanistan, in support of Operation Enduring Freedom 2009-2010. The data collected from monthly pen-and-paper questionnaires was analyzed using a multilevel variable time series design. The results indicated that symptoms of PTS and depression gradually worsened over time. PTS displayed a slight curvilinear trend during which symptoms increased until the 8th month but then slightly improved, but this trend failed to hold significance when the other predictors were included in the model. Combat exposure predicted both PTS and depression, such that PTS and depression symptoms would increase with each exposure to a combat situation. Morale and perceptions of positive deployment benefits were

negatively related to both PTS and depression. Unit cohesion had a negative relationship with PTS and depression entered when alone in the model, but it lost significance when the other predictors were included in the model. By examining the trend of PTS and depression over time and the relationship of PTS and depression with combat exposure, morale, unit cohesion, and perceptions of positive deployment benefits, this study attempted to contribute to greater understanding of how negative psychological outcomes develop during combat.

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INTRODUCTION

Combat Blues: Depression and Post Traumatic Stress in Combat

Few would deny that combat deployments are a difficult time for Soldiers, with possible negative psychological outcomes. Military combat operations consist of multiple sources of stress that may negatively affect Soldiers who are deployed in support of them. In addition to the apparent risk of physical harm of combat, deployments also may include many other stressors, such as separation from family and friends for extended periods of time, difficulty in communicating with those back home, conditions that range from inconvenient to harsh, absence of privacy, and the unique combination of uncertainty, boredom, and threat (Adler, Huffman, Bliese, & Castro, 2005). Stressors range from physical, such as unfriendly terrain and extremes of noise and temperature, to psychological, such as exposure to traumatic events and/or, being forced to make decisions with severe consequences, under pressure with either limited information or information overload. Although the potential physical consequences of combat are apparent, such as being wounded, the psychological effects are sometimes overlooked. Currently, between 10% and 50% of combat operation injuries are classified as psychological (Thomas & McCreary, 2006). Research has shown that combat/deployment stressors and combat exposure can result in risks to mental health, such as posttraumatic stress disorder (PTSD), depression, impairment in social functions, and ability to work (Magnus, Suvak, & Litz, 2006). Conservative estimates put the risk for clinical rates of PTSD and depression between 11% and 17% after the deployment in support of Operation Enduring Freedom (OEF, Afghanistan) and Operation Iraqi Freedom (OIF, Iraq; Hoge, Castro, Messer, McGurk, & Cotting, 2004). In a meta-analytic review of PTSD, the

estimated prevalence of PTSD in OIF and OEF veterans is between 4.7% and 19.9% (Magruder & Yeager, 2009). Despite the growing awareness of the psychological problems (depression, acute stress, or anxiety) related to deployments, it has been observed that psychological problems have increased significantly in Soldiers deployed to Afghanistan in 2010 compared to 2005 (J-MHAT-7, 2011). This does not account for veterans who may develop delayed onset mental health issues several months to years after the deployment, which is likely also increasing.

Soldiers and Marines returning from combat acknowledge that they are suffering impairment in work and social functions due to the deployment-related mental health issues (e.g. PTSD, depression) arising from being deployed to a combat zone (Hoge et al., 2004). Although the psychological effects of combat have been acknowledged, it is only in the last few decades that serious examination of the effects of combat trauma and stress has been explored (Weathers, Litz, & Keane, 1995). Organizations that participate in war and peacekeeping operations have a need to minimize and prevent the psychological ill effects of these deployments on their members. Often this is accomplished with training and prevention programs (Adler, Litz, & Bartone, 2003). In order to develop and implement effective programs, the nature of the relationship between stressors and mental health needs to be understood. This is especially true today, considering that OEF and the recently ended OIF have been the longest sustained U.S. ground operations since the Vietnam War.

Although direct combat with its inherent danger, conflict, and trauma, has traditionally been considered a sufficient cause for post-service mental health problems (e.g. PTSD), research has suggested that it is only one of the sources of the stress and trauma. Other interrelated cultural, social, economic, and individual factors play a role in influencing the mental health outcomes of a deployment (Maguen, Suvak, & Litz, 2006). In addition to individual

characteristics, it is important to examine general contextual factors (e.g. living conditions, unit cohesion) as well as the traditional traumatic incidents (e.g. witnessing death, exposure to direct combat; Maguen, Suvak, & Litz, 2006).

The military and deployments are a unique occupation and situation, different from their civilian counterparts in many ways (e.g. military personnel are not allowed to quit their jobs during their term and the activities job consist of are more closely controlled by the "employer," so that it is a total institution). National Guard Soldiers as an element of the reserve component of the military are a unique subcategory of the military however, in that they are civilians who are part-time Soldiers. Traditionally, they remain stateside in the U.S. training; and occasionally deploying for rescue, domestic aid, and martial protection. The reserve component during the time period after World War II has primarily served in garrison units, only serving one weekend a month and two weeks a year (Griffith, 2011). With the "Total Force" policy of 1970, the standing army was reduced, and an increase of combat and combat support units were added to the Army Reserve and National Guard. This would reduce the need for a large standing active duty army; if a need arose, reserve elements would be called up to serve in large military operations. Since the Operation Desert Storm and lately Operation Enduring Freedom and Operation Iraqi Freedom, the nation has seen the first major use of reserve units since the Korean War (Griffith, 2011). Griffith (2011), in his review of reservist involvement in combat, reported between 460,000 and 1.2 million Reserve and National Guard personnel have been deployed in support of OEF and OIF. This number has greatly increased in the last two years and is still growing as reserve components are still being deployed in large numbers.

Taking into account military status, active duty versus reservist (National Guard, Army/Marine reserve components) is important. Past research suggests, that military status is a

predictor of the risk of developing mental health issues post-deployment, with reserve components exhibiting higher risk (Wolfe, Erickson, Sharkansky, King, & King, 1999). There is evidence that suggests reserve component military personnel, such as those in the National Guard and Reserve, may have more adverse responses to the stressors of war compared to their active duty counterparts (e.g. Browne et al., 2007; Milliken, Auchterlonie, & Hoge, 2007; Wolfe et al., 1999; Vogt, Samper, King, King, & Martin, 2008).Why reserve component military personnel tend to have more adverse reactions to combat deployment compared to their active duty counterparts is still being researched, but several factors have been proposed in the literature. Active duty personnel are more prepared militarily, have greater familiarity with combat operations, and they may also have more resources available upon returning from combat to aid in recovery and prevention (Griffith, 2011; Wolfe et al., 1999). Reservists on the other hand have reported several risk-inducing factors such as slightly lower comradeship and unit cohesion, greater problems with family, and feeling less informed compared to active duty Soldiers (Browne et al., 2007). Also for reservists, deployment and military life may be a greater disruption to their daily regimen, increasing the amount of stress they experience. Even after adjusting for the socio-demographic differences between active duty and reservist, there still remained a significant difference in PTSD rates in returning personnel, with more reservists reporting PTSD compared to their active duty counterparts after reintegration, and reserve personnel are also found to report higher rates of PTSD and related symptoms immediately following the deployment (Browne et al., 2007). The relationship between reserve status and increased PTSD rates is not consistent in all studies however, with other reports suggesting that reserve components and active duty units do not differ in PTSD and related symptoms (Griffith, 2011; US Department of Army, 2008). When

considering rates of PTSD and other mental health issues due to deployment concerns, there are several other factors that influence risk aside from duty status.

In a war zone, military personnel experience a wide range of stressors, both acute and chronic, and of various intensities (Maguen et al., 2006). Existing literature has shown that personnel who are deployed to war zones and peacekeeping missions are at risk of developing multiple forms of psychological strains (reviews by Billington, Younkins, & Kochert, 2009; Griffith, 2010). Historically, research on the effects of combat services is conducted years or decades after the personnel return home, with the exception of recent and ongoing wars in the Middle East (OIF, OEF; Hoge, 2011). Research on the outcomes of combat strain typically measure mental health by surveys taken once the military personnel return from the deployment (e.g. Browne et al., 2007; Dhillon & Boyd, 2010; Englehard & van den Hout, 2007; Fielder et al., 2006; Hotopf et al., 2006; McKenzie et al., 2004; Richardson, Naifeh, & Elhai, 2007; Rona et al., 2007; Sareen et al., 2007; Stretch et al., 1996; Toomey et al., 2007). Another common method involves longitudinal studies that are conducted postdeployment with two or more surveys (e.g. Gray, Bolton, & Litz, 2004; Milliken et al., 2007; Wolfe et al., 1999). Although these postdeployment studies do provide important insight into the deployment, they often fail to establish causality. Additionally, many of these studies rely on the participants' recollection of combat stressors several months to years after the deployment and as such may have issues concerning accuracy of individual recall.

Occasionally data will be collected before and after the deployment (e.g. Hoge et al., 2004; Sawamura,et al., 2008), and more rarely, one or two measures are collected during the actual deployment in war or peacekeeping theater of operations (e.g. Adler, Huffman, Bliese, & Castro, 2005; MacDonald, Chamberlain, Long, Pereira-Laird, & Mirfin 1998; Meis, Erbes, Kaler, Arbisi,

& Polusny, 2011; Mulligan et al., 2010; Stuart & Halverson, 1997). Only one monthly longitudinal study of deployed Soldiers has been conducted to the knowledge of the author. This was an online-based survey completed monthly by 177 Soldiers from combat, combat support, and combat service and support units (9 separate units) deployed to Iraq (Lee, Goudarzi, Baldwin, Rosenfield, & Telch, 2011). They examined several combat stressors, PTSD, traumatic brain injury, depression, and general distress, and they noted that monthly variations of war zone stressors were related to the variations in PTSD symptoms and general stress and anxiety. Although not clearly reported in the results, the authors suggest this relationship was also found for depression. This study failed to include possible resources (e.g. unit cohesion, morale) in the study, and although they collected measures of specific war zone stressors, the study failed to report relationships of specific combat stressors to the various strains measured. There is little research on the experiences of military personnel over time during a deployment, most likely due to difficulty of collecting data at multiple time points from personnel in a stressful, high operation tempo, and potentially chaotic environment. The use of predeployment and postdeployment design does allow for examination of the change in participants mental states during the deployment; they often have similar weakness of the postdeployment-only designs, in which participant recall is relied upon for reporting of several of the combat stressors and resources. The longitudinal designs, despite many of the measurement difficulties inherent in these situations, do rely less on long term memory recall and can provide a stronger argument for causality.

The current study is unique in that it examines an intact cohort of National Guard Soldiers from activation (a phenomena unique to reserve components), through pre-deployment training, and the duration of the deployment. The focus of this study is the relationship between stressors,

resources, and mental health outcomes (PTSD and depression) during the deployment, in contrast to the more common assessment of mental health at a post-deployment time point. The current study addresses this by examining data collected monthly from a National Guard company deployed for ten months in a heavy combat zone in eastern Afghanistan. In doing so, potential antecedents and the development of mental strains from combat and deployment-related stressors are examined. To the knowledge of the author, no prior study has attempted to conduct a longitudinal study with this broad a scope.

Mental Health Outcomes of Combat

The two most commonly assessed mental outcomes of combat stress are PTSD and depression. These two are highly comorbid, and often veterans who suffer from PTSD will also suffer from depression (Weathers et al., 1995). As such, both depression and PTSD have been the core surveillance items throughout all the Mental Health Advisory Team's (MHAT) monitoring the mental health concerns of the military in OEF and OIF. The risk of the development of PTSD and depression due to combat deployment can be noted in that Soldiers who meet the criteria for major depression and PTSD are significantly more numerous after deployment to Iraq and Afghanistan than before (Hoge et al., 2004). It is accepted in the stress literature that exposure to prolonged or particularly intense stressors is associated with the onset of depression and trauma-related mental health disorders (Kelly & Vogt, 2009). Although a majority of studies show a decline in mental health from pre-deployment measures to post-deployment, there are some inconsistencies. In an examination of Soldiers deploying for a peacekeeping operation to Kosovo, it was found that Soldiers reported more PTSD symptoms and depression pre-deployment than post-deployment, suggesting anticipatory affects (Maguen, Litz, Wang, & Cook, 2004).

How far in advance of the actual deployment the pre-deployment data was collected was not reported, and thus is difficult to compare to other studies. Additionally, the unique nature of this peacekeeping operation may have also influenced the findings.

In occupational stress, potential buffers to strain are divided into two broad categories, individual factors and contextual/social factors (Bliese & Britt, 2001). In the research of combat stress there has been a great deal of interest in the individual factors that increase or decrease the risk of negative mental health outcomes of combat exposure. The focus of this study is to examine several contextual factors (i.e. morale, cohesion, & positive perceptions of deployment) that may have a buffering effect of exposure to combat.

The literature review draws from military research of both peacekeeping and combat deployments, and although peacekeeping deployments are conceptually different from combat operations, they have many stressors that overlap with combat deployments (Moldjard, Fossum, & Holen, 2003).

Posttraumatic Stress Disorder (PTSD)

PTSD is an anxiety disorder that can occur in individuals who experience an extreme stressor that triggers feelings of fear, helplessness, or horror. PTSD consists of several symptoms that develop in response to traumatic events. Symptoms typically fall into categories: reexperiencing, avoidance, withdrawal, and arousal. According to the *Diagnostic and Statistical Manual of Mental Disorders 4th ed*. (APA, 1994) several criteria (criteria A – F) need to be met for diagnosis of PTSD. The first is exposure criteria (criterion A). The exposure criteria consist of two sub-criteria that an event must meet to be considered traumatic: (1) the individual experiences an event with actual or threatened death or serious injury, and (2) the individual response involves

intense fear, helplessness, or horror. Then as a result of the traumatic incident the individual needs to display the following three symptom categories: (B) persistent reexperience of the traumatic event, (C) avoidance of stimuli associated with the trauma and numbing of general response, (D) persistent symptoms of increased arousal. The final criteria are (E), that the symptoms must persist for more than a month and (F) that there is significant distress or impairment.

The current DSM-IV definition and diagnosis of PTSD is often criticized, especially in its application with veterans of combat deployments. Although the DSM-IV (APA, 1994) and traditional perceptions of PTSD emphasize that a singular traumatic event is perceived as source of the development of PTSD, recent research recognizes a variety of factors related to development of PTSD (King et al., 1999). In an analysis of self-reported data from Vietnam veterans, it was found that that there are multiple sources of stressors contributing to PTSD from combat (e.g., threat perception, malevolent environment; King, King, Gudanowski, & Vreven, 1995). There is some disagreement in the combat stress literature on how the stressor for PTSD should be operationally defined (King. et al, 1995; Vogt, King, & King, 2007). It has been suggested that reoccurring situations and less intense events and circumstances can induce PTSD symptoms. There is evidence that suggest that less intense but repeated events may create a cumulative effect that can induce PTSD (King et al., 1995; Sutker, Uddo-Crane, & Allain, 1991). The DSM-IV (APA, 1994) fails to recognize the effects of these low-level accumulated stressors as a potential source for development of PTSD. A combat zone has an array of intense stressors, several of which easily meet the criteria of a singular traumatic event outlined in the DSM-IV (APA, 2004), it also has other less intense, more chronic stressors. These chronic stressors do not satisfy the DSM-IV criteria, but still impact long-term mental health and military personnel adjustment (Maguen et al., 2006).

The DSM-IV symptoms have also been criticized culturally. Norris and Slone (2007) in their review of the epidemiology of trauma and PTSD, make a point that in several different cultures (China & Caribbean Islands) the Western-based diagnosis of PTSD may miss other underlying symptoms and effects of trauma exposure.

Additionally, there is growing interest in partial PTSD, in which individuals' only display one or two of the categories of PTSD required for the DSM-IV (APA, 1994). It has been found that individuals with partial PTSD, who would fail to meet the criteria for diagnosis of PTSD, exhibit significant decreases in function in both school and work (Norris & Slone, 2007). If partial PTSD is accounted for, there would be a large increase in the number of people who are judged to develop PTSD in response to traumatic exposure. In their review of PTSD symptomatology, Meis and colleagues (2011) state that the current DSM criteria for PTSD symptomatology may be incomplete and fail to represent the true complexity of posttraumatic stress reactions. Additionally, they noted that in longitudinal studies that factor stability is often not observed, suggesting that symptom clusters may fluctuate over time.

As noted PTSD is a complex distress outcome. Rates of PTSD have been found to vary greatly between studies (Maguen et al., 2006), and this is likely due to the wide range of methods used, different scales and cutoff scores, convenience sampling and varied time lapses between return from deployment and time of measurement. There is a growing body of research that suggests some individuals exhibit an increase in PTSD symptoms over time or develop PTSD symptoms a significant amount of time after exposure to traumatic events (this is known as delayed onset PTSD; Ehlers, Mayou, and Bryant, 1998; Gray, Bolton, & Litz, 2004; Wolfe et al., 1999). The concept that clinically significant or functionally impairing PTSD can develop after a delay from exposure to traumatic event challenges the traditional assumptions of development of

PTSD. Most of the theoretical conceptualizations are built upon classical conditioning of fear and anxiety to traumatic events (Gray et al., 2004).

While not covered in the scope of this research, there are many individual characteristics that have been studied as potential risk factors relating to PTSD. These include personality characteristics, gender, age, ethnicity, and life experiences. A good review of individual characteristics and their relationship with PTSD can be found in Maguen et al. (2006) or in Brewin, Anderson and Valentine's (2000) meta-analysis.

Pre-trauma individual characteristics may make some individuals more prone to negative effects of combat stressors. They interact with the combat stressor, such that PTSD's relationship to preexisting characteristics is dependent on the level of the stressor (King, King, Foy, & Gudanowski, 1996). When exposed to high stress, negative outcomes are likely regardless of individual characteristics; under less extreme stressors, those with the preexisting vulnerability are more likely to generate negative outcomes.

Aside from individual characteristics, there are several contextual factors that also contribute. The unique nature of each combat operation, war, peacekeeping operation, and other possible deployments, carry their own factors that contribute to risk of mental health outcomes. Differences in average levels of PTSD have been noted between Vietnam veterans and Gulf War veterans (Wolfe et al., 1999), likely due to several factors including, but not limited to, duration of combat operations, support in home nation, and differing demographic makeup of Soldiers who engaged in each combat. Each theater of operations carries its own unique nature and intensity of stressors, which results in variation in the rates of PTSD (Manguen et al., 2006). Even within a theater of operation and within the same conflict, the contextual factors may shift, influencing the risk of adverse mental health outcomes. The data collected in 2010 showed that Soldiers in

Afghanistan were reporting significantly increased rates of PTSD symptoms, compared to past MHAT reports (J-MHAT-7, 2011), suggesting the contextual factors of the war had shifted. A few possible causes for this increase include an increase in combat operations by the Soldiers and overcrowding of existing bases. It should be noted that in the US Army's MHAT studies of mental health in Iraq and Afghanistan, the PTSD scale used is referred to as acute stress, because the technical definition of PTSD requires that it occurs after a traumatic event (J-MHAT-7, 2011; MHAT-V, 2008).

Depression

Depression is classified as a mood disorder by the DSM-IV (APA, 1994). Although most clinical research in depression is focused on diagnosed major depression, the focus of this study is on the general symptoms of depression, not necessarily clinical diagnosis. Depression is sometimes included in combat mental health studies due to it comorbidity with PTSD, but a majority of these studies have been cross-sectional and have led to a debate about the relationship between depression and PTSD (Vogt et al., 2007). Although depression is acknowledged as a potential mental health outcome of deployment, it is not examined to the same extent as PTSD among Soldiers, and there is less knowledge about the individual and contextual characteristics that may increase risk among Soldiers. Some evidence suggests that there may be a reciprocal relationship between depression and PTSD, but the casual link is unclear. Vogt, King, and King (2007) suggest that there may be a third factor or factors that create the risk for PTSD and depression. Aside from its possible comorbity with PTSD, it is important to examine depression during a deployment. In a review of reasons Soldiers were referred to restoration center (a in theater program designed to return Soldiers impaired by stress-related conditions back to duty)

during their deployment to Afghanistan, 13% (2009) and 20% (2010) were due to depression-related issues, compared to anxiety 5%,7% and PTSD 4%, 6% (2009, 2010, respectively; J-MHAT-7, 2011). These rates suggest that depression is a major cause for concern for the combat effectiveness of units deployed in combat operations.

Although depression has been examined less in conjunction with deployments compared to PTSD, there still exists evidence that it is a potential mental health risk linked to deployments. In a longitudinal cohort study of combat Soldiers and Marines from Iraq and Afghanistan, Hoge et al. (2004) noted a significant increase in depression symptoms. Depression has been linked to deployment stressors in Soldiers deployed to Kosovo both during and three to four months after the deployment (Alder & Dolan, 2006). In Soldiers returning from Kosovo, generic low magnitude stressors had a significant relationship with postdeployment depression symptoms (Maguen, Litz, Wang, & Cook, 2004). Troops deployed in the Gulf War reported higher scores of clinical depression and anxiety compared to a non-deployed stateside unit (Sutker, Davis, Uddo, & Ditta, 1995a).

There is less known about how different individual characteristics either protect or increase risk of deployment-related depression. As with PTSD, some individual characteristics have been shown to be related to risk of depression from deployment (e.g. neuroticism and extraversion; Peng, Riolli, Schaubroek, & Spain, 2011). As with PTSD, ethnicity may contribute to development of deployment-related depression; Sutker et al. (1995a) found that minority veterans from the Gulf War were at greater risk of developing clinical levels of depression.

Current Study

As shown in the previous sections, negative mental outcomes (depression and PTSD) of combat have been clearly documented. The goal of the current study is to examine how stressors of combat and potential resources can affect the rate of self-reported depression and PTS. As noted before, rates of PTSD and depression vary between combats and among military personnel returning from these combat deployments, generating a need to gain greater understanding about the nature of the relationship between combat deployment and negative mental health outcomes. By examining the differences in individuals' exposure to mental health risk factors (time deployed and combat exposure) and the differences in individuals' perceptions of psychological resources (morale, unit cohesion, and positive perceptions of deployment), the differences in individual's mental health may be explained (Hobfoll, Banerjee, & Britton, 1994).

Conservation of Resources (COR) theory (Hobfoll, 1988; 1989) provides the theoretical bases for the hypotheses proposed in this study. COR is a stress theory that incorporates an emphasis on both environmental and internal processes. COR is a resources-focused theory, suggesting that individuals are driven to build, protect, and retain resources, and what is perceived as threatening to the individual is the loss or potential loss of these resources (Hobfoll, 1989). The advantage that COR theory provides the current study is its approach to stress, in which the focus is on external demands and less on internal demands, in contrast to the more cognitive approaches found in other stress theories (Kohn, 1996; Lazarus, 1966; Lazarus & Folkman, 1984, 1987). The external focus allows for the examination of exposure to fearful events (combat exposure) compared to attempting to assess only the internal assessment of individual's perception of each exposure. Additionally, COR theory has been used in the examination of the relationship of prolonged exposure to stressors and distress (Kohn, 1996). The conceptualization of external

demand as a chronic stressor is directly related to the present study's use of duration of time deployed in a combat zone as a stressor. Another strength of the COR theory in comparison to an appraisal-focused approach is that COR is more tangible to conceptualize as; the nature of personal, social, and environmental resources combined with threats to resources determine the response to stress and the outcomes (Hobfoll, 2001). The insight that this approach to the problem of negative mental outcomes from combat provides may prove to be beneficial in development of approaches to training and prevention.

Hobfoll (1989) defined stress as a "reaction to the environment in which there is (a) the threat of net loss of resources, (b) the actual net loss of resources, or (c) a lack of resources gained following the investment of resources" (p. 516). Resources are defined as "those objects, personal characteristics, conditions, or energies that are valued by the individual" (Hobfoll, 1989, p. 516). One of the principles of COR theory assumes that individuals who have greater resources (e.g., Soldiers with good morale, unit cohesion, and positive perceptions of deployment benefits) are less vulnerable to the stressors (e.g., combat exposure and time deployed) and are more capable of rebuilding any lost resources (Hobfoll, et al., 1994). It can also be assumed, in contrast, that Soldiers who lack valuable resources are more at risk to potential stressors and less able to recover if there is a loss of resources. Soldiers who have greater resources, found in their overall morale, unit cohesion, and perceiving benefits from the deployment for example, will be less likely to experience resource loss with combat exposure or over the duration of the deployment, because they will have more resources left after experiencing stressors.

Overview of Stressors

In the conceptualization of stressors, two existing definitions were considered. Adler and colleagues (2003) define stressor in their review of military stressors as "A stressor is some event external to the individual that the individual perceives as demanding, frustrating, or in some way exceeding his or her available coping resources." (Adler et al., 2003, p. 149). The second definition is that an event or situation is defined as stressful when it is perceived by the individual as surpassing their coping resources, values, self-concept, or competencies (Lazarus &Folkman, 1984). This study examines two main sources of stressors in combat, the length of time deployed and the exposure to fear-inducing events (e.g. combat exposure). Both of these proposed stressors meet the criteria of the above definitions.

Time Deployed

Research on expatriates working in multinational companies in the civilian sector who are transferred overseas suggests a pattern of adjustment to the new location. Similarly, literature shows international students who study abroad often experience a u-shaped curvilinear trend over time explaining adjustment to the new country (e.g. review of employees by Black & Mendenhall, 1990; study of international students by Hechanova-Alampav, Beehr, Christiansen, & Van Horn, 2002). This u-shaped curve suggests that after an initial period of positive excitement (or lack of stress) there comes a period of (negative) readjustment, followed by adjustment to new circumstances. Although it can be expected that military personnel deployed may follow a similar pattern, the unique nature of combat and unique chronic and reoccurring traumatic experiences may produce a different pattern. In a review of the data provided by the Mental

Health Advisory Teams (MHAT), Hoge (2011) noted that longer deployments were related to higher rates of depression and PTSD.

It is likely that the continued exposure to the chronic stressors (low magnitude stressors) present in a war zone (Maguen et al., 2006) may accumulate over the duration of the deployment, so that there would be increasing negative stress reactions as resources are depleted. Extended exposure to work demands (e.g. work overload, overtime) has been demonstrated to be related to symptoms of poor well-being (e.g. difficulty relaxing, poor sleep quality, negative affect; Geurts & Sonnentag, 2006; Sonnentag, 2001; Sonnentag & Zijlstra, 2006). Beyond the demanding nature of combat operations, the constant exposure to maladaptive environments overtime has been linked to negative mental health outcomes (King et al., 1995). In an examination of stressors experienced by deployed Soldiers, several chronic stressors were noted, such as operating in desert climates, long duty days, crowding, lack of private time, physical workload, and boredom (Stretch, Bliese, & Marlowe, 1996), separation from home and family, and physical conditions (Adler et al., 2003.

When Soldiers who were deployed reported major stressors of the deployment, 61% of the Soldiers rated low magnitude but constant or high-duration stressors (i.e. separation from home and family and physical conditions) as moderately stressful or greater (Alder at al., 2003). The chronic stress of being separated from family was reported by 83% of Gulf War veterans in one report, and of these 68% reported this class of stressor to be moderate or greater in magnitude (Stretch et al., 1996). In a study of Soldiers deployed to Iraq, concerns about life and family disruptions were significantly related to PTS symptoms (PTSS), depression, and mental health function (Vogt, Proctor, King, King, & Vasterling, 2008). Evidence in the deployment literature suggests that the stressor of being separated from home remains relatively constant during the

deployment (Adler et al., 2006). Stressors such as these are often defined in military stress literature as chronic stressors, because they often have no clear and immediate end, exist for a long duration of time (often the whole term of the deployment), and require substantial changes in identity and lifestyle (Kelly & Vogt, 2009). In a longitudinal examination of stressors during a deployment of peacekeepers in the former Yugoslavia, several stressors such as boredom, family issues, isolation, and ambiguity, stayed at relatively the same magnitude throughout the deployment (Bartone, Vaitkus, & Adler, 1998). In a longitudinal examination of New Zealand Defense Forces during a peacekeeping operation, it was noted that daily hassles consisting of everyday concerns stayed constant throughout the deployment (MacDonald et al., 1998). Interestingly, it was noted that deployment hassles (mission demands), decreased linearly throughout the deployment, suggesting that the work demands may have improved either from adaptation or the Soldiers getting more skilled at performing them. This may have been due to the specific mission experienced by these personnel and should be interpreted with caution, however. All of these chronic stressors were found to have significant positive relationships with depression and psychiatric symptoms (MacDonald et al., 1998). In the construction of the *Deployment Risk and Resilience Inventory* (*DRRI*), several of the chronic stressors noted above were stated as deployment stressors in focus groups of previously deployed soldiers (King et al., 2006) and were shown to have moderate correlations with deployment-related PTSD and depression. In addition to the direct effect low magnitude stressors have on mental health, a traumatic event or combat exposure when combined with increased low magnitude stressors, will have an increased risk of PTSD (Vogt et al., 2007).

Temporal factors, such as the duration of a stressor, may make it more difficult for the individual to cope with the stressor the longer they are exposed to it (Beehr & Bhagat, 1985), as

they become exhausted to the constant exposure of the stressors and use up existing resources (Adler, Litz, & Bartone, 2003; Adler et al., 2005). If the individual adjusts to the stressors over time, then the effects of the stressors may be halted (Adler et al., 2005). In an examination of military personnel who had been deployed to Somalia, it was found that low-magnitude stressors such as separation from family, difficult and uncomfortable environment, and difficulties of military life, were significantly related to post deployment PTSD (Litz et al., 1997; Orsillo, Roemer, Litz, Ehlich, & Friedman, 1998). Most of these stressors are chronic, in the sense that they exist more or less continuously during the deployment, and therefore time in the combat zone serves as a proxy variable for their accumulation.

The environment that a soldier is exposed to during a deployment is one of the most commonly researched low magnitude stressors. This can consist of the environment of the combat zone (e.g. desert, Iraq; high mountain desert, Afghanistan; jungle, Vietnam) and the living conditions that can range from the Spartan but relative comfort of main bases to the tents and plywood shacks of Forward Operation Bases (FOB). Physical living conditions can vary greatly across combat operations depending on the "maturity of the theater of operations" (Alder et al., 2006; p. 157). As the operation progresses, the living conditions tend to consistently improve. There are always exceptions to this, such as the development and occupation of new forward operating bases, which will lack amenities found in more established bases. King et al. (1995) showed that malevolent environment (e.g. poor living conditions, daily hassles) had a distinct effect on the development of PTSD in Vietnam veterans. An indirect effect of malevolent environment was mediated by perceived threat on PTSD. When gender was accounted for, a direct path from malevolent environment to PTSD was established for males. This gives support to the growing body of literature that suggests that PTSD is not purely dependent on acute stressors

(combat exposure; Fontana &Rosenheck, 1998; Maguen et al., 2006). In the development of the *DRRI*, the construct of difficult living conditions and working environment was identified as one of the situational stressors that Soldiers would be exposed to (King et al., 2006) and was shown to have moderate correlations with PTSD and depression. Additional evidence of the environmental effects on mental health is that Soldiers who were deployed in the Gulf War but not exposed to combat or causalities still displayed levels of distress relating to the deployment (Sutker et al., 1996).

The research into deployment mental health is finding that low-level chronic stressors are affecting Soldier's mental health. Low-magnitude stressors were found to be significantly related to PTSD in military personnel who had returned from Somalia (Litz et al., 1997). General life stressors have been found to have a significant positive relationship with post-deployment depression in peacekeepers deployed to Kosovo (Maguen et al., 2004). In summation, lower level stressors have been linked to depression and PTSD symptoms (Kelly & Vogt, 2009). The longer that Soldiers are exposed to these low magnitude stressors the more likely it is that they will affect mental health.

Deployment length in general is a concern for many deployed Soldiers, with over 60% of Soldiers reporting a great deal of concern about deployment length (MHAT-V, 2008), making it the primary cause of concern or trouble among Soldiers. Literature supports that deployment length predicts psychological distress in deployed Soldiers (Adler et al., 2005; Rona, Hull, Earnshaw, & Wessely, 2007; Sundin, Forbes, Fear, Dandeker, & Wessely, 2011). Rona and colleagues (2007) found that military personnel deployed for longer periods of time displayed more psychological distress; additionally, none of the other variables collected (role in combat, type of deployment, time in forward area, and problems at home) explained the relationship

between length of deployment and psychological distress. Adler and colleagues (2005) point out that there is no clear definition of what constitutes a long versus short deployment, with deployments ranging from less than a month for some advisory roles to 22-month deployment experienced by the Minnesota National Guard (Associated Press, 2010). Regardless, if deployment length is regarded as a continuous variable, it appears that the longer the Soldier is deployed the more distress they report. In an examination of Soldiers deployed to Bosnia, deployment length had a positive relationship for men with post-deployment PTSD measured within 30 days of returning to home station (Adler et al., 2005).

Past Mental Health Advisory Team (US Army Surgeon General) studies have shown that months deployed are related to behavioral health indices (e.g. depression, acute stress symptoms; J-MHAT-7, 2011). Mental health problems were noted to increase with each month deployed and then start to decrease in the last third of the deployment (MHAT-V, 2008). This was proposed to be due to optimism of returning home soon. In examination of deployment length of Soldiers deployed on a peacekeeping mission to Bosnia, the mean scores of depression and PTSD increased until the 5-6 month period and then remained constant (PTSD) or decreased slightly (depression; Adler et al., 2005). Slightly different trends over time were noted in a monthly longitudinal study of Soldiers deployed to Iraq; using growth curve analysis it was noted that mental health (PTSD, depression, anxiety) was worse during the middle of the deployment (month 8) and gradually returned to initial levels at the end (month 16), controlling for war zone stressors (Lee et al., 2011). Psychological distress displayed an unusual trend in New Zealand military personnel deployed in a peacekeeping operation; the distress levels were highest at the pre-deployment and six-to-seven month follow-up post deployment periods, decreased at early stages of deployment (one month), increased at mid-deployment, and then decreased again at post-deployment (MacDonald et al.,

1998). In the same study, depression showed a similar trend; it increased from pre-deployment through mid-deployment, decreased at the post-deployment, then increased again for the follow-up six-to-seven months post-deployment (MacDonald et al., 1998). In an examination of Soldiers deployed to Bosnia, deployment length had a positive relationship for men, with postdeployment depression reported within 30 days of returning to home station (Adler et al., 2005). Based on the existing literature of mental health over the duration of the deployment and the effects of duration of deployment on mental health, it is expected that (poor) mental health (depression and PTS) will increase at the beginning of the deployment, then stabilize around the midpoint, and show signs of recovery as the deployment draws to an end.

It can be conceptualized that the initial decrease in mental health is caused by the resources being consumed by the constant exposure to chronic stressors. According to COR theory the net loss of resources will be resisted by the individual but will result in distress as measured in negative mental health outcomes (Hobfoll et al., 1994). Over the duration of the deployment the Soldiers may develop more effective coping mechanisms or become adjusted to the stressors causing the resource loss, thus minimizing resource loss and allowing them to build more resources; ultimately, this results in reduced distress reactions.

Hypothesis 1: PTS will display a curvilinear trend over time, such that it will worsen initially, peak about mid-deployment, then improve slightly.

Hypothesis 2: Depression will display a curvilinear trend over time, such that it will worsen initially, peak about mid-deployment, then improve slightly.

Combat Exposure

One of the most common combat deployment stressors that is examined is exposure to combat; it has been directly linked to PTSD and depression. Combat exposure (e.g. being shot at, engaging the enemy, seeing dead Soldiers and civilians) is an inherit part of combat. Additionally, it is an increasing stressor of the current combat operations; J-MHAT-7 (2011) report showed that exposure to combat has been increasing for combat units (Army and Marines) in Afghanistan compared to past mental health evaluations conducted in either Afghanistan or Iraq. Several studies demonstrate the relationship between combat exposure and risk for PTSD (Adler, Vaitkus & Martin, 1996; Fontana & Rosenbeck, 1998; Luxton, Skopp, &Maguen, 2010; Hoge, Aucherlonie, & Milliken, 2006; King et al., 1995; Koenen, Stellman, Stellman, & Sommer, 2003; Southwick et al., 1993). A strong relationship was established of being shot at and handling dead bodies with prevalence of PTSD in Soldiers and marines returning from Iraq (Hoge et al., 2004), such that a linear trend was noted with increased rates of PTSD and number of fire fights. But the relationship between exposure to combat and PTSD can be complex and varied. In one longitudinal post war study of Gulf War veterans, combat exposure was found to be the strongest predictor of PTSD, across both time periods (Wolfe et al., 1999). Conversely, in a study of Gulf War veterans, it was found that combat exposure did not predict PTSD at one and six months post deployment, but did predict PTSD two years later. In an analysis of Vietnam veterans, it was determined that there were multiple sources of stressors from combat (King et al, 1995). Using structural equation modeling, traditional combat (e.g. observable standard combat exposure) had an indirect path to PTSD through perceived threat (personal judgment of threat of event or circumstances). Exposure to atrocities and abusive violence (e.g. events or circumstance that seemed extreme from war-related experiences) had a direct effect on PTSD. Interestingly, it was

found that the relationship of malevolent environment (e.g. poor living conditions, daily hassles) to PTSD was partially mediated by perceived threat. This is in contrast to *DSM 4th ed*. (APA, 1994) in which the criteria for PTSD require a distinct event. In an examination of predictors of PTSD in Soldiers returning from Somalia, it was found that dangerous duties had an indirect path through fear to the PTSD scores, and being fired upon had both an indirect path as well as a weak direct path to PTSD in the same model (Fontana, Litz, & Rosenheck, 2000).

One of the possible explanations for the difference in rates of PTSD related to combat exposure across combats is multiple differences that exist between service in each of these different wars (e.g. rates of exposure, differences in environment, cultural effects; Magnues et al., 2006). Additionally it may not be the amount of combat exposure but the quality (intensity) of the exposures. Considering evidence that the relationship between combat exposure and PTSD is mediated by perceived threat, it is possible that the threat element of the combat exposure determines the risk of PTSD. Brewin et al. (2000) demonstrated that trauma severity predicts PTSD in military studies. The intensity of the battle as measured by number of fatalities to which a military unit is exposed, and it is related positively to the number of psychiatric casualties they incur (Belenky, Noy, & Solomon, 1987). Using a measure of combat exposure focusing on the experiences that are likely to produce fear, helplessness, or horror, Maguen et al. (2004) showed that higher PTE scores (combat exposure) in Kosovo veterans predicted PTSD symptoms.

Increased perceptions of combat severity have been linked to PTSD and psychological distress (Sutker et al., 1995b). King and colleagues (1999) noted that the perceived threat of bodily harm or death mediated the effects of objective combat exposure and the severity of PTSD symptoms. This link to perceived threat was also noted by Ozer and colleagues' meta-analysis of PTSD (2008), in which the perceived life threat of the traumatic event was significantly related to

PTSD, and this relationship did not vary across type of study or methods used. In the development and validation of the *DRRI* it was found that the construct of perceived threat had a much stronger correlations with PTSD and depression (.51, .31; respectively) than the construct of combat exposure (.32, .16; respectively; King et al., 2006). Based on previous research, it is believed the best means to concisely measure combat exposure as a predictor of PTSD is to measure the Soldier's reaction to an event. This captures the perceived threat that a combat exposure event may project upon the Soldier.

Combat exposure's relationship with depression has not been examined to the same extent as with PTSD, but a few studies have shown that they are related. In Hoge's (2011) review of MHAT reports, it was noted that increased combat intensity and frequency contributed to increased rates of both PTSD and depression. In a sample of Soldiers deployed to Iraq, combat exposure was found to be significantly related to depression (Vogt et al., 2008). In the same study, a strong relationship was found between depression and perceived threat. Combat exposure in Soldiers deployed to OIF/OEF significantly predicted depression levels post-deployment (Luxton, Skopp, & Maguen, 2010). In an examination of Marines returned from Iraq, it was found that combat exposure had a significant positive relationship with depression and PTS (Armistead-Jehle, Johnston, & Wade, 2011). In an assessment of Canadian military personnel who had been involved in various combat and peacekeeping missions, it was noted that combat exposure was related to post-deployment major depression and PTSD (Sareen et al., 2007). Using a measure of combat exposure (PTE scale) which focuses on the experiences that are likely to produce fear, helplessness, or horror, Maguen et al. (2004) showed that higher PTE scores in Kosovo veterans predicted PTSD symptoms.

Soldiers exposed to combat may perceive this as a threat to their bodily health and existence. In addition to the concern that combat exposure presents a risk to the individual, the potential threat is not isolated but is extended to concern for their fellow Soldiers and civilians who may be present. As such, the greater the threat of loss that the individual is exposed to, the greater their perceived risk is (Hobfoll et al., 1991). Friends and colleagues are potential resources for people under stress, and according to COR theory, the greater the risk of loss of resources the more the individual will attempt to protect the resources and build more; and this will increase the amount of distress the individual experiences. Based on the existing literature, it is expected that Soldier's reported depression and PTS scores will be positively related to exposure to traumatic incidents.

Hypothesis 3: Combat exposure will be positively related to PTS and depression.

Current Study's Resources

Resources provide a degree of protection from the stressors that the Soldier is experiencing while deployed. They can work by either providing the Soldiers with support, by providing additional resources, or buffering the negative effects of the stressors. These resources, according to COR theory, provide the means that a Soldier can build, maintain, or rebuild lost resources and provide resilience to the inherent stressors of combat deployment. Resources that are examined in this study are unit cohesion, morale, and perceived benefits of the deployment. Unit cohesion has been recognized as a potential protective factor, a buffering variable, to risk factors by the U.S. military (e.g. combat exposure, deployment concerns; MHAT-V, 2008; adapted from Bliese & Castro, 2003). Morale, although sometimes conceptualized as an outcome of deployment stressors (MHAT-V, 2008; adapted from Bliese & Castro, 2003), appears to have more potential

influence as a resource, reducing the risk of negative mental health outcomes. Perceived positive benefits of the deployment have been suggested in deployment literature as potential resource, drawing from the positive psychology framework (Britt & Dickinson, 2006). By including positive perceptions in this study (e.g., resources are a set of positive variables), it is hoped that we can expand insight in this growing field of psychology.

Morale

Morale has long been recognized as an important element of the military, but despite this, relatively little empirical research has been conducted on it and its effects on performance and well-being (Britt & Dickinson, 2006). Compared to the interest in PTSD, there have been relatively few studies done on the antecedents and consequences of morale. It has been suggested that this is due to the existing imbalance in the field between maladaptive and adaptive responses. Because of this imbalance, there has arisen a growing interest in "positive psychology" (Britt & Dickinson, 2006). Advocates of positive psychology stress that maladaptive problems and adaptive functions are two separate constructs, not opposite ends of a dimension (Britt & Dickinson, 2006; Hart, 1994). In an attempt to identify potential predictors of post deployment morale, Maguen and Litz (2006) found that positive military experiences, general overseas stressors, and unit cohesion predicted post-deployment Soldier morale (Maguen & Litz, 2006). Although these predictors have been found to also predict mental health outcomes of deployment, they also found that traumatic events did not have a relationship with morale, suggesting that that morale and negative psychological constructs may not lay on a single continuum. Hart (1994) asserts that antecedents of positive psychology (morale and positive perceptions) are likely to differ from or at least explain unique variance to antecedents of dysfunctional responses.

Throughout the limited research on morale, there have been a wide range of definitions (Britt & Dickinson, 2006; Manning, 1991), with most authors placing different degrees of emphasis on three factors often used to describe morale: satisfaction, group cohesiveness, and motivation (Motowildo & Borman, 1978). Manning (1991), in his review of research and theory of morale, defined it as "the enthusiasm and persistence with which a member of a group engages in the prescribed activity of the group" (p. 455). Manning emphasized that morale must have more than an affective component in order to have the motivational effect on Soldier's performance.

The Army's definition of morale can be found in FM 6-22 (field manual *Army Leadership; previously FM 22-100*) which defines morale as "the human dimension's most important intangible element. It is a measure of how people feel about themselves, their team, and their leaders" (p.7-8). This is the definition that is taught to all Soldiers in Basic Training and is the conceptualization used in this study. Because this study uses the common single item measures of morale discussed below, it is assumed that the Soldiers will use the above frame of reference in answering the item.

Not surprisingly, as a reflection of the diverse conceptualizations of morale, it has been measured differently in various studies (Britt & Dickinson, 2006). The most commonly used measure is a single-item measure of morale, which asks the military personnel to rate their level of personal morale and unit morale (Bliese & Britt, 2001; Gal, 1986; Schumm, Gade, & Bell, 2003). Although the single item measures are not the best in a psychometric view and are unlikely to capture the complete construct domain, this measure is an adequate measure due to two factors (Britt & Dickinson, 2006). First, the single item measure has high face validity and is direct in its measurement. Secondly, because there is a lack of clear understanding of the construct of morale,

this may be the best means to measure it. This simple measure uses the Soldier's implicit concept of morale; it most likely matches the definition of morale taught by the Army, as found in FM 6-22.

Unfortunately, the lack of consensus on the definition and how to measure morale has hindered the research and understanding of the construct (Britt & Dickinson, 2006). When morale is considered from the viewpoint of positive psychology as a motivational orientation, it can be conceptualized by its relationships to positive outcomes, such as psychological growth and thriving (e.g. deriving benefits from stressful events; Seligman & Csikszentmihalyi, 2000). Although morale has a variety of definitions, it is typically conceptualized as the psychological factor that is assumed to allow Soldiers to persevere under conditions of extreme stress (Manning, 1991). Some researchers have used conceptions of morale that are broad and consist of multiple subdimensions such as unit cohesion and esprit de corps, but others defined it more narrowly, as a psychological state of mind of well-being (Britt et al., 2007). In a confirmatory factor analysis (CFA) conducted on measures of morale and unit cohesion taken from Soldiers deployed to Kosovo, unit cohesion and morale loaded on separate factors, providing support that they are distinct constructs (Britt et al., 2007). In Britt and colleagues' review of Soldier's conceptualization of morale, they noted across several studies that Soldiers tend to view morale as a motivational state, providing drive in contrast to purely affective states (Britt et al., 2007). Often an implicit assumption about morale is that military personnel with high levels of morale are less likely to develop negative psychological outcomes from a deployment (Britt & Dickinson, 2006). Personnel who report high levels of morale during a military operation should also report higher levels of well-being and benefits from participating in the operation. Additionally, it has been suggested that the loss of unit morale maybe a potential combat stressor (Weathers et al., 1995).

Morale has been shown to change over a deployment; in a study of peacekeepers in Kosovo, it was found that the post-deployment morale was significantly higher than the pre-deployment morale (Maguen & Litz, 2006). Their results suggest that morale is influenced by multiple factors that occur over the duration of a deployment. In their review of literature of morale, Britt and Dickenson (2006) suggested that it is expected that morale will fluctuate over the duration of a deployment, stressing the need for use of longitudinal studies to examine its effects.

Morale has been shown in OIF and OEF veterans to have a strong relationship with PTSD severity and psychological distress (Whitesell & Owens, 2012). Positive unit morale appeared to protect Israeli Soldiers from psychiatric breakdown in their war with Lebanon 1982 and in the Arab-Israeli war 1973. In an examination of male reserve Israel Soldiers, it was found that the Soldiers who suffered from acute or late onset PTSD rated their unit morale as very low (Steiner & Neumann, 1978). In a post deployment evaluation of Soldiers who had returned from Kosovo, it was found that a combined measure of Soldiers' and perceived unit morale was significantly related to postdeployment depression levels (Maguen et al., 2004). In a separate analysis of Soldiers at mid-deployment on a peacekeeping mission in Kosovo, it was found that morale had a significant negative relationship with depression scores (Britt et al., 2007). The impact of morale on Soldiers' mental well-being is of interest especially considering that it has been noted that in 2010, individual Soldier morale has been declining in Afghanistan relative to 2009 and 2005 (J-MHAT-7, 2011).

Similar to self-esteem, morale represents an internal individual resource. In COR theory, self-esteem has been presented as a principal individual resource and a building block for other resources (Hobfoll, et al., 1994). Soldiers with higher morale will be more resilient to the stressors of deployment, due to having greater resources and the potential to use morale to rebuild

lost resources, thus reducing their risk of developing negative mental health outcomes. Based on COR theory and the review of the existing literature of morale's relationship with deployment-related negative mental health outcomes, it is anticipated that Soldier's morale, consisting of their perceptions of individual and unit morale combined will have a negative relationship with their reported depression and PTS scores.

Hypothesis 4: Morale will be negatively related to PTS and depression.

Unit Cohesion

Unit cohesion is an important social element in military units. It is generally considered a desirable characteristic of units and is related to increased performance and productivity (Griffith, 1997; Oliver, Harman, Hoover, Hayes, & Pandhi, 1999). Until World War II, the primary motivating factor for Soldiers was thought to be patriotism, pride, or leadership, however in several studies conducted briefly after WWII, examining what motivated men in combat it was found that it was membership to the primary group that was the strongest determinate (Greenberg & Jones, 2011). Since then, the research has shown the unit cohesion and morale predicted loyalty to the group and mental health of members of the unit (Greenberg & Jones, 2011). It has been suggested by military sociologists that small-group relations have a strong influence on the Soldier (Griffith, 1988). Unit cohesion, when measured at mid-deployment in Soldiers deployed to Kosovo, was unrelated to deployment stress, events during the deployment, and work overload, indicating that it might be independent of these constructs (Britt et al., 2007). In a meta-analytic review of military cohesion studies, unit cohesion was found to have a moderate positive correlation with group performance, and a slightly weaker positive relationship with individual

performance (Oliver et al., 1999). It was also found to have a strong effect on job satisfaction, and weak to moderate effect on retention.

It has been noted in previous literature on morale that it has been often seen as synonymous with unit cohesion (Gal & Manning, 1987; Manning, 1991). Even though unit cohesion and morale are distinctly separate constructs, they have often been found to be highly correlated in several studies but not all, with some studies finding morale and unit cohesion to be negative or unrelated (Britt & Dickinson, 2006). These studies provide evidence that unit cohesion can be high while morale is low and provide support that view that unit cohesion and morale are independent constructs. One of the reasons that in past literature morale and unit cohesion have overlapped is the broad and varied definitions of morale being used. High unit cohesion by itself should not be expected to be related to a motivational orientation (Britt & Dickinson, 2006). Additionally, unit cohesion has also been suggested to be a predictor of morale, thus should be considered a separate construct (Maguen & Litz, 2006). In their review of morale, Maguen and Litz (2006) suggest that sources of morale appear to vary and are situationally dependent. In Manning's (1991) review of morale, unit cohesion, and esprit de corps, he states that unit cohesion is a group factor and distinct from morale, although it may act as a determinate. For the purposes of this study, unit cohesion is examined as an independent resource factor in predicting resistance to depression and PTS.

Another common factor that is often grouped with unit cohesion is social support. Group cohesion and social support have many similar theoretical commonalities within their constructs and are considered to overlap considerably (Griffith, 1997). In military research, social support is often combined or even termed "unit cohesion" (Greenburg & Jones, 2011). The military's conceptualization of unit cohesion, maintains a separation from satisfaction and well-being (Manning, 1991). Additionally, military writers tend to conceptualize unit cohesion differently

from academic psychologists, the military conceptualizing it as bonding of Soldiers to sustain will and commitment to the mission and each other (Manning, 1991). Group cohesion and social support are two constructs that have the most similarity to military conceptualization of unit cohesion and also morale (Manning, 1991).

In the research of group cohesion and social support, the difference between the two constructs is the presumed differences in outcomes; the emphasis on group cohesion has been focused on its effects on group performance, but social support has been more traditionally linked to buffering the effects of stressors on individual strains (Griffith, 1997). Nevertheless, within the study of military context and traumatic events, there is an interest and established link between cohesion and individual adjustment to stress (Griffith, 1997). The US Army acknowledges the resilience nature of unit cohesion and as such examines it as part of its mental health surveys (J-MHAT-7, 2011). One of the reasons that there is an interest in unit cohesion is that it has the potential to be modified and is a good candidate for preventative measures (Brailey, Vasterling, Proctor, Constans, & Friedman, 2007). Group cohesion has long been associated with resistance to stressors; Shils (1950) noted in observations of American Soldiers in World War II that primary group cohesion provided support from stressors of the deployment. According to Maguen, Suvak, and Litz's (2006) model of war-zone trauma, unit cohesion should reduce the risk of PTSD.

Unit cohesion is traditionally measured using individual responses to questionnaire items (e.g. Griffith, 1988; Griffith, 2002; Sutker et al., 1996) compared to using a group level measure of the construct. Although there is some disagreement about the appropriateness of this measurement, evidence exists to suggest that the use of individual level measure has greater predictive value compared to the using group or unit level. In analysis of garrison (non-deployed) Soldiers on the effects of group cohesion on several outcomes including individuals'

strain, Griffith (2002) found that more variance was explained by the individuals' reports of unit cohesion compared to when cohesion was accounted for by the company. In the same study, unit cohesion was found to significantly relate with Soldier well-being, controlling for company membership, but only using the individual measures of unit cohesion (Griffith, 2002). This was supported in an examination of unit cohesion at several Army battalions; it was found that examining unit cohesion at the group (battalion) level was not a significant predictor of individual level PTSD, but individually reported unit cohesion had a moderate relationship (Brailey et al., 2007). Based on these studies, it was determined that in order to examine the effect of group cohesion on individual strain, it was preferred that unit cohesion be measured on the individual level.

Unit cohesion can affect individuals' well-being via the social support, acceptance, and opportunities for reality testing, and not being alone in suffering, that it provides (Griffith, 2002). In an analysis of several combat arms units stationed in Europe, it was found that both task and emotional measures of group cohesion partially mediated the effects of stressors on individual strains measured by the *General Well-Being Scale* (Griffith, 1997). In examination of Soldiers from the UK during deployment to Iraq, it was found that Soldiers who perceived higher quality unit cohesion were less likely to be flagged for possible mental health issues on the *General Health Questionnaire 12 item (GHQ-12)* and PTSD (Mulligan et al., 2010).

In the meta-analysis of military studies of cohesion, unit cohesion was found to have a moderate correlation with physical and psychological well-being (Oliver et al., 1999). The feeling that one is part of the unit can reduce psychological despair (Greenberg & Jones, 2011). It has been suggested by the stress-buffering hypothesis that social support reduces the effects of stressful events via feedback and reinforcement from the social network of the individual

(Greenburg & Jones, 2011). In combat, this feedback can be from validation from the command and fellow Soldiers after traumatic events or difficult tasks (Greenberg & Jones, 2011). This feedback helps the Soldier find meaning in what happened and thus reduces adverse psychological consequences. Additionally, the feeling of belonging, security, and feeling valued by a social network, may enable the Soldier to better cope and adapt to stressful circumstances.

In an examination of Soldiers who had been previously deployed to OIF or OEF, unit cohesion was found to have a significant negative relationship with PTSD; it was also found to have a weak interaction effect, buffering the effects of negative life events on PTSD such that the relationship between negative life events and PTSD weakened as unit cohesion increased (Brailey et al., 2007).

Unit cohesion has been observed to change over the duration of a deployment; in an examination of Soldiers deployed to peacekeeping operations in Kosovo, it was noted that the post-deployment cohesion was higher than the pre-deployment levels (Maguen & Litz, 2006). Unit cohesion was found to be related with PTSD symptoms in Gulf War veterans, such that the greater amount of problems with coworkers and chain of command, there was an increased rate of PTSD (Alder, Vaitkus, & Martin, 1996; Sutker et al., 1996), accounting for rank and combat exposure. Sutker and colleagues suggest that a lack of unit problems help relieve the PTSD symptoms. The possible buffering effects of unit cohesion have been noted in past examinations of deployed Soldiers (J-MHAT-7, 2011), but only in sample sizes exceeding 1000, due to the small effect size of the interaction. Because of this, it is not unusual for studies with moderate to small samples to fail to detect the moderating effects of unit cohesion on risk factors such as combat exposure. The relationship between unit cohesion and PTSD is not uniformly consistent; in an examination of a small sample of OIF and OEF veterans, unit cohesion failed to have a significant

relationship with PTSD and general distress (Whitesell & Owens, 2012). The sample used in that study was only 171 veterans, post-deployment and recruited using on-line resources and should be interpreted with caution.

Although Maguen, Suvak, and Litz's (2006) model of war-zone trauma was primarily developed to demonstrate the interrelatedness of several contextual and individual factors on the effects of traumatic incidents towards the development of PTSD, it can be extended to other mental health outcomes, in particular depression. It suggested that unit cohesion will act as a buffer reducing the risk of negative mental health outcomes (depression) from traumatic incidents (Maguen et al., 2006; Weathers et al., 1995). In an examination of Soldiers deployed to Haiti as part of Operation Restore Democracy, consensus of leadership ratings within a unit, used as a proxy measure of strong intergroup cohesion and positive group climate, weakly predicted individual levels of depression, while measures of work stressors were significantly related to depression (Bliese & Britt, 2001). Although they failed to find strong support of level of agreement in leadership ratings (consensus) predicting depression, the interesting observation in their multilevel analysis was that there was not significant variation between groups on the slopes of depression across variables, suggesting that group membership in regards to consensus of leadership ratings and depression may not have a major impact. In an examination of Soldiers at mid-deployment in Kosovo, unit cohesion was found to have a moderate negative relationship with depression (Britt et al., 2007). In a post-deployment examination of Marines who were deployed to Iraq, unit cohesion was found to have a significant negative relationship with depression and PTSD (Armistead-Jehle et al., 2011). Additionally, there was a weak interaction effect of unit cohesion and combat exposure, supporting the buffering effect of unit cohesion, such that Marines who reported lower unit cohesion and were exposed to more combat reported higher

PTS in contrast to those who reported both higher cohesion and combat exposure. The interaction for depression was such that although individuals who reported both high and low cohesion had a positive relationship between combat exposure and depression, those who reported high unit cohesion had a weaker relationship.

There is some concern with the research in unit cohesion and mental health outcomes in that the current literature relies on retrospective measures of unit cohesion (Armistead-Jehle et al., 2011; Brailey et al., 2007), but the present study addresses this as it measures the unit cohesion throughout the deployment, removing the concern of retrospective reporting.

In examinations of social support (a similar construct to group cohesion) it has been suggested that it is a crucial resource; it is the primary means of gaining other resources that are not processed solely by the individual, and it is crucial to the sense of identity and development of self-esteem (Hobfoll et al., 1994). The commitment to the group and the mission that group cohesion represents will act similarly to social support, in that it provides self identity and support to the individual. Soldiers who have higher perceptions of group cohesion will be more resilient to resources loss, based on the greater opportunity to draw resources from the group. Based on the existing literature and COR theory, it is expected that Soldiers' perceived unit cohesion will be negatively related to their PTS and depression.

Hypothesis 5: Soldiers' reported unit cohesion will be related to their mental health, such that Soldiers who report higher levels of unit cohesion will report lower levels of depression and PTS.

Perceived Positive Deployment Benefits

Positive psychology, including general positivity and sense of purpose (Seligman & Chikszentmihalyi, 2000), is proposed to act as a resource against stressors. The tendency to view life situations positively has been noted as a key element of self-esteem, which has been recognized as a personal resource that provides support to individuals and minimizes the tendency for negative events to become overwhelming (Cast & Burke, 2002). Conceptually, the tendencies to view life with a positive perspective act as a resource and can be used to limit resource loss and generate more resources as needed. There has been a call for the examination of positive psychology in the stress literature and in the examination of combat stress (Britt, Dickinson, Moore, Castro, & Alder, 2007). Soldiers reporting similar positivity measures (e.g. engagement, meaningfulness) are more likely to report positive benefits after a mission (Britt & Dickinson, 2006).

Although positive perceptions of the deployment can be related to overall morale, they have been found to only be moderately correlated, and positive perceptions can be considered a unique construct (Litz et al., 2006). Perceptions of benefits from deployment and measures of morale were found to load onto distinct factors in a CFA conducted on data collected from Soldiers deployed to Kosovo (Britt et al., 2007). Positive perceptions of deployment were not found to be significantly related to general life stressors, general operational stressors, predeployment unit cohesion or post deployment morale; they were found to be moderately positively related to pre- and post-deployment morale and combat exposure (Maguen & Litz, 2006). Interestingly, general overseas military stressors, which measured a low-magnitude stressors, were not related to positive perceptions of the deployment, and there was a significant but weak relationship between positive perceptions and potentially traumatic events, suggesting that positive perceptions of the

deployment maybe independent of low level stressors and not strongly dependent on traumatic events.

Perceptions of the mission can have an effect on the development of PTSD. Litz et al. (1997) suggest that seeing positive aspects in the mission will translate to reduced PTSD. In a longitudinal postdeployment study of veterans who participated in the humanitarian mission in Somalia, it was found that positive perceptions (events or circumstances during the mission that were perceived as positive) were linked to reduced risk of immediate distress with some of the veterans (those who later developed delayed onset PTSD; Gray, Bolton, & Litz, 2004). Negative perceptions (stressful events and circumstances that created discomfort or distress) were risk indicators for the development of immediate and chronic distress (PTSD). World War II and Korean War veterans who perceived their military experiences as positive reported fewer PTSD symptoms; the results suggest that positive perceptions of deployment experiences have a direct effect on PTSD symptoms (Aldwin, Levenson, & Spiro, 1994). Positive perceptions of military service were found to moderate the negative relationship with PTSD symptoms' severity in Soldiers who were deployed to Somalia, although positive perceptions of the humanitarian mission had no relationship (Litz, Orsillo, Friedman, Ehlich, & Batres, 1997).

The link between positive perceptions of deployment and PTSD is not uniformly consistent. Using the *National Vietnam Veterans Readjustment Study* (*NVVRS*) data, Fontana and Rosenheck (1998) found that liabilities (perceptions of negative psychological outcomes; e.g. self-impoverishment, disillusion) were positively related to the risk of PTSD, although they did not find that positive perceptions (e.g. self-improvement, affirmation of patriotic beliefs) of the deployment related to the probability of PTSD. These results should be interpreted with caution; positive and negative perceptions were developed from coding open-response items and were not

taken from a measure explicitly intended to addresses positive/negative perceptions. Positive perceptions of deployment to Kosovo failed to predict PTSD symptoms or depression postdeployment; negative perceptions had a significant relationship with PTSD symptoms and depression (Maguen et al, 2006).

Considering the potential for perceptions of gaining positive benefits from the deployment as a resource and the existing trends in the literature, it is expected that the Soldier's perceptions of gaining positive benefits from the deployment will be negatively related to their reported depression and PTS scores.

Hypothesis 6: Soldiers' perceived positive deployment benefits will be directly related to Soldier's mental health, such that Soldiers who report more positive benefits of deployment will report less PTS and depression.

CHAPTER II

METHODS

Procedure

This study used data collected by the author and the author's advisor during activation, training, and combat deployment (to Afghanistan) of a Midwestern National Guard unit.

The questionnaires were pencil-and-paper instruments distributed monthly to the participants. Pre-activation and training (times 1-4) data was collected at times when the majority of the unit were gathered in one location, often a large meeting room or auditorium. The data collected during the actual combat deployment was a more complicated process. The author would have to make combat patrols to the locations of several of the elements of the unit and would distribute packets of the questionnaires to the senior noncommissioned officer of that element, with instructions to distribute and collect the anonymous questionnaires as close to the first of the month as possible. Then on later patrols the completed measures would be collected by the author and mailed back to his academic advisor. The data was entered into SPSS format by a fellow graduate assistant working for the author's academic advisor.

A total of 14 time points (monthly) of data were collected. The initial (time 1) surveys included demographic data and informed consent sheets, and were administered by the author's academic adviser at pre-activation meeting of the National Guard unit. Although a 100% volunteer rate was achieved at the first administration, several of the participants who initially agreed to participate did not complete the following training or the deployment for various reasons (e.g. other duty obligations, physically unfit for combat duty). Unfortunately, with the methods used to ensure confidentiality of the participants, there was no way to track which individuals were

removed from the initial participant pool. This attrition is very common for units being activated and deployed, resulting in the current practice of having a unit start the activation process at 120% strength with the anticipation of up to 20% losses during the activation and training.

After the preactivation data collection, the next three monthly data collections (time 2-4) were conducted during training in the U.S. to provide a baseline for the deployment observations. Time 2 questionnaires were administered by the author's academic advisor at U.S. Army deployment training center located the Southeastern United States. The questionnaires for the third and fourth time points, during the last two months of training were administered by the author at another U.S. Army deployment center located in Southern United States. All remaining data collections, the 5th through 14th month (referred in following analysis as months 1 -10), were during the deployment in Afghanistan. This data was often collected by requesting senior noncommissioned officers and platoon leaders to distribute the anonymous questionnaires in their units and have Soldiers return them to central locations. The author would collect completed surveys when he was able to join a combat patrol going to the various locations occupied by each element of the unit. The final time point (month 10) was collected as the unit was redeploying back from the deployment and was unique in that it was collected at Bagram Airfield while the unit was in transit home to the U.S.

Participants

Participants in this study were members of one U.S. National Guard Infantry company from the Midwest. The unit's mission was to train, assist, and mentor the local Afghani police. The unit was divided into three platoons consisting of three squads each, and each squad within each platoon had one district of Afghani National Police (ANP) station assigned to it. The

mission required that the squads travel to the ANP district stations and conduct a variety of missions ranging from training to conducting combat patrols to provide security for the ANP as they conducted their daily operations. Additional combat missions, separate from the ANP-specific mission, were periodically assigned to subunits. Combat risks that the unit was exposed to included fire fights, IEDs (improvised explosive devices), mortar and rocket attacks, and exposure to wounded and dead local nationals and U.S. military personnel. The living arrangements for the unit were spare, ranging from relatively private but small rooms in plywood shacks to living in large open rooms with bunk beds.

At a company meeting prior to activation, all 181 participants were approached and requested to complete the questionnaire voluntarily. All 181 Soldiers completed the pretest questionnaire; this is not uncommon with military and paramilitary samples (Norris, Maguen, Litz, Adler, & Britt, 2005). During the subsequent data collections in training, there was a less than 100% response rate. In addition to some Soldiers choosing not to complete the questionnaire at these times, there were others who were not available due to being on duty elsewhere. The following data collections that occurred during the deployment period were also less than 100%. Data collection during the deployment was extremely difficult because subunits of the company were separated to multiple different forward operating bases.

In addition to the difficulty of getting the questionnaires to the participants, a major difficulty with the data set was the frequency with which individuals forgot their identification numbers which they chose for themselves. When Soldiers during the study had forgotten their identification number, they were instructed to create a new identification number and remember it for subsequent data collections. Because of this, it was impossible to match all identification

numbers throughout all time points of the studies. Fortunately, there were usually several time points in a row for each identification number, allowing their use in most analyses.

Of the 181 Soldiers who completed the preactivation questionnaire, 176 reported about their previous deployment status; of these 125 (71%) had not been deployed before, 32 (18%) reported being deployed once before, and 19 (11%) reported two or more deployments. Of the 178 providing information about rank, 5 (3%) were commissioned officers, 54 (30%) were non-commissioned officers, and 119 (67%) were enlisted personnel. Of the 177 who provided marital status, 107 (60%) were married or living with someone as a couple. Of the 178 reporting whether or not they had children living with them, 69 (39%) reported having children. Of the 178 reporting education status, 71 (40%) had completed high school, 82 (46%) had some college, and 25 (14%) had a college degree or higher. Of the 178 reporting age, 46 (26%) were younger than 22, 79 (44%) were between 22 and 30 years old, and 53 (30%) were over 30. The sample was predominately male with 172 of the 178 who provided gender information (97%) being male, and they were predominately Caucasian (151 of 178; 85%).

Response Rates and Missing Data

At time point 1, preactivation, 181 (100%) of the Soldiers completed the preactivation questionnaire and informed consent. At time point 2, 171 (94%) completed the first training questionnaire. At time points 3 and 4, 160 (88%) and 123 (68%) completed the remaining training questionnaires, respectively. During the deployment time points, 82 (45%) completed time 5 questionnaire, 63 (35%) time 6, 76 (42%) time 7, 80 (44%) time 8, 62 (34%) time 9, 66 (36%) time 10, 57 (31%) time 11, 50 (27%) time 12, 106 (59%) time 13, and 76 (42%) time 14.

The number of missing time points are common in studies like this. In a longitudinal study

of Soldiers deployed to Iraq, it was noted that despite their overall high response rate, Soldiers only responded once every two months (Lee et al., 2011). Of the 177 participants 25% completed only one survey, 20% completed 2-3 surveys, 16% completed 4-6, 9% completed 7-9, and only 30% completed 10 or more. MacDonald and colleagues (1998) experienced similar difficulties in getting questionnaires to participants and having various participants being unable to participate due to operational demands. Across five data collection points, of which only two were conducted during the deployment, they were only able to get 23% of individuals to complete all five questionnaires, 73.5% completed two (40% of the questionnaires; 239/325), and only 32% completed all the questionnaires after the initial survey (104/325). Participation in the current study is very similar, with response rates during several of the deployment months, in the low 30 and high 20 percentages. The overall response rate across all time points is comparable to these other studies conducted in similar circumstances.

Measures

Most of the measures were short versions of the originals, to reduce the respondents' task load in answering questionnaires multiple times, and most of them had been used with military samples in the past. There were three versions of the monthly questionnaire, which varied only slightly in items being recorded (i.e. combat exposure was not in initial questionnaire). The first was administered in the U.S. during the month before the company's activation to full-time status (time 1). The second was administered during the three training months in the U.S. (times 1-3). The third was administered in Afghanistan after deployment (times 4-14).

Combat Exposure (*trauma exposure)*

Combat exposure was measured at time points 2-14. Using a precedent established in prior research (Maguen, et al., 2004) to measure combat exposure, we used a single item that asked the Soldiers how many times they experienced an event that caused fear, helplessness, or shock in the last month. This item meets the qualifications for traumatic exposure for PTSD based on the DSM-IV (APA, 1994).

Morale

Morale was measured at time points 1-14. Participants were asked to rate their general individual morale and morale of unit on a 5-point scale ranging from (1) very low to (5) very high. This measure of morale is commonly used and was developed for use with a military population (Whitesell & Owen, 2012), has been used in previous military studies (e.g. Maguen & Litz, 2006; MHAT-V, 2008; J-MHAT-7, 2011; Whitesell & Owen, 2012), and is adapted from the *Combat Readiness Morale Questionnaire* (Gal & Manning, 1987). It is assumed that the Soldiers being assessed will conceptualize morale in line with the Army's definition, which is morale is "the human dimension's most important intangible element. It is a measure of how people feel about themselves, their team, and their leaders" (FM 6-22, p. 7-8). An individual's overall morale was calculated as the sum of the responses to questions about their morale and their perceptions of their platoon's morale. Morale had good internal consistency α = .80 across all measurement periods.

Unit Cohesion

Unit cohesion was measured at time points 1-14. Participants were asked to rate their unit on three items: (1) "members of my platoon can depend on each other," (2) "members of my platoon would risk their lives for each other," and (3) "members of my platoon stand up for each

other." These items were rated on a five-point Likert scale from (1) strongly disagree to (5) strongly agree. This scale has been previously used by the MHAT Advisory Teams to measure unit cohesion in Iraq and Afghanistan (MHAT-VI, 2009). Internal consistence for unit cohesion was very good α = .93.

Perceived Positive Deployment Benefits

Positive benefits were measured at time points 2-14. The Soldier's perception of positive benefits gained from the deployment was measured with two items: (1) "Overall, this deployment has had a positive effect on my life," and (2) "This deployment has made me more confident in my abilities." These items were rated on a 5-point Likert scale ranging from (1) strongly disagree to (5) strongly agree. This scale has been previously used by the MHAT Advisory Teams to measure perceived benefits of deployment in Iraq and Afghanistan (MHAT-VI, 2009). The perceived positive deployment benefits scale had a good internal consistency with α = .81.

Depression

Depression was reported at time points 1-14. Depression was measured using 2- item *Patient Health Questionnaire* (*PHQ-2*). This is a commonly used depression screening measure for the U.S. military; it is a component of the *Post-Deployment Health Assessment* (*PDHA*; Hoge, Aucherlonie, & Milliken, 2006). The *PHQ-2* is derived from the first two items of the 9-item *Patient Health Questionnaire* (*PHQ-9*) and has been supported as to be an accurate measure of depression symptoms (Arroll et al., 2010; Kroenke, Spitzer, & Williams, 2003). The *PHQ-2* as a short scale of the *PHQ-9* is desirable because it requires fewer items while still providing clinicians with good sensitivity and adequate specificity (Arroll et al., 2010). Although it is primarily used as a screening tool for major depression, using a cut off score of greater than or

equal to three (0-4 Likert scale), its use in this study was as a continuous score. In a primary care population used for validation of the *PHQ-2*, 44% of the sample reported scores ≥ 1 and only 11% reported scores ≥ 3 on a 0-3 Likert scale. This suggests that the items using the 1-4 Likert scale in this study will likely have about the 40-50% reporting scores ≥ 3, and 10% ≥ 5, providing decent range of response for analysis. Using it as a continuous variable will reduce some of the problems that can arise from dichotomizing the scores and will allow for a better analysis of the relationship between depression and the threats and resources. Participants responded to two items, "little interest or pleasure in doing things" and "feeling down, depressed, or hopeless," on a four-point frequency Likert scale ranging from (1) not at all to (4) nearly every day. An additional item from the *PHQ-9*was added to the depression scale concerning sleep quality "trouble falling or staying asleep or sleeping too much." While this item was not part of the original *PHQ-2*, sleep is known to be a problem for deployed Soldiers. A separate analysis maybe conducted to see if it explains any additional variance beyond the first two items. The internal consistence of the depression scale was $\alpha = .82$.

Post-traumatic Symptoms

Posttraumatic stress symptoms were reported at time points 1-14. Posttraumatic symptoms (PTS) were assessed using the four items from the *Posttraumatic Stress Disorder Checklist* (*PCL*), a PTSD screening instrument developed for Soldiers returning from combat deployment. The *PCL* is a 17-item instrument that has respondents rate the extent they experience the 17 PTSD diagnostic symptoms outlined in the *DSM-IV* (APA, 1994). Although the *PCL* is relatively easy to administer and score, it is considered relatively lengthy (Bliese et al., 2008). In a graded item response analysis of the PCL, these four items were selected as primary

candidates for a shortened scale (Bliese et al., 2008). Participants were asked to rate the extent that they experienced the symptoms on a five-point Likert scale ranging from (1) not at all to (5) extremely. The four items selected were as follows:

Item 1: "Repeated disturbing memories, thoughts, or images of the stressful experience"

Item 5: "Having physical reactions (like heart pounding, trouble breathing, sweating) when something reminded you of the stressful experience"

Item 7: "Avoiding activities or situations because they reminded you of the stressful experience"

Item 15: "Having difficulty concentrating."

Examinations of the item-characteristic curves for these four items indicate that they provide a majority of information in the positive half of the latent PTSD variable. This shows that the items provide information based on responses that differentiate respondents with slightly above average from those with moderate to high PTSD levels. Despite this, the item information curves still suggest that a fair amount of information is captured as low as -1 below theta and provides a great deal more information overall when compared to the low information-value items.

The four items represented in this short scale, in addition to providing a large amount of information, represent the three PTSD domains: Items 1 and 5 reexperiencing, Item 7 avoidance, and Item 15 increased arousal. Secondly, the four items identified have consistency with previously developed shortened versions of the same scale by Lang and Stein (2005), whose four-item scale included Items 1 and 7, and six-item scale included Items 1, 7, and 15. In comparison to the existing *PCL* and *Primary Care Posttraumatic Stress Disorder Screen* (*PC-PTSD*) using an independent sample, the area under the curve analysis (which is used to assess overall utility of the instrument) showed that the four-item *PCL* scale was within the 95%

cutoff intervals compared other two established items. The internal consistency of the PTS scale was $\alpha = .87$.

Analyses

There are several limitations within the data set that limit the methods available for analysis. First, due to confidentiality reasons, information on subunit membership (i.e., which platoon or squad in the company) of individual Soldiers was not collected. Because subgroup membership cannot be established, it is not possible to account for it during the analysis. Secondly, across time periods there are many missing data points where Soldiers for various reasons failed to complete that time period's questionnaire. Finally, the third limitation is that several of the Soldiers forgot their identification number during the deployment. For Soldiers who forgot their identification numbers, they were instructed to generate a new one to use for remaining questionnaires. To address the problem of participants' forgotten identification numbers, multiple imputation was used to generate missing baseline data points for inclusion as level 1 (individual level) variables. Ninety-one percent of the Soldiers' responses during combat (Time 5-14) could be matched to pre-combat data (Time 1-4), suggesting that only 9% of the soldiers had forgotten their identification number once they had entered combat.

Due to the limitations, a multilevel model with variable time series approach was determined to be the appropriate method to analysis the data. The multilevel variable time series allows for analysis of the relationship between variables at each time point (month) while accounting for individual Soldier effects. The use of a variable time series design allows for missing time points within each individual without corrupting the model. The repeated measures can occur at fixed or varied time points, because multilevel analysis does not require balanced data

and as such can handle both situations (Hox, 2010). The variable time series approach essentially treats time as an interval-scale independent variable (e.g., months since deployment), whereas the fixed time series treats each observation point as a distinct category (i.e., Time 1, Time 2, Time 3, etc.). Although the original study design was a fixed-measure design, if we consider the responses to have occurred at variable times and that balanced data is not a necessity, multilevel analysis is an ideal method.

Missing Data

Item-level missing data was replaced using missing item scores generated via multiple imputation using SPSS 20. Because multiple imputation uses all available data to calculate the most likely value for that particular data point, all possible items (including items not used in this study, but were on the questionnaires) were included to generate the missing data values. Missing demographic data was not generated, because there is little theoretical justification for predicting demographic characteristics using psychological item responses. In addition to item-level missing data, the baseline measures of pre-combat deployment depression and PTS were computed using multiple imputation for those Soldiers whose deployment time period cases cannot be matched to initial or training scores.

In addition to item-level missing data, there are large percentages of case-level missing data across time points. Although multiple imputation is a powerful method that can account for large amounts of missing data (Enders, 2010), the casewise missing data across several of the time points exceed 50%, and this is likely to be problematic. Because multilevel variable time series analysis does not require balanced data across time points, the missing case-level data for each time point (with exception of baseline) will not be generated and will be left as missing data.

Pooling of Multiple Imputation Datasets

Multiple imputation works by generating multiple datasets with the missing values substituted with an appropriate number (generated via a maximum likelihood estimation) to create a complete data set. The number of complete data sets generated is equal to the number of imputations that the program is instructed to run (20 imputations were conducted for the analysis). The usual analysis is then performed on each of these complete data sets, and then inferences can be drawn from the within and between imputation variability.

For the analysis of the data, the fixed effects across the multiple imputations were pooled according to standard pooling procedures. A review of the multiple imputation literature failed to produce formulas to pool the random effects and model fit statistics for multilevel modeling, as such the output of the original data (with missing values) are reported, along with any deviation from these results from the imputed data sets.

The formulas for the pooling of the imputed data sets are drawn primarily from Rubin (1987). As stated above, for a dataset with missing values, *m* imputations are conducted, resulting in *m* complete data sets. On each of these *m* data sets, the analysis of interest is conducted, the results of each data set is then pooled to obtain a single set of results. For each multilevel analysis, we will say that $\hat{Q}_j$ is the estimate of the regression coefficient of interest from data set (*j* = 1,2,…, *m*) and $U_j = SE^2$ associated with $\hat{Q}_j$.

The overall estimate of the regression coefficient is the average of the individual estimates,

$$\bar{Q} = \frac{1}{m}\sum_{j=1}^{m} \hat{Q}_j .$$

In order to calculate the standard error, first the within-imputation variance needs to be calculated

$$\bar{U} = \frac{1}{\mathrm{m}}\sum_{j=1}^{m} \hat{U}_{\mathrm{j}}$$

and the between-imputation variance, $B = \frac{1}{m-1}\sum_{j=1}^{m}\left(\widehat{Q_J} - \bar{Q}\right)^2$.

The total variance is $T = \bar{U} + \left(1 + \frac{1}{m}\right)B$.

The standard error is the square root of *T*.

Significance testing of the null hypothesis that $Q = 0$ is performed by comparing the ratio $t = \bar{Q}/\sqrt{T}$ to the t-distribution. The method of obtaining the degrees-of-freedom deviates from Rubin's (1987) methodology, for the Lipski, Parzen, and Zhoa (2002) method. The Rubin and Schenker (1986) development of degrees-of-freedom is based on two key assumptions: first is that there is a finite number of multiple imputations, but secondly there exist an infinite number of observations in the sample. The Rubin and Schenker (1986) degrees-of-freedom assumption may produce *df* that are unrealistically large for some data sets, in particular when they are have limited sample sizes of when the between imputation variance is small (Barnard & Rubin, 1999; Lipski, Parzen, & Zhao, 2002). To address this problem an adjusted degrees-of-freedom formula was developed by Lipski, Parzen, and Zhao (2002) that provides a very conservative estimate of *df*, and it was used. Degrees-of-freedom is

$$df = \frac{[\bar{U} + \left(\frac{m+1}{m}\right)\bar{B}]^2}{\frac{\bar{U}^2}{N-1} + \frac{\left(\frac{m+1}{m}\right)^2 \mathrm{B}^2}{\mathrm{m}+1}}$$

The confidence intervals are calculated by taking the overall estimate plus or minus a number of standard errors, which is a quantile of the t-distribution with degrees-of-freedom.

Variable Time Series Design (mixed model approach)

In the analysis of multiple time series data there is the issue of the data points being nested under individuals. A repeated measures design can be considered as multilevel data with the repeated measures nested under the individual (Hox, 2010). A Multi-Level Analysis using SPSS linear mixed effects model similar to Hierarchical Linear Modeling (HLM) will address many of the problems associated with nested data (Heck, Thomas, & Tabata, 2010; Hox, 2010). The mixed effects model differs from linear models in that it can examine correlated data and unequal variances that are commonly found in repeated measures and nested data. The mixed effects model is suited for use with continuous outcome variables such as the depression and PTS scales that are examined in this study. The strength to using SPSS linear mixed effects model over HLM is that the multiple imputation method that is best suited to handle the missing data can be used, and additionally the mixed effects model in SPSS is more flexible in determining the various covariance matrixes used in the analysis.

There are several advantages to analyzing repeated measures using multilevel models. There are five points addressed by Bryk and Raudenbush (1992). First, because multilevel modeling allows modeling the varying regression coefficients at the measurement level, we can have growth curves that vary for each participant. Considering that we are interested in the effect of duration of time in the deployment, this is an especially attractive advantage. Second, due to missing data patterns across participants there may be a difference in number of repeated measures, and the spacing between these may vary. Because this is a major limitation of this data set, HLM provides a significant benefit, considering that other repeated measures designs do not handle this well. Third, the covariances between the repeated measures can be modeled as well. Fourth, although not the case with this data set, if we had balanced data and used restricted

maximum likelihood, the usual analysis of variance based on *F* and *t*-test can be calculated. Fifth, it is easy to add higher levels of analysis to examine the effects of individual and group characteristics. A sixth advantage added to this list by Hox (2010) is that it is easy to include time-varying or time-constant explanatory variables to the model.

Analysis Procedure

To address concerns of non-purposeful responding in the survey, in particular long string responses (e.g., a participant choosing 3 multiple times in a row), a variable was computed indicating the standard deviation of individual responses. The standard deviation and mean for responses was calculated, and those cases that exceeded two standard deviations below the mean (indicating low variability in responses) were flagged and individually examined for long string responses. If they appeared to have long string responses and additionally failed to respond appropriately to reverse-coded items, these cases were deleted. Twenty-three cases (3%) were identified as containing possible non-purposeful responding and were removed from the data set.

The hierarchical models used in the following analysis consist of two levels. Level 1 consists of the reported scores for each individual time point. Level 2 consists of the individual Soldier under which the multiple time point responses are nested.

The first step in the multilevel analysis is to establish the necessity of using this approach and to establish a model for later models to be compared to. The necessity of the method is accomplished by examining the variance in the outcomes scores within each Soldier across the time periods and comparing that to the variance in outcome scores between the Soldiers. If there is little to no variation (less than 5%) in the variance in the outcome variable between groups, then there is little need for a multilevel analysis. To assess this, a one-way ANOVA (no predictor)

model (null model) is run for each of the outcome variables. The null model gives an estimate of the variance between time periods (level 1) and individuals (level 2). The output produced from this analysis will provide the average intercept, the between groups variation in average intercept, and individual level error (residual error). An intraclass correlation (ICC) is calculated to justify the use of multilevel modeling in analysis. The ICC is the proportion of the variance that is common to each unit (individual) opposed to the variance due to level 1 (time periods) within the individuals.

The null model also provides a baseline parameter against which other subsequent models can be tested. Model fit improvement will be examined using a combination of a chi square test of model fit compared to the preceding model and Schwarz's Bayesian Information Criterion (BIC), allowing the model's parsimony to be taken into account. The chi square test of model fit is determined by the degree of difference in model deviance and the difference in the number of parameters in the model. The model deviance is the -2 Log Likelihood (-2*LL*), which is -2 time the natural log function of the likelihood function of the model at convergence, which indicates how well the data fits the model (Heck et al., 2010).

Once the multilevel model approach has been justified by the ICC, models that include the variables of interest can then be tested. Each dependent variable was analyzed separately. The first model was simply included the baseline measure of the dependent variable, which was calculated by aggregating the Soldier's activation and training (time points 1-4) scores on either depression or PTS. This baseline model thus controlled for the Soldier's pre-combat levels of the dependent variable. This baseline measure is included in the model as a level-2 variable, because the Soldier's score will not vary across the combat time points (5-14).

In the mixed model, the relationship of the predictor variables (time, traumatic exposure, morale, unit cohesion and positive perceptions) with depression and PTS were examined at the monthly level (level 1). Using the individual survey points, depression and PTS were regressed on the predictors (time, trauma exposure, morale, unit cohesion, and positive perceptions). This analysis is analogous to ordinary least squares regression. The results show how the individual variables contribute to the well-being measures at that given point in time. The level 1, or month-level, analysis yields estimated relations or slopes between any one predictor variable and an outcome for each individual, such as the relationship of unit cohesion to depression, adjusted for within-individual variations among predictor variables. The level 2, the individual Soldier-level analysis, uses the mean scores of Soldiers to predict variability in the relationships across Soldiers. For the purposes of this analysis, level 2 variables will be included as controls, providing a model to compare against the relationships of the level 1 variables and improvements to the model provided by these variables.

After the baseline model for each strain variable (depression and PTS) was computed, the next step was to determine the trend of depression and PTS over time. Because curvilinear trends were proposed, both the linear function of time (as months into deployment) and the quadratic function of time were added to the baseline model as level one variables. If the quadratic term was significant, it was retained for further testing in the following models. If it was not significant, it was removed, and the linear trend of time was tested alone. If the linear trend was significant it was retained for the further analysis.

After the trend over time was established, the predictor variables (combat exposure, unit cohesion, morale, and perceived positive deployment benefits) were examined for their relationships with depression and PTS, controlling for the baseline measures of the dependent

variable and the trend across time. The predictor variable of interest was added to the model, and it was initially allowed to have random effects (allowing the slope to vary between Soldiers). If the random effects obtained significance determined by a Wald *Z* test, it was retained in the model. If it failed to obtain significance, this indicates the slopes of the predictor variables do not vary significantly between Soldiers, and it was removed from the model to allow for the most parsimonious model to be tested.

The final model for depression and PTS included the baseline measure of the dependent variable, the trend over time and all of the predictor variables. It was initially run with all predictor variables allowed to have random effects (slopes) and the intercept was set at random. If the predictor failed to generate random effects, the random effects for that predictor were fixed to ensure the most parsimonious model.

An important issue to consider is the centering/coding of the variables. As typical in longitudinal analysis, the first measurement occasion was set at zero. For this study the first measurement occasion to occur during the actual deployment was time period 5, and therefore this time point was coded as zero for analysis purposes. As such, the variance in intercepts reflected the variations of the dependent variables at the first time point in the deployment. The trauma exposure variable was coded at zero, because zero in this variable has a meaningful value, indicating an absence of traumatic events for that time period (Heck, Thomas, &Tabata, 2010; Hox, 2010). The remaining variables (morale, unit cohesion, and positive perceptions) were grand mean centered. Grand mean centering means that the variables were centered on the unadjusted mean score across all individuals for all measurement occurrences (Heck, Thomas, & Tabata, 2010; Hox, 2010). This allows for comparison of Soldiers' scores across individuals, e.g.

Soldiers who report a greater amount of unit cohesion are less likely to report higher PTS than Soldiers who report lesser amounts of unit cohesion.

CHAPTER III

RESULTS

Scale Correlations

A correlation matrix was made by running a mixed model with one of the variables acting as the predictor variable and the other as the dependent variable. To match the correlations as closely to the models tested, a repeated effects covariance matrix was set as autoregressive. An autoregressive covariance matrix allows the model to take in account that the residual covariance between measurement occasions with subjects are correlated, with stronger correlations occurring between measurement periods closer together (Heck et al., 2010). The exception to the autoregressive matrix was when computing the coefficient for variables when month was acting as the predictor, the repeated effects of months had to be removed from these models because months were acting as the predictor. See Table 1 for means, standard deviations, and correlations. Both the original data set (with missing values) and pooled results of the imputed data sets are reported; the original data results are posted above the diagonal, pooled data below.

Table 1. *Correlations, Means,& Standard Deviations*

				1	2	3	4	5	6	7	8	9
			M	0.00	0.00	1.84	1.48	4.54	4.05	3.01	4.05	3.43
		M	***SD***	1.00	1.00	0.81	0.74	3.00	0.80	0.94	0.80	0.94
1	Baseline Depression	0.01	.99	–	0.55**	0.37**	0.35**	-0.01	0.16**	-0.22**	-0.09	-0.20**
2	Baseline PTS Sym	0.00	1.00	0.34**	–	0.28**	0.44**	-0.01	0.13**	-0.15**	-0.14**	-0.15**
3	Depression	1.85	0.81	0.42**	0.25**	–	0.48**	0.05**	0.19**	-0.44**	-0.13**	-0.34**
4	PTS Symptoms	1.50	0.75	0.28**	0.41**	0.48**	–	0.03*	0.35**	-0.19**	-0.17**	-0.30**
5	Month	4.56	2.98	0.00	0.00	0.15**	0.10**	–	0.00	-0.03	0.00	0.02
6	Exposure	0.47	0.97	0.13*	0.17**	0.19**	0.35**	0.01	–	-0.16**	-0.10**	-0.22**
7	Morale	3.01	0.92	-0.19**	-0.12**	-0.44**	-0.30**	-0.08**	-0.16**	–	0.25**	0.46**
8	Unit Cohesion	4.01	0.85	-0.08	-0.17**	-0.13*	-0.17**	0.03	-0.10**	0.25**	–	0.37**
9	Positive Deployment	3.41	0.96	-0.17**	-0.16**	-0.34**	-0.30**	-0.06	-0.22**	0.46**	0.36**	–

Notes: Correlations calculated from unstandardized regression coefficients produced via Linear Mixed Modeling (SPSS 18) analysis between two variables with the variables residual parameter variance set to zero. Correlations below the diagonal represent the complete data set with multiple imputed data, and correlations above the diagonal were computed from the original data set with missing values, Baseline depression and PTS were reported as *Z* scores, *N* multiple imputed data (lower triangle) = 196, *N* original data = 155-196, N = 714, * p< .05, ** p < .01.

Scale Internal Consistency

The reliability of the scales was assessed using Cronbach's Alpha prior to the multiple imputations. Alphas ranged from .80 (Morale) to .93 (Unit Cohesion), all within an acceptable range of reliability. Scale reliability was not calculated for combat exposure and month, because they are either a single item scale or the time period recorded.

Missing Data Analysis

The properties of missing data were assessed on the complete data set (including variables that were not included in following analysis) after the data base was assembled for multi-level time series analysis. To increase the likelihood that any pattern to the missing data would be discovered, all the items captured in the monthly questionnaires (e.g. family support, concussions, hours of sleep), regardless of whether they were utilized in hypotheses or later analysis, were included in the missing data analysis. The use of auxiliary variables that are not related to the hypothesis, but may be correlates of missingness or of a variable related to missingness, is referred to as an inclusive analysis strategy and is recommended for identification of missing-at-random (MAR) conditions and resulting estimates (Enders, 2006).

To test for missing completely at random (MCAR) status of missing data, Little's MCAR test was conducted in SPSS on the complete data set (baseline data and deployment data). Item level missing data ranged from 0% to 74%. The 74% missing item was an outlier, due to its dependence on its proceeding item, which asked if the Soldier took leave the month prior. Soldiers were only granted leave once during the deployment, and as such they would have left this item blank for all months that they didn't take leave, thus the high rate of missingness. The item "If yes, did you leave Afghanistan during this leave?" was removed from the analysis. With the removal of

the above item, the range of missing item level data was reduced from 0% to 29%. The 29% is also misleadingly high, because it represents family problem and family support items. These family-related items would not have been completed by most single Soldiers. The Little's MCAR test of all items was significant, $\chi^2 = 2517.26$, $df = 1935$, $p < .000$. This was expected because the missing status of the family support and family problem items would have been directly related to reported marital status and correlated strongly with other items (e.g. child status), and as such the items would be missing not-at-random (MNAR).

The test was conducted again without the "did you leave Afghanistan" and family focused items. Marriage status was left in the analysis to ensure that the missing data for the nonfamily related items were not related to marital status. Item level missing data ranged from 0% to 8.5%. Little's MCAR test was not significant, $\chi^2 = 421.83$, $df = 405$, $p = .272$, indicating that for the remaining items, the data was missing completely at random.

Linear Mixed Model Analysis

Unless otherwise specified, all the models were run with the variables included in the model as main fixed effects. Random effects were measured with a variance components covariance matrix, and a repeated covariance matrix was set as a first-order autoregressive covariance matrix. This differs from a standard covariance matrix, in which covariances between all observations are assumed to be equal. Fixed effects (coefficients) reported below are the pooled results from the multiple imputation data set unless otherwise noted (Tables 2, 3, & 6). To demonstrate how the multiple imputed data sets did not significantly vary the relationships between variables both the results of the original data set (the data set with the missing item level variables form which the multiple imputed data set were generated) and the pooled results from the

multiple imputed data sets can be found in their respective tables. The original data set results are posted above the pooled results in the tables. The R^2 values for the models were calculated from the pooled correlations of the predicted values of the dependent variable produced by the models using the multiple imputation datasets with the dependent variables reported scores. The original data set was used to calculate the reported random effects and model fit measures: log likelihood (-2LL), Akeike's Information Criterion (AIC), and BIC (Tables 2-8).

Null Model

The null model (dependent variable only) for depression suggests that the development of a multilevel model is warranted. The depression score intercept varied significantly across Soldiers, Wald $Z = 7.14$, $p < .000$. The between units variance $\sigma^2_B = .370$ and within unit variance $\sigma^2_W = .302$ produce an ICC = .370/(.370 + .302) = .55, suggesting that about 55% of the variability in depression scores lies between Soldiers. The combination of the significant variance in intercept between Soldiers and the ICC suggests that multilevel model is justified to examine the development of depression within Soldiers. The residual parameter is significant, Wald $Z = 15.73$, $p < .001$, suggesting that there is significant variance in depression within Soldiers to be explained.

The null model for PTS symptoms also suggests that the development of a multilevel model is warranted. The PTS symptoms intercepts vary significantly across Soldiers, Wald Z = 7.46, $p < .001$. The between units variance $\sigma^2_B = .398$ and within unit variance $\sigma^2_W = .220$, produce an ICC .398/(.398 +.220) = .40, suggesting that about 40% of the variability in PTS symptom scores lies between Soldiers. The combination of the significant variance in intercept between Soldiers and the ICC suggests that multilevel model is justified to examine depression

variability within and between Soldiers. The residual parameter is significant, Wald $Z = 15.48$, $p < .001$, suggesting that there is significant variance in depression within Soldiers to be explained.

Hypothesis Testing

Baseline Measure

To establish the baseline model for further model testing, the baseline measures of depression and PTS were entered into the model, predicting depression and PTS during the deployment, respectively. The pooled fixed effects of the baseline measure of PTS also had a significant relationship with PTS scores during combat $b = .28$, $t\ (146) = 6.41$, $p < .001$. The random effects for baseline PTS were nonsignificant, Wald $Z = 0.16$, $p = .87$, and the variable was set as fixed in the model. The baseline-only model explained 67% of the variance in depression scores overall (Table 2).

The pooled fixed effects of the baseline measure of depression had a significant relationship with depression scores during combat $b = .27$, $t\ (146) = 5.30$, $p < .001$ (Table 2). The random effects for baseline depression were nonsignificant, Wald $Z = 0.55$, $p = .58$, and the variable was set as fixed in the model. The baseline-only model of depression explained 62% of the variance in depression scores overall (Table 2).

Table 2. *PTS and Depression Trend Over Time*

	PTS		Depression		
Models	M1	M2	M1	M2	M3
Fixed Effects *Original Data (Missing Values)*					
	b(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)
Intercept	1.49(.04)***	1.35(.05)***	1.86(.04)***	1.63(.05)***	1.66(.05)***
Baseline DV	.31(.04)***	.34(.04)***	.33(.04)***	.34(.04)***	.34(.04)***
Month		.06(.02)**		.07(.03)*	.05(.01)***
Month Quad		-.00(.00)		.00(.00)	-
	b(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)
Fixed Effects *MI Pooled Data*					
Intercept	1.53(.04)***	1.37(.05)***	1.89(.04)***	1.63(.06)***	1.68(.05)***
Baseline DV	.28(.04)***	.30(.04)***	.27(.05)***	.28(.05)***	.28(.05)***
Month		.06(.02)**		.09(.03)**	.05(.01)***
Month Quad		-.003(.00)*		.00(.00)	-
Random Effects (Original Data)					
	Wald Z	Wald Z	Wald Z	Wald Z	Wald Z
Intercept	4.35***	4.56***	3.91***	3.21***	3.27***
Baseline DV	*ns*	-	*ns*	-	-
Month		3.79***		4.03***	4.07***
Model Fit					
LL^2	1072.224	1030.829	1213.37	1156.69	1157.48
AIC	1082.224	1046.829	1223.37	1172.69	1171.48
BIC	1104.547	1082.545	1250.69	1208.41	1202.74
Parameters	5	8	5	8	7
ΔLL^2		41.40***		56.68***	55.88***
Total R^2	0.67	0.77	0.62	0.72	0.73
ΔR^2	0.00	0.10	0.00	0.11	0.11

Notes. *** = p<.001, ** p< .01, * p<.05, N (Original data) = 155, N (Pooled data) = 196, Model fit N = 155, ΔR^2 is improvement is over Baseline only model (PTS & Depression Model 1). *ns* = random effects were not found to be significant for this predictor in the model and were fixed for the analysis presented

Time (months in combat) Predicting PTS and Depression

Hypotheses one and two focused on the trend of PTS and depression over time. Hypothesis one is that PTS will display a curvilinear trend over time, such that it will worsen initially, peak about mid-deployment, then improve slightly. Time was examined both for its linear function as well as its quadratic. Times recorded as months had a small but positive significant correlation with PTS, $r = .10$, $p < .01$. This suggests that PTS scores rise slightly as months during the deployment progress (Table 1).

Time, both as a linear function and a quadratic function, was then entered into a model controlling for the baseline measure of PTS (PTS Model 2; Table 2). The pooled fixed effect for months for PTS was significant $b = .062$, $t\,(205) = 2.97$, $p < .01$, suggesting a linear growth rate of .06 on the PTS scale per month. The quadratic function of time also was significant $b = -.003$, $t\,(207) = 1.88$, $p < .05$, suggesting that the rate of change does change over time, in particular that the linear rate of change decreases as time progresses. Random effects for the intercept were significant, Wald $Z = 4.56$, $p < .001$, suggesting that there is significant variability in the random intercept to explain between individuals. The linear time slope (month) was also significant, Wald $Z = 3.79$, $p < .001$, suggesting that slope varies across Soldiers. The model was a significant improvement over the null model, $\Delta\ -2LL = 41.40$, Δ parameters = 3, $p < .001$. To determine the nature of the curvilinear trend of time, the mean predicted scores of the above model were graphed (PTS Model 2; Figure 1). PTS did gradually increase over time to peak during the eight month, before gradually decreasing in the last two. The model including month and month quadratic explained 10% more variance than the baseline only model (Table 2). Because the quadratic function of time was significant, it was retained in the following models.

Time was then entered into a model containing the baseline measure of PTS and the other predictors (e.g. combat exposure, unit cohesion, morale, and positive deployment perceptions; Model 7, Tables 3-5). The pooled fixed effect for linear function of months on PTS was significant, $b = .03$, $t\ (197) = 1.80$, $p = .04$, but the quadratic function of time was not significant, $b = .00$, $t\ (197) = .35$, $p = .36$ (Table 3).

Table 3. *PTS Models: Fixed Effects Coefficients*

Models	M2	M3	M4	M5	M6	M7
			Original Data (Missing Values)			
Fixed Effects	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)
Intercept	1.35(.05)***	1.25(.04)***	1.39(.05)***	1.24(.04)***	1.31(.05)***	1.23(.03)***
Baseline PTS	.34(.04)***	.30(.03)***	.31(.03)***	.33(.03)***	.29(.03)***	.22(.04)***
Month	.06(.02)**	.05(02)**	.02(.02)	.08(.02)***	.06(.02)**	.03(.02)
Month Quad	-.00(.00)	.00(.00)	.00(.00)	-.005(.00)*	.00(.00)	.00(.00)
Exposure		.23(.4)***				.22(.05)***
Morale			-.19(.03)***			-.10(.03)**
Unit Cohesion				-.08(.06)		-.01(.03)
Positive Deployment					-.17(.04)***	-.06(.02)**
			MI Pooled Date			
Fixed Effects	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)
Intercept	1.37(.05)***	1.25(.04)***	1.40(.05)***	1.26(.05)***	1.32(.05)***	1.24(.03)***
Baseline PST	.30(.04)***	.26(.03)***	.29(.04)***	.31 (.03)***	.26(.04)***	.20(.04)***
Month	.06(.02)**	.05(.02)**	.03(.02)	.09(.02)***	.07(.02)***	.03(.02)*
Month Quad	-.003(.00)*	-.00(.00)	.00(.00)	-.006(.00)**	-.004(.00)*	.00(.00)
Exposure		.25(.04)***				.24(.04)***
Morale			-.22(.03)***			-.11(.03)***
Unit Cohesion				-.09(.05)*		.01(.03)
Positive Deployment					-.19(.04)***	-.07(.02)**

Note: *** $p<.001$, ** $p< .01$, * $p<.05$, N (Original data) = 155, N (Pooled data) = 196,

While support for hypothesis one is given in that a quadratic function of time was found to be significant in Model 2 for PTS and the graph showed the expected curvilinear trend, the quadratic term failed to hold significance when the other predictors were included in the model. As such, the hypothesis that PTS will display a curvilinear trend over time was partially supported.

To test hypothesis two, that depression will display a curvilinear trend over time, such that it will worsen initially, peak about mid-deployment, then improve slightly, the same methods as used for hypothesis one were used. Time measured as months into the deployment has a positive significant correlation with depression, $r = .15$, $p < .001$ suggesting that depression scores got worse as months progressed (Table 2).

To test for a curvilinear trend in time, months that the questionnaire was collected was entered into the depression model, along with its quadratic function to examine the rate of change over time. The pooled fixed effect for months for depression was significant $b = .086$, $t\,(197) = 3.15$, $p < .001$, suggesting a linear growth rate of .09 on the depression scale per month. The quadratic function of time was not significant $b = -.004$, $t\,(197) = 1.45$, $p = .07$, suggesting that the rate of change in depression does not fluctuate over time (Table 2). Random effects for the intercept are significant, Wald $Z = 3.21$, $p < .001$, suggesting that there is significant variability in the random intercept to explain between individuals. The random effect of the linear time slope (month) was also significant, Wald $Z = 4.03$, $p < .001$, suggesting that slope varies across Soldiers. The model was a significant improvement over the null model, Δ *-2LL* = 56.68, Δ parameters = 3, $p < .001$. The model including month and month quadratic explained 11% more variance than the baseline only model across all time points (Table 2). The quadratic function of months failed to

reach significance, however, and therefore there is no support for hypothesis two that depression will display a curvilinear trend over time.

Because the quadratic function of time failed to reach significance, it was removed from the model, but time as a linear function was retained in Model 3 for depression. The pooled fixed effect of months was still significant $b = .049$, $t\ (197) = 5.20$, $p < .001$, suggesting a linear growth rate of .05 on the depression scale per month. The random effect of the intercept was still significant, Wald $Z = 3.27$, $p = .001$. The linear time slope was also significant, Wald $Z = 4.07$, $p < .001$. To confirm that removing the quadratic function of time did not significantly reduce the accuracy of the model, model deviance and BIC were examined. The model deviance is the -2 Log Likelihood (-2*LL*) which is -2 times the natural log function of the likelihood function of the model at convergence, which indicates how well the data fits the model. The model deviance was not significantly different from the previous model (1157.48, 1156.69, respectively), Δ *-2LL* = .80, Δ parameters = 1, $p = .37$. The BIC was smaller for the model with the linear function only, compared to the model including the quadratic function (1202.74, 1208.41; respectively). The model including month as linear function solely explained 11% more variance than the baseline only model across all time points (Table 2). Because the quadratic function of months was not significant and did not significantly improve model fit or explain additional variance over the model with month as a linear function, the variable month quadratic was removed from further analysis.

Finally time was entered into a model containing the baseline measure of depression and the other predictors (e.g. combat exposure, unit cohesion, morale, and positive deployment perceptions; Model 8, Tables 6-8). The pooled fixed effect for the linear function of months on depression was significant; $b = .034$, $t\ (197) = 4.15$, $p < .001$.

There was no support found for hypothesis 2 in any of the models tested.

Combat Exposure Predicting PTS and Depression

Hypothesis 3 proposed that combat exposure would be positively related to PTS and depression. Combat exposure had a significant positive moderate correlation with depression and PTS; $r = .19$, $p < .001$, and $r = .35$, $p < .001$, respectively (Table 1). These correlations provide support to the hypothesis, that as exposure to combat events increased so did scores on PTS and depression.

To further examine the relationship exposure has with depression and PTS, for PTS, in model 3, combat exposure was included into the model, with the linear and quadratic function of time. Time variables and exposure were entered as fixed effects and as random effects (slope) with random effects for intercept. The random effects for exposure were significant Wald $Z = 3.71$, $p< .001$, suggesting that effects of combat exposure on reported PTS symptoms vary across Soldiers, and were kept in the model (Table 4). The pooled fixed effect for exposure was significant, $b = .248$, t (203) = 5.79, $p < .001$, suggesting each exposure to a fear inducing event corresponded with a .25 increase on the PTS score holding baseline measure of PTS and time constant (Table 3). The model was a significant improvement over Model 2, Δ *-2LL* = 142.43, Δ parameters = 2, $p < .001$ (Table 5). Combat exposure model explained 19% of variance over the null model, 9% improvement over the previous model (Table 5). The results for PTS and depression models containing combat exposure with baseline measures of the dependent variables and the trend over time for both PTS and depression, support the hypothesis that combat exposure will be positively related to the strain measures.

Table 4. *PTS Models: Random Effects (Original Data)*

Models	M2	M3	M4	M5	M6	M7
	Wald Z	Wald Z	Wald Z	Wald Z	Wald Z	Wald Z
Intercept	4.56***	3.12***	3.64**	0.84	2.88**	*ns*
Baseline PTS	-	-	-	-	-	2.46*
Month	3.79***	4.52***	4.05***	4.47***	3.59***	4.94***
Exposure		3.71***				4.10***
Morale			2.15*			2.93**
Unit Cohesion				5.06***		*ns*
Positive Deployment					3.60***	*ns*

Notes. *** = $p<.001$, ** $p< .01$, * $p<.05$, *ns* = random effects were not found for this predictor in the model and it was fixed for the analysis.

Table 5. *PTS: Model Fit & Variance Explained*

Model	M2	M3	M4	M5	M6	M7
Baseline PTS	*	*	*	*	*	*
Month	*	*	*	*	*	*
Months Quad	*	*	*	*	*	*
Exposure		*				*
Morale			*			*
Unit Cohesion				*		*
Positive Deployment					*	*
Model Fit (*Original Data*)						
LL^2	1030.83	888.40	978.76	917.49	953.53	821.86
AIC	1046.83	908.40	998.76	937.49	973.53	849.86
BIC	1082.54	953.05	1043.39	982.12	1018.16	912.34
Parameters	8	10	10	10	10	14
ΔLL^2	41.40***	142.43***	52.07***	113.34***	77.30***	208.97***
Total R^2 (*Pooled Data*)						
	0.77	0.86	0.80	0.83	0.83	0.89
Improvement in R^2 (*Pooled Data*)						
	-	0.09	0.03	0.06	0.07	0.12

Note: Model fit $N = 155$, R^2 Improvement is over Model 1 (baseline model)

Combat exposure was included into a model that controlled for the baseline measure of the dependent variables and accounted for the monthly trends established for PTS and depression. For depression, combat exposure was included in model 4, with the linear function of time. Month and exposure were entered as fixed effects and as random effects. The random effects for combat were not significant Wald $Z = 1.41$, $p = .15$, and were removed from the model. The pooled fixed effect for exposure was significant, $b = .158$, $t\ (205) = 5.71$, $p < .001$, suggesting each exposure to a fear-inducing event corresponded with a .16 increase on the depression score while keeping the baseline measure of depression and months constant (Table 6). The model was a significant improvement over Model 3, Δ *-2LL* = 17.53, Δ parameters = 1, $p < .001$ (Table 8). Although there was significant model improvement over the trend over time model (Model 3), the combat exposure model explained the same amount of variance as the trend over time only model (Model 3). Due to the multi-level nature of the analysis, it is possible that the inclusion of a predictor that has a significant relationship with the dependent variable may not result in increased variance explained, because it is possible for this variable to increase the amount of known variance between Soldiers.

Table 6. *Depression Models: Fixed Effects Coefficients*

Models	M3	M4	M5	M6	M7	M8
			Original Data (Missing Values)			
Fixed Effects	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)
Intercept	1.66(.05)***	1.60(.05)***	1.70(.04)***	1.65(.04)***	1.66(.04)***	1.65(.05)***
Baseline Depression	.34(.04)***	.32(.04)***	.27(.03)***	.34(.04)***	.29(.03)***	.17(.03)***
Month	.05(.01)***	.05(.01)***	.03(.01)***	.05(.01)***	.04(.01)***	.03(.01)***
Exposure		.12(.03)***				.08(.03)**
Morale			-.34(.03)***			-.29(.04)***
Unit Cohesion				-.11(.04)*		.01(.04)
Positive Deployment					-.23(.03)***	-.11(.03)**
			MI Pooled Date			
Fixed Effects	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)	*b*(*SE*)
Intercept	1.68(.05)***	1.60(.05)***	1.71(.04)***	1.67(.05)***	1.68(.05)***	1.65(.05)***
Baseline Depression	.28(.05)***	.27(.04)***	.22(.04)***	.29(.04)***	.23(.04)***	.14(.04)***
Month	.05(.01)***	.05(.01)***	.04(.01)***	.05(.01)***	.04(.01)***	.03(.01)***
Exposure		.16(.03)***				.10(.03)***
Morale			-.33(.04)***			-.25(.04)***
Unit Cohesion				-.14(.04)**		-.00(.04)
Positive Deployment					.27(.03)***	-.14(.03)***

Note: *** p <.001, ** p < .01, * p <.05, N (Original data) = 155, N (Pooled data) = 196.

Table 7. *Depression Models : Random Effects (Original Data)*

Models	M3	M4	M5	M6	M7	M8
	Wald Z	Wald Z	Wald Z	Wald Z	Wald Z	Wald Z
Intercept	3.91***	3.21***	2.51*	2.39*	2.49**	3.18***
Baseline Depression	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
Month		4.03***	3.60***	4.26***	4.06***	3.62***
Exposure		*ns*				*ns*
Morale			2.26*			2.18*
Unit Cohesion				2.23*		2.37*
Positive Deployment					*ns*	*ns*

Notes. *** = $p<.001$, ** $p< .01$, * $p<.05$, *ns* = random effects were not found for this predictor in the model and it was fixed for the analysis.

Table 8. *Depression: Model Fit & Variance Explained*

Model	M3	M4	M5	M6	M7	M8
Baseline PTS	*	*	*	*	*	*
Month	*	*	*	*	*	*
Exposure		*				*
Morale			*			*
Unit Cohesion				*		*
Positive Deployment					*	*
Model Fit (*Original Data*)						
LL^2	1157.48	1139.95	1033.35	1137.24	1101.87	1027.66
AIC	1171.48	1155.95	1051.35	1155.24	1117.87	1053.66
BIC	1202.74	1194.67	1100.52	1195.41	1153.57	1111.68
Parameters	7	8	9	9	9	13
ΔLL^2	-	17.53***	124.13***	20.24***	55.61***	129.82***
Total R^2 (*Pooled Data*)	*0.73*	*0.73*	*0.79*	*0.76*	*0.73*	*0.83*
Improvement in R^2 (*Pooled Data*)	-	*0.00*	*0.06*	*0. 03*	*0.01*	*0.11*

Note: Model fit $N = 155$, R^2 Improvement is over Model 1 (baseline model)

The next step is to examine combat exposures relationship to the strain measures in a model containing all the predictor variables, trend over time and the baseline measures of the dependent variables. In PTS final model (Model 7) pooled fixed effects for combat exposure was significant $b = .236$, $t\ (203) = 5.31$, $p < .001$, suggesting for each exposure to a fear-inducing event corresponded with a .24 increase on the PTS score, holding all other predictors constant (Table 3). In depression's final model (Model 8), the pooled fixed effects of combat exposure were significant, $b = .104$, $t\ (199) = 4.00$, $p < .001$, suggesting each exposure to a fear-inducing event corresponded with a .10 increase on the depression score, holding all other predictors constant (Table 6). Based on the above findings, hypothesis 3 that combat exposure would be positively related to PTS and depression was supported.

Morale Predicting PTS and Depression

Hypothesis 4 proposed that morale would be negatively related to PTS and depression. Morale was found to have a strong to moderate significant negative correlation with both depression and PTS; $r = -.44$, $p < .001$, $r = -.30$, $p < .001$, respectively (Table 2). These correlations lend preliminary support to the hypothesis.

To further examine the relationship morale had with PTS and depression, morale was included into a model that controlled for the baseline measure of the dependent variable and accounted for the monthly trends identified for PTS and depression. For PTS, morale was included in model 4, with the linear and quadratic function of time and baseline measure of PTS. Morale and months were entered as random effects, and the random effects of morale were significant Wald $Z = 2.15$, $p = .03$, and retained in the model (Table 4). The pooled fixed effects for morale were significant, $b = -.223$, $t\ (208) = 6.65$, $p < .001$, suggesting each increase in a point on

the morale scale corresponded with a .22 decrease on the PTS score, keeping the baseline measure of depression and months constant (Table 3). The model was a significant improvement over PTS Model 2, Δ *-2LL* = 52.07, Δ parameters = 2, $p < .001$ (Table 5). The morale model explained 3% more variance over the trend of time model (Table 5).

For depression, morale was included in depression model 5, with the linear function of time and baseline measure of depression. Morale and months were entered as random effects, and the random effects of morale were significant Wald $Z = 2.26$, $p = .02$, and retained in the model (Table 7). The pooled fixed effects for morale were significant, $b = -.331$, t (200) = 9.15, $p < .001$, suggesting each increase in a point on the morale scale corresponded with a .33 decrease on the depression score keeping the baseline measure of depression and months constant (Table 6). The model was a significant improvement over depression Model 3, Δ *-2LL* = 124.13, Δ parameters = 2, $p < .001$ (Table 8). The morale model explained 6% more variance over the trend of time model (Table 8). The results of the models containing morale with baseline measure of the dependent variables and the trends over time support the hypothesis that morale is negatively related to the strain measures.

Morale was then included in a model that contained all the predictor variables, trend over time, and the baseline measures of the dependent variables. In the PTS final model (Model 7) pooled fixed effects of morale were significant $b = -.114$, t (199) = 3.87, $p < .001$ (Table 3). In depression's final model (Model 8), the pooled fixed effects of morale were significant, $b = -.265$, t (198) = 6.89, $p < .001$ (Table 6). Based on the above findings, hypothesis 4 that, Soldiers' reported morale will be negatively related to PTS and depression was supported.

Unit Cohesion

Hypothesis 5 proposed that unit cohesion would be negatively related to PTS and depression. Unit cohesion was found to have moderate significant negative correlations with both depression and PTS; $r = -.13$, $p < .05$ and $r = -.17$, $p < .01$, respectively (Table 2). These correlations lend preliminary support to the hypothesis.

To further examine the relationship unit cohesion had with PTS and depression, unit cohesion was included in a model that controlled for the baseline measure of the dependent variable and accounted for the month trends identified for PTS and depression. For PTS, unit cohesion was included in model 5, with the linear and quadratic function of time and baseline measure of PTS. Unit cohesion and months were entered as random effects, and the random effects of unit cohesion were significant Wald $Z = 5.06$, $p < .001$, and retained in the model (Table 4). The pooled fixed effects for unit cohesion were significant, $b = -.092$, t (203) = 1.77, $p < .05$, suggesting for each increase in a point on the unit cohesion scale corresponded with a .09 decrease on the PTS score keeping the baseline measure of PTS and months constant (Table 3). The model was a significant improvement over PTS Model 2, Δ *-2LL* = 113.34, Δ parameters = 2, $p < .001$ (Table 5). The unit cohesion model explained 6% more variance over the trend of time model (Table 5).

For depression, unit cohesion was included in model 6, with the linear function of time and baseline measure of depression. Unit cohesion and months were entered as random effects, the random effects of unit cohesion were significant Wald $Z = 2.23$, $p < .05$, and retained in the model (Table 7). The pooled fixed effects for unit cohesion were significant, $b = -.135$, t (201) = 3.00, $p < .01$, suggesting for each increase in a point on the unit cohesion scale corresponded with a .14 decrease on the depression score keeping the baseline measure of depression and months constant

(Table 6). The model was a significant improvement over depression Model 3, Δ *-2LL* = 20.24, Δ parameters = 2, $p < .001$ (Table 8). The unit cohesion model explained 3% more variance over the trend of time model (Table 5). Overall, the results of the models containing unit cohesion with baseline measure of the dependent variables and the trends over time, support the hypothesis that unit cohesion is negatively related to the strain measures.

Unit cohesion was then included in a model that contained all the predictor variables, trend over time, and the baseline measures of the dependent variables. In PTS final model (Model 7) pooled fixed effects unit cohesion also were no longer significant $b = -.010$, t (199) = 0.36, $p = .36$ (Tables 6 & 3, respectively). In depression's final model (Model 8), the pooled fixed effects of unit cohesion was no longer significant, $b = -.001$, t (198) = 0.02, $p = .49$. Based on the above findings, hypothesis 5 that, Soldiers' reported unit cohesion will be related to their mental health, was partially supported. The correlations between unit cohesion and the strain measures and the models containing unit cohesion with baseline measures of the dependent variables and trend over time, support the hypothesis. But in the final model including all variables, unit cohesion failed to reach significance, suggesting that unit cohesion did not have a unique effect on PTS and depression.

Perceptions of Positive Deployment Benefits

Hypothesis 6 proposed that Soldiers' perceived perceptions of deployment benefits would be negatively related to PTS and depression. Perceived benefits were found to have moderate significant negative correlations with both depression and PTS; $r = -.34$, $p < .001$ and $r = -.30$, $p < .001$, respectively (Table 2). These correlations lend preliminary support to the hypothesis.

To further examine the relationship perceived benefits had with PTS and depression, perceived benefits was included into a model that controlled for the baseline measure of the dependent variable and accounted for the monthly trends identified for PTS and depression. For PTS, perceived benefits were included in model 6, with the linear and quadratic function of time and baseline measure of PTS. Perceived benefits and months were entered as random effects, and the random effects of perceived benefits were significant, Wald $Z = 3.60$, $p < .001$, and retained in the model (Table 4). The pooled fixed effects for perceived benefits were significant, $b = -.19$, $t(204) = 4.90$, $p < .001$, suggesting for each increase in a point on the perceived benefits scale corresponded with a .19 decrease on the PTS score keeping the baseline measure of depression and months constant (Table 3). The model was a significant improvement over PTS Model 2, Δ *-2LL* = 77.30, Δ parameters = 2, $p < .001$ (Table 5). The perceived benefits model explained 7% more variance over the trend of time model (Table 5).

For depression, perceived benefits were included in model 7, with the linear function of time and baseline measure of depression. Perceived benefits and months were entered as random effects, and the random effects of perceived benefits were not significant, Wald $Z = 1.43$, $p = .16$, and not retained in the model. The pooled fixed effects for perceived benefits were significant, $b = -.267$, $t(204) = 8.72$, $p < .001$, suggesting each increase in a point on the perceived benefits scale corresponded with a .27 decrease on the depression score keeping the baseline measure of depression and months constant (Table 6). The model was a significant improvement over depression, Model 3, Δ *-2LL* = 55.61, Δ parameters = 1, $p < .001$ (Table 8). The perceived positive benefits model explained 0.8% more variance over the trend of time model (Table 5). The results of the models containing perceived benefits with baseline measures of the dependent

variables and the trends over time support the hypothesis that perceived benefits is negatively related to the strain measures.

Perceived benefits were then included in a model that contained all the predictor variables, trend over time, and the baseline measures of the dependent variables. In PTS final model (Model 7), pooled fixed effects perceived benefits also were significant b = -.069, t (202) = 2.86, p= .002 (Table 3). In depression's final model (Model 8), the pooled fixed effects of perceived benefits were significant, b = -.138, t (199) = 4.09, p< .001 (Table 6). Based on the above findings, hypothesis 6, that Soldiers' perceived positive deployment benefits will be negatively related to depression and PTS, was supported.

Facet Level Analysis of PTS

As discussed in the methods section, PTS consist of three sub-facets: reexperiencing, avoidance, and arousal. A separate exploratory analysis was conducted to see how these three facets may potentially differ in their relationships with the predictor variables. The best fitting model for each of the subfacets was retained depending on parsimony and significance of predictor variables' random effects. Variables with nonsignificant random effects for each model were fixed, and significant random effects were allowed to vary. The three models with coefficients, random effects, and model fit are reported in Table 9. It is noted that although the size of the coefficients differed, the significance and direction were relatively consistent between the three facets, the exception being the linear and quadratic function of time, which was only significant for reexperiencing. Avoidance and arousal facet models did not have a significant function of time.

Table 9. *PTS Facet Models*

Models	Re-experience	Avoidance	Arousal
MI Pooled Data			
Fixed Effects			
Intercept	1.16(.05)***	1.23(.06)***	1.54(.08)***
Month	.06(.02)***	.01(.02)	.04(.03)
Month Quad	-.003(.00)*	.00(.00)	.00(.00)
Events	.23(.04)***	.10(.02)***	.27(.05)***
Morale	-.08(.03)**	-.08(.03)**	-.21(.05)***
Unit Cohesion	-.02(.04)	-.04(.06)	-.03(.05)
Positive Deployment	-.09(.04)**	-.15(.05)***	-.16(.05)**
N	196	196	196
Random Effects (Original Data)	Wald Z	Wald Z	Wald Z
Intercept	2.60**	5.05***	5.60***
Month	4.17***	*ns*	3.02**
Events	2.75**	*ns*	2.61**
Morale	*ns*	*ns*	2.41*
Unit Cohesion	3.14**	4.88***	*ns*
Positive Deployment	2.75**	3.91***	2.19*
Model Fit (Original Data)			
LL^2	1047.96	1167.47	1600.91
AIC	1075.96	1191.47	1628.91
BIC	1139.48	1245.91	1692.42
Parameters	14	12	14

Notes. *** = $p<.001$, ** $p< .01$, * $p<.05$,

Relative Weights Analysis

To gain a better understanding of the unique variance explained in depression and PTS by each predictor variable, an exploratory analysis using relative weights analysis (RWA) was conducted using the baseline measure of the dependent variable, time, exposure, morale, unit cohesion, and positive deployment perceptions. RWA is a relative importance index similar to a dominance analysis. RWA is recommended to be used as a supplement to multiple regression analysis, to partition unique variance among multiple correlated predictors (Tonidandel & LeBreton, 2011). Although RWA is useful in that it can show the unique variance contributed by each predictor variable, it does not take into account the nested nature of the data. Thus, it would not be appropriate to use it for the purposes of hypothesis testing in this study, but it can be an aid to better understand the results found in the primary analyzes. While RWA has been criticized because it is an atheoretical approach, it can been a valuable tool in theory-building in that it allows for correctly identifying predicted variance to appropriate variables (Tonidandel & LeBreton, 2011). The RWA was conducted using SPSS 20, using the syntax format provided by Lundby and Johnson (2006). The correlation matrix previously described provided to correlations used in the analysis.

CHAPTER IV

DISCUSSION

The results of this study contribute to the understanding of how Soldiers' mental health strains (PTS and depression) seem to be influenced by stressors and resources during combat. Although the link between combat deployments and negative mental health outcomes are well documented in stress and military literature, a majority of these studies examine mental health at points before and after the deployment and rely on recollection for variables that exist within the deployment. A very few studies have examine the nature of mental health during the actual deployment, likely due to the inherent difficulty of gathering data in such an environment. The results produced by this study contribute to military and occupational stress research, in that they were collected during the deployment and examine both stressors and resources as predictors of mental health strain.

Although most of the hypothesized relationships were at least partially supported, there were some contrary findings. The results will be addressed in greater detail below, broken down by their specified predictor's relationship to the individual strain measures.

Effects of Duration of Deployment on Strains

It was hypothesized that PTS would display a curvilinear trend over time in combat. This was based in large part on previous studies conducted by Mental Health Advisory Team (J-MHAT, 2011; MHAT-V, 2008) that noted that mental health deteriorated at the beginning of the deployment, but started to recover towards the end. Although the results of the PTS model 2 suggest that a curvilinear trend for time did exist, the coefficient for the quadratic function was quite small, but significant. A visual analysis of the predicted scores of the model confirmed the

prediction. PTS gradually increased over time to peak during the eight month of the deployment before gradually decreasing in the last two months (Figure 1), a trend that is very similar to the trends identified in previous research. There are several possible explanations for the recovery noted in the last few months of the deployment. First, the Soldiers at this point may have started to adapt to being in combat, and as such they were less sensitive to the chronic stressors of being in combat and began to recover. This adaptation pattern would be similar to what has been noted in the literature for expatriates and international students, where after a period of (negative) readjustment, they adapted to their new environment (Black & Mendenhall, 1990; Hechanova-Almampav, Beehr, Christiansen, & Van Horn, 2002). Another possible explanation was that the recovery may be due to the anticipation of returning home and leaving combat. The positive affect and relief generated by this anticipation may act as an internal resource and thus the soldiers would be more resilient to daily stressors, allowing for recovery. The third possibility is that some element of the deployment changed in the last few months, reducing the overall stressors that the Soldiers were experiencing, thus allowing for recovery and improvement in mental health.

To gain a better understanding of the nature of the curvilinear trend found for PTS, the last month of the deployment (tenth month) was removed, and the analysis was conducted again. In this analysis of the first 9 months, the month quadratic (curvilinear trend) was no longer significant. This is of slight interest because the final month's data collection differed in many ways. When the Soldiers were taking this questionnaire they were in a vastly different environment than when they took the previous questionnaires. The Soldiers during this time period were in the process of demobilization and had been removed from the forward operating bases that they have been occupying; they were instead stationed in Bagram Airforce Base waiting to be shipped home. As such their daily routines had been changed. No longer were they

expected to conduct dangerous combat missions or additional duties and tasks, but they were allowed to enjoy the comforts and distractions provided by Bagram.

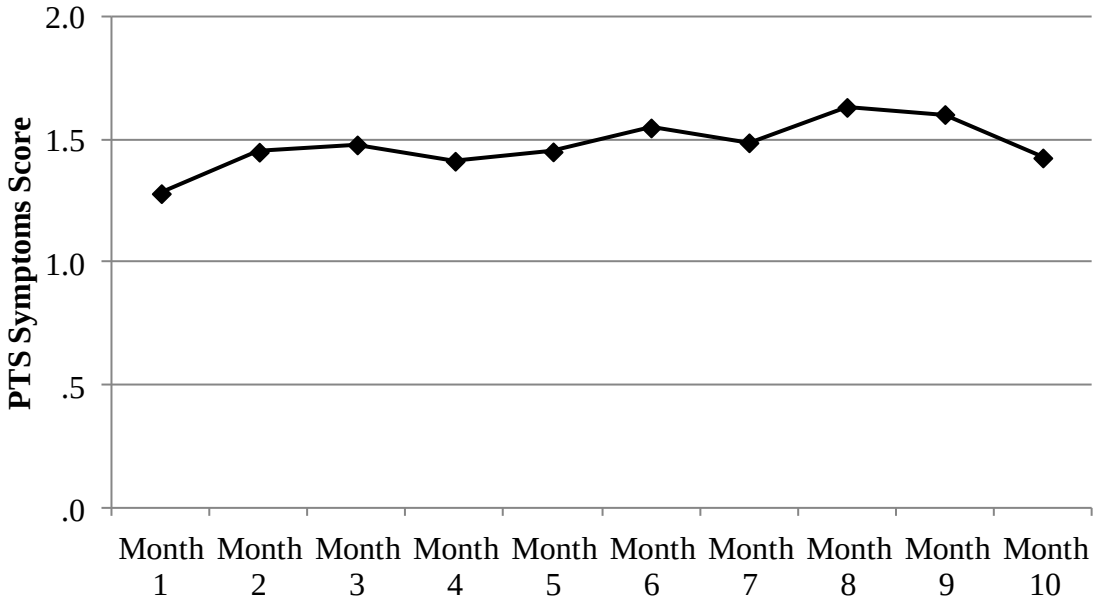

Figure 1. *Mean predicted PTS symptom values for PTS model 2 (baseline, month and month quadratic).* Demonstrating the curvilinear relationship of PTS symptoms over time, controlling for baseline scores of PTS symptoms.

Bagram during this time period had many such distractions; i.e. several gyms, recreation areas, familiar food services (i.e. pizza hut and Burger King), and even masseuses. This period of recovery, relaxation, and knowing that they would be going home soon would provide the Soldiers with many sources of potential resources and could make them feel safer (i.e., fewer immediate stressors), thus allowing them to recover from the strains of combat.

That the environmental nature of the deployment changed in the last month, becoming a safer and a less maladaptive environment, lends support to third possible explanation provided previously. Additionally, this may provide some insight into why PTS recovered towards the end of the deployment, but depression did not. It has been demonstrated that among the resources and

stressors examined in this study, they often had different magnitudes of effect on PTS and depression (e.g. morale having a larger impact on depression, Tables 3, 6 & Figure 2). It is possible that the change in environment that the Soldiers experienced in the last month either reduced exposure to stressors (less time "outside the wire") or increased access to resources (more comfortable environment) that influence the expression of strain as PTS more than depression. It has been established in previous research that low magnitude stressors such as the environment and living conditions can influence PTS rates (Alder, 2006; King et al., 1995), and in the last month these conditions did improve. While a resource such as morale, which this study's results suggest has a great impact on depression, may not have been impacted by the change in environment.

Additional lack of support for the curvilinear relationship between time and PTS can be seen in how quickly the quadratic function of months lost significance. For PTS models 3 and 5, once combat exposure or morale was included in the model (model 3 & 5 respectively; Table 3), months quadratic lost all significance. Additionally in PTS model 5, when morale was included in the model, the linear function of time lost significance, suggesting that to morale may have some shared variance with time in its effect on PTS. No interaction effects were found for time and morale or time and exposure. These findings are similar to the findings by the US Army, that found that while months in combat is a strong predictor of mental health problems, it will no longer be significant when combat exposure is included in the model (MHAT-V, 2008). They also note that no interaction was found and suggest that the effects of time are independent of combat experiences.

When a relative weights analysis (RWA) was conducted to examine the unique variance explained by each variable, it was found that time only explained about 1% of the total variance

explained by all the variables in the model (see Figure 2). This suggests that the chronic stress exposure over time on PTS does not contribute as much as combat exposure, baseline PTS, morale, positive deployment perceptions.

Depression, in contrast to PTS, did not follow the predicted trend over time. There was no evidence found that supported a curvilinear trend for depression, only a linear trend with depression scores increasing during the deployment. Although the quadratic function of depression was not significant, it only missed significance by a slight margin. It is possible that the small sample size may have been a hindrance to finding a significant curvilinear relationship. There was a linear effect of time on depression while accounting for baseline depression levels. Depression increased slightly over the duration of the deployment, suggesting that the continued exposure to chronic stressors depleted the resources of the Soldiers, making them more likely to exhibit strain as depression. Additionally, the lack of recovery in depression scores over time suggests that Soldiers failed to adapt to the chronic stressors over time; thus the sustained exposure likely continued to exhaust resources from the Soldiers, increasing their vulnerability to strain. It may have been possible that the duration of time was just not long enough to allow for the Soldiers to adapt. The curvilinear trend in poor mental health (PTSD, depression, and anxiety) that was noted in the literature review, was tracked over a 16 month period (compared to the 10 months in this study), with the recovery occurring around the 10^{th} month (MHAT-V, 2008; Lee et al., 2011).

This linear effect of time on depression maintained significance with the inclusion of both combat exposure and the resources into the model. This suggests that the chronic exposure to stressors acts partially independent of these variables. When a relatively weights analysis was conducted on all the predictors on depression, time (months) contributed 1.6% of the overall variance explained in depression (see Figure 2). It should be noted that RWA does not take into

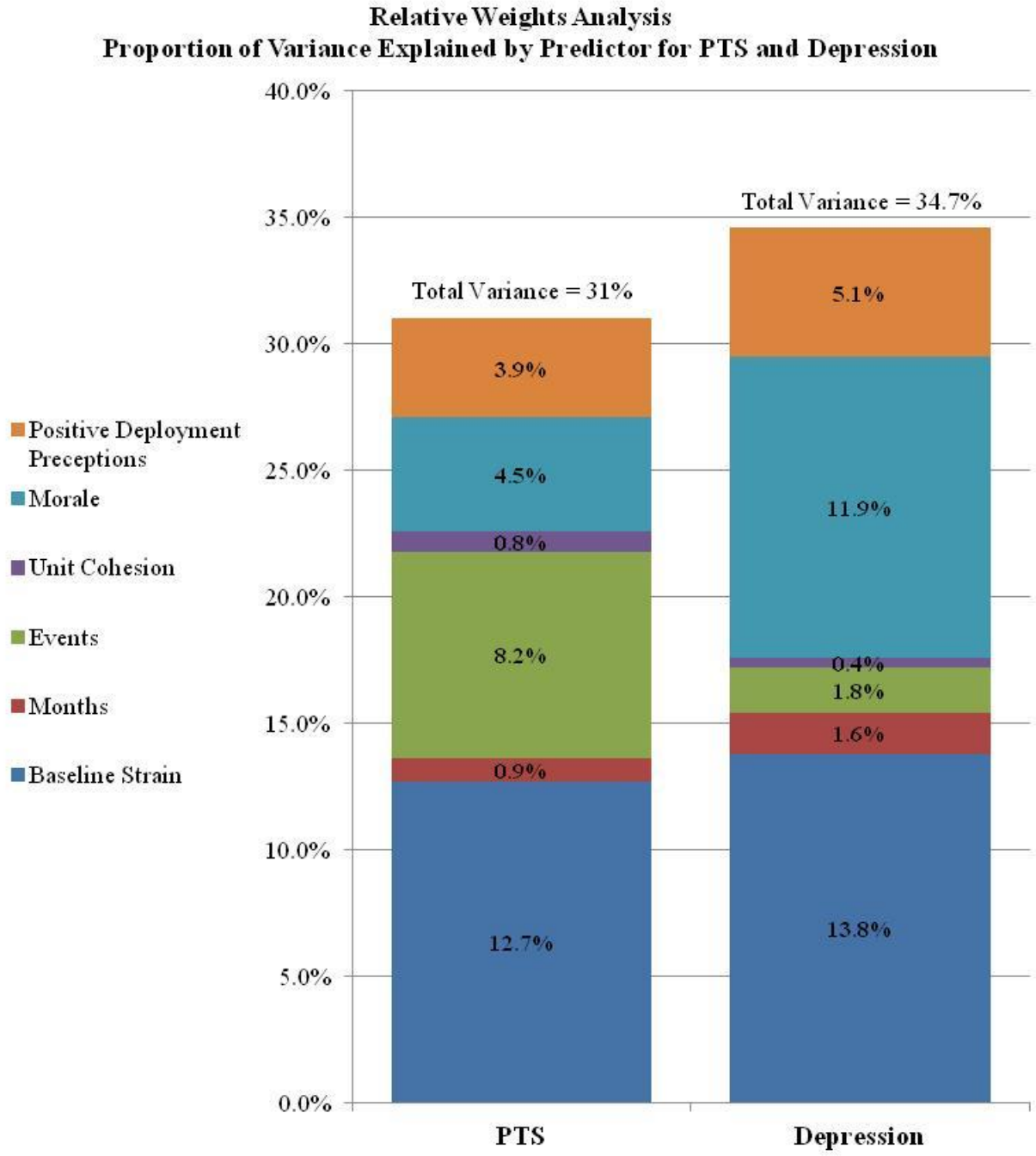

Figure 2. *Relative weights analysis of predictors' unique variance explained to PTS and depression.* The relative weights were calculated using the model defined correlation matrix and explain the overall unique variance each predictor explain in the strain variable overall. This method does not take in account the random effects accounted for by the mixed model and as such may differ slightly from the variance explained in those models.

account the random effects, which remained significant throughout the models. The random effects variance captured by the models allows them to potentially explain a greater amount of variance than the RWA. Time does appear to contribute slightly more to depression than to PTS. This is evident in that time (months deployed) maintained significance throughout all the models for depression but lost significance for PTS and that it explained a greater amount of variance in the RWA for depression than it did for PTS (Tables 2, 6-8, Figure 2).

Overall, the support for the proposal of a curvilinear relationship of duration of deployment on the two psychological strains was very weak. Duration of deployment did not have a curvilinear effect on depression. Its curvilinear relationship with PTS was weak and due primarily to the reduction in PTS during the last month of deployment. During the last month the Soldiers' situation was very different, however, and in fact entailed less stressful situations. The slight recovery seen at that time is more likely due to the decrease in stressors than to adaptation to stressors based on available resources, which was the assumption inherent in the hypothesis.

Effect of the Stressor (Combat Exposure) on Strains

Consistent with past research, combat exposure (perceived threat) was found to be positively related to both PTS and depression. Additionally, combat exposure was found to have a greater effect on PTS than it did on depression, as evident by the degree of the fixed effect coefficients (See Tables 2 & 5). That combat exposure has a stronger relationship with PTS than depression is consistent with past research that measured both PTS and depression among Soldiers (King et al., 2006) and is therefore not unexpected, considering the nature of the two strain measures. Additional support for this was found in a RWA, where it can be seen that combat exposure accounted for more variance explained in PTS (8.2%) than it did in depression (1.8%).

It should also be noted that the random effects for the slope of combat exposure with PTS did vary significantly among Soldiers. This suggests that there are potential individual differences not included in this study that influence the degree to which combat exposure relates to PTS symptoms during combat. Although baseline PTS scores, which were included in the analysis, may account for some of these individual differences, they are unlikely to account for all of them. If individual differences such as gender, age, or education play a role in increasing the vulnerability of an individual to trauma, then they will likely have a stronger reaction to combat exposure (a steeper slope) in regards to PTS. Once again this is not completely unexpected considering that past research has identified several individual characteristics that influence the risk for PTSD (Brewin, et al., 2000; Maguen et al., 2006). The random effects for the slope of combat exposure and depression was not significant, suggesting that the relationship noted in the fixed effects is constant for all Soldiers.

Effects of Resources on Strains

Morale

The hypothesis that morale would be negatively related to PTS and depression was supported for both psychological strains. In addition, the RWA showed that morale uniquely explained decent amounts of variance for both PTS and depression (5% and 12%, respectively). It is interesting to note that morale did explain more than twice the amount of variance in depression as it did in PTS. This suggests that a Soldier's morale may have more of an impact on the expression of strain in the form of depression symptoms than PTS symptoms. Soldiers that report having higher morale appear to be a lower risk of reporting depression and PTS symptoms than Soldiers reporting lower morale. This decreased risk associated with morale appears to have a

greater degree of influence on depression than PTS. Morale acting as an internal individual resource (individual's morale) as well as a resource gain from the unit (perception of platoon morale), is in line with COR theory that having a great amount of morale helps minimize the threat of loss of resources from exposure to stressors of a combat deployment. This differentiation in degree of impact lends support to distinction between PTS and depression as different mental health concerns. Furthermore, because morale may potentially be a means through which unit cohesion influences PTS and depression, and unit cohesion has found to buffer the effects of combat exposure on PTS (J-MHAT-7, 2011), the potential buffering effect of morale on combat exposure's effect on PTS was examined. Using a model that included baseline PTS, combat exposure, morale, and the interaction of combat exposure with morale, the interaction term reached significance b = - .04, t (211) = 1.84, p = .03. This shows a slight buffering effect of morale on the relationship between combat exposure and PTS, such that Soldiers with lower morale have a slightly greater risk of PTS with increasing combat exposure than Soldiers with higher morale. That this interaction is of interest, because it is similar to the buffering effect of unit cohesion on the relationship of combat exposure with PTS that has been found by the US Army (J-MHAT-7, 2011), and they have invested in it although it is quite small and could only be identified in very large samples.

Unit Cohesion

Unit cohesion is widely regarded as an important predictor of unit and individual performance and productivity in military units (Griffith, 1997; Oliver et al., 1999). This study found only partial support that unit cohesion was negatively related to PTS and depression. Although unit cohesion had obtained a significant negative relationship with both PTS and

depression when included in the model (Model 4) and had a significant negative correlation with the strain measures, it lost that significance in the final model with all predictors included. In the RWA analysis, it was determined that unit cohesion contributed less than 1% of the variance explained in both strain variables. Although MHAT studies using the same measure of unit cohesion as this study had found that unit cohesion was significantly related to acute stress (PTS), they examined morale as an outcome variable instead of including it in their model as a predictor as this study did; this may explain their contradictory findings (J-MHAT-7, 2011). Other past literature has also failed to find support of unit cohesions having a significant relationship with negative mental health outcomes, however (literature review by Whitesell & Owens, 2012).

In an exploratory analysis, it was found that by including combat exposure in a model with unit cohesion, unit cohesion still maintained significance. When morale was added to the exploratory analysis model, unit cohesion lost its significance, however. Unit cohesion may influence the strain variables through morale and positive deployment benefits, because it is highly correlated with these two predictors, and when they are in the model together unit cohesion lost significance. There is some support of this potential mediated effect in literature, as unit cohesion has been found to predict morale following a deployment (Maguen & Litz, 2006), establishing one of the necessary paths of mediation. If we consider morale as a motivational state, as proposed by Britt et al. (2007), it could be proposed that unit cohesion influences this motivational state which in turn acts as a resource limiting the risk of PTS and depression. As noted in the literature review of unit cohesion, it has not always been found to be significantly related to negative mental health outcomes (Whitesell& Owens, 2012).

Positive Perceived Deployment Benefits

The hypothesis that positive perceived deployment benefits would be directly related to strains was supported. Significant relationships were established between positive perceptions of deployment benefits for both PTS and depression, although there was only a slight increase in variance explained for depression over the baseline depression and trend over time model (depression Model 3). While the improvement in R^2 in the models when adding positive deployment perceptions was only 1% for depression variable, when the RWA is examined, it can be seen that the positive perceived deployment benefits did explain a good deal of variance for both PTS and depression (4% & 5%, respectively). Thus Soldiers who report having a higher degree of positive perceptions appear to have a reduced risk of reporting negative mental health symptoms during combat. This provides support to the assertion that Soldiers who tend to view elements of the deployment more positively may have a greater resilience to the negative stressors present during the combat deployment. The RWA additionally provides support to Litz and colleagues' (1997) assertion that positive perceptions of deployment and overall morale are distinct constructs. Because the relative weights analysis shows the unique variance explained by each factor, we see that morale and perceptions of positive deployment benefits explain unique amounts of the strain variables.

Overall, the results indicate that the may not be a curvilinear trend for psychological strains during the course of a combat deployment. Both the stressor of combat exposure and the resources of morale, unit cohesion, and positive perceptions about deployment are likely to reduce the strains during deployment, however.

Limitations

As with all the studies, there are limitations with the current study. This study is limited in its generalizability in that it only followed the experience of one National Guard Infantry company with a very specific mission during a single combat deployment. The assumption that their experience was typical of deployments must be made with caution. It is possible that these Soldiers experienced unique events and situations that may have influenced the results of the study. This combined with the relative small sample size of the study may limit the findings. It has been noted in previous research (J-MHAT, 2008) that unless the sample is relatively large, many of the potential interactions between variables will not reach significance. Although the sample size was small and limited to one unit, the concerns of these limitations are reduced due to the longitudinal nature of the study with multiple data points, providing the analysis with a large number of observations with many possible combinations of experiences and individuals.

Additionally, the design of the analysis, while longitudinal, examined the relationships between variables at the same time period, which limits the assertions of causality. While it is assumed that the presence of stressors and resources precede the mental health outcomes, it is possible that relationships between variables may be bidirectional. This is especially true considering perceived resources such as morale and positive perceptions of deployment benefits with a strain measure like depression. Due to the nature of depression, a depressed individual may perceive their unit morale to be lower and feel that there are fewer benefits to the deployment. In future research, to determine more clearly the causality of the strains, time 1 resources could be compared to a time 2 strain.

Missing time period data is another weakness to this study. Although item level missing data was relatively low for most items, 0% to 9% depending on the item, there were a few items

that had a large percentage of missingness. Fortunately for the study, the items that were missing a large percentage were not items of interest. Furthermore the missingness on those items was likely legitimate, that is, they included the variables related to having a spouse/partner and family; because these were not relevant to many of the single soldiers, they may have been missing simply because they were irrelevant. Aside from item-level missing data, missing time period data is another weakness to this study. Some Soldiers may not have answered a questionnaire due to reasons comparable to civilian workers, e.g. they consciously chose not to do it or they just felt too busy. In this unique situation, however, with the difficult nature of gathering data in a combat zone, many soldiers may have failed to complete questionnaires at specific time periods due to unavailability. In addition, another problem that contributed to the time period missingness was that Soldiers forgot their identification numbers used to match questionnaires. Although the statistical analysis methods used attempted to address this weakness (e.g. mixed level variable time series analysis and multiple imputation), we cannot prove that there was not another underlying reason for missingness. Most of these missing questionnaires should not be attributed to attrition in the traditional sense, however. That would be indicated by a pattern of complete or frequent response to questionnaires over the months followed by complete nonresponse after a certain time. This was rarely the case in the present study; instead when soldiers missed a month, they usually answered again in a later month. Evidence for this can be observed in the percentage of responses by month, where it was observed that response rates would dip then improve in the following months (e.g. 27% month 12, 59% month 13), if it was true attrition, the response rate would be expected to decrease each month without recovering.

Another limitation discussed in the analysis section was that sub-group membership was not accounted for. The National Guard company had four maneuver platoons that were each

assigned to work with different Afghan National Police (ANP) units and conducted operations in the corresponding geographical areas where the ANP were located. As such, the separate units were located in three to four (depending on the time period within the deployment) different operating bases and were exposed to different missions and combat exposures. Although the overall combat missions, geographical terrain, living conditions, and standard operating principles were very similar across the subgroups, there may have been differences that were not noted because of the method of analysis used. Additionally, several organizational factors such as leadership styles of officers and noncommissioned officers, group cohesion, and platoon morale may have also varied across the different sub-groups. Even if subgroup membership could have been tracked without sacrificing an element of confidentiality, the small number of subgroups (three platoons within the company, three squads within platoon, and three fire teams within a squad) would have made it unlikely that the mixed models method used would be able to capture significant differences, unless the effect size was rather substantial. This aside, future research may benefit from examining subgroup membership as a random effects; if significant random effects are noted, then further analysis of subgroup characteristics may shed some light on organizational factors that may influence negative mental health outcomes during combat. To the knowledge of this author, this is a relatively unexplored area for PTS (and PTSD) and depression in regards to deployment and may provide useful insight into preventive measures that may reduce the negative outcomes of combat deployment. Considering the role that morale has in both PTS and depression, it would be interesting to explore how leadership styles and intergroup relationships may influence negative mental health outcomes through morale via full or partial mediation.

An additional limitation that arose with the absence of sub-group membership was the measuring of group level variables, in particular unit cohesion. Often when testing perceptions of the group (in the case of unit cohesion, platoon) it is desired to use a group level measure. As discussed previously, it was not possible to compute a platoon level measure of unit cohesion due to confidentiality concerns with tracking unit membership. Throughout the review of literature on unit cohesion though, it was noted that unit cohesion is often measured with individual responses (e.g. Griffith, 1988; Griffith, 2002; Sutker et al., 1996) rather than group-level measures. In addition, as stated in the review of unit cohesion literature, there is evidence that suggest using an individual level measure will have greater predictive value than the unit level measure (Griffith, 2002).

Despite these limitations, this study provides unique insight in the relationship between PTS and depression with several stressors and resources during a combat deployment. Future research can expand on these findings by clarifying causal links between them and identifying potential moderators.

Future Research

Unfortunately, there will be continued opportunity and cause for further research in negative mental health outcomes that military and civilian personnel are exposure to, due to current and future combat operations. This study provides a brief glimpse of some potential areas that may provide insight into the nature of PTS and depression. One recommendation that can be taken from this study is for an increase in studies that examine what is happening during combat, rather than focusing on take measures taken before and after the units return from combat and the reliance on soldiers' recollection of events during combat.

In regards to the effects of duration in combat, it is fairly well established that the length of a deployment is related to risk of negative mental health outcomes, such that the longer military personnel are deployed there is a greater risk of them developing negative mental health outcomes. But the nature of this trend over time is not completely understood. Future research would be useful in determining if adaptation to the stressors truly does occur as it is suggested by the curvilinear relationships noted in other studies (e.g. MHAT-V, 2008) or are there other factors at play. Additionally, it would be beneficial to examine negative mental health outcomes separately (e.g. PTS, depression, anxiety) to determine if they have unique trends over time in combat as this study suggests.

As mentioned previously in the review of literature, there has not been an abundant amount of empirical research done focusing on morale, despite its importance to the military. The results presented in this study have shed some light on how morale can be a potential variable of interest on soldiers' well-being. Some of the potential questions are why does morale appear to have a greater impact on depression than PTS, and does morale act as an internal resource similar to self-efficacy or as a motivational state. In addition, a very interesting interaction effect was found for morale, suggesting that high morale buffers the effect of combat exposure on PTS, this would be a valuable area to examine further, as it has direct application to potentially reducing PTSD rates in returning veterans.

Related to expanding the research focusing on morale, there is potential in examining how it works in conjunction to unit cohesion. There is evidence that suggest that morale may act as a mediator between unit cohesion and negative mental health outcomes. This would provide valuable insight to the military when it considers how to develop and leverage unit cohesion within in its elements. Finally, there should be continued research into positive psychology's role in

prevention of negative mental health outcomes in deployed soldiers, as this field of psychology has been relatively untapped.

In conclusion, although certain aspects of PTS and depression are well established as combat strains (e.g. the increased risk associated with exposure to combat), there are still aspects of PTS and depression in relation to combat deployment that are uncertain. Due to the high rates of soldiers, marines, airmen, and sailors who are suffering from depression and PTS during their combat deployments and after they have returned, there is a need to continue to gain a greater understanding of these mental health issues. With a great understanding, better training, resilient focused leadership, and primary care for these military personnel can be developed or improved to minimize their risk of negative mental health concerns during a combat deployment.

APPENDIX B

INITIAL QUESTIONNAIRE SURVEY

Please choose a unique code for yourself. You will need to remember this code, in order to put it on each monthly survey. You could choose, for example, the last four digits of your social security number.
Enter Your Survey Code Number_____

PLEASE ANSWER THE FOLLOWING QUESTIONS BY CIRCLING THE WORDS OR NUMBERS THAT INDICATE YOUR RESPONSE OR BY WRITING YOUR ANSWER ON THE BLANK LINE BESIDE THE QUESTION.

How many times have you been deployed to a combat area before? 0 1 2 or more

Overall, in the PAST MONTH, how would you rate your physical health, on a one-to-ten scale?

Very poor									Excellent
1	2	3	4	5	6	7	8	9	10

On the Army Physical Fitness Test (APFT), what was your most recent score? _____

How many times in the PAST MONTH have you gone to sick call or visited a doctor or other medical professional?

Zero once twice three times four times five or more times

How many DAYS OF WORK did you miss due to illness in the PAST MONTH?

0 days 1 day 2 days 3 days 4 days 5 days 6 or more days

Over the LAST MONTH, how often have you been bothered by any of the following problems?

	Not At all	Few or Several Days	More than Half the Days	Nearly Every Day
Little interest or pleasure in doing things.	1	2	3	4
Feeling down, depressed, or hopeless.	1	2	3	4
Trouble falling or staying asleep, or sleeping too much.	1	2	3	4

During the last month, how many times did you experience any event that caused fear, helplessness or shock?

Zero times once twice three times four times five times or more

On average, how many hours of sleep do you get per day? _____
How many hours of sleep do you need per day in order to feel well-rested? _____

Below is a list of reactions that soldiers sometimes experience during deployment or in response to other stressful life experiences. Please mark how much you have been bothered by each problem IN THE LAST MONTH.

	Not at all	A little bit	Moderately	Quite a bit	Extremely
Repeated disturbing memories, thoughts, or images of the stressful experience	1	2	3	4	5
Having physical reactions (like heart pounding, trouble breathing, sweating) when something reminded you of the stressful experience	1	2	3	4	5
Avoiding activities or situations because they reminded you of the stressful experience	1	2	3	4	5
Having difficulty concentrating	1	2	3	4	5

How much trouble or concern has each of the following been for you IN THE LAST MONTH?

	Very low trouble or concern				Very high trouble or concern
Being separated from family	1	2	3	4	5
Illness or problems back home	1	2	3	4	5
Lack of time off, for personal time	1	2	3	4	5
Not getting enough sleep	1	2	3	4	5

Only answer the next 3 questions if you live with a spouse or with someone as a couple.

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
1 I have a good marriage	1	2	3	4	5
2 My relationship with my spouse is very stable	1	2	3	4	5
3 I really feel like a part of a team with my spouse	1	2	3	4	5

Please rate the following:

Your personal morale	very low	low	medium	high	very high
Morale in your **platoon**	very low	low	medium	high	very high

The members of my **platoon**…	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
know they can depend on each other	1	2	3	4	5
would risk their lives for each other	1	2	3	4	5
stand up for each other	1	2	3	4	5

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
I think the level of training in my platoon is high	1	2	3	4	5
I have real confidence in my platoon's ability to perform its mission	1	2	3	4	5

These phrases describe people's behaviors. Please describe yourself as you generally feel now, not as you wish to be in the future. How accurately does each statement apply to you?

	Very Inaccurate	Moderately Inaccurate	Neither Inaccurate nor Accurate	Moderately Accurate	Very Accurate
Am skilled in handling social situations	1	2	3	4	5
Have frequent mood swings	1	2	3	4	5
Am the life of the party	1	2	3	4	5
Am not easily bothered by part things	1	2	3	4	5
Don't like to draw attention to myself	1	2	3	4	5
Dislike myself	1	2	3	4	5
Make friends easily	1	2	3	4	5
Seldom feel blue	1	2	3	4	5
Know how to captivate people	1	2	3	4	5
Panic easily	1	2	3	4	5
Keep in the background	1	2	3	4	5
Feel comfortable with myself	1	2	3	4	5
Don't talk a lot	1	2	3	4	5
Am often down in the dumps	1	2	3	4	5
Feel comfortable around people	1	2	3	4	5
Often feel blue	1	2	3	4	5
Have little to say	1	2	3	4	5

Demographics

Please circle your rank: officer E5 or above E4 or below

Are you married or living with someone as a couple? Yes No

Do you have children living with you in your home? Yes No

What is your level of education? High School Some College College degree

How old are you? younger than 22 22-30 30 or older

What is your gender? male female

Do you consider yourself to be a member of a racial or ethnic minority? Yes No

MONTHLY QUESTIONNAIRE STATESIDE

TODAY'S DATE IS _____

Please Enter Your Survey Code Number_____

PLEASE ANSWER THE FOLLOWING QUESTIONS BY CIRCLING THE WORDS OR NUMBERS THAT INDICATE YOUR RESPONSE OR BY WRITING YOUR ANSWER ON THE BLANK LINE BESIDE THE QUESTION.

Did you take a leave during the last month? Yes___ No___

Overall, in the PAST MONTH, how would you rate your physical health, on a one-to-ten scale?

Very poor Excellent

1 2 3 4 5 6 7 8 9 10

How many times in the PAST MONTH have you gone to sick call or visited a doctor or other medical professional?

Zero once twice three times four times five or more times

How many DAYS OF WORK did you miss due to illness in the PAST MONTH?

0 days 1 day 2 days 3 days 4 days 5 days 6 or more days

Over the LAST MONTH, how often have you been bothered by any of the following problems?

	Not At all	Few or Several Days	More than Half the Days	Nearly Every Day
Little interest or pleasure in doing things.	1	2	3	4
Feeling down, depressed, or hopeless.	1	2	3	4
Trouble falling or staying asleep, or sleeping too much.	1	2	3	4

During the last month, how many times did you experience any event that caused fear, helplessness or shock?

Zero times once twice three times four times five times or more

On average, how many hours of sleep do you get per day? _____

How many hours of sleep do you need per day in order to feel well-rested? _____

Below is a list of reactions that Soldiers sometimes experience during deployment or in response to other stressful life experiences. Please mark how much you have been bothered by each problem IN THE LAST MONTH.

	Not at all	A little bit	Moderately	Quite a bit	Extremely
Repeated disturbing memories, thoughts, or images of the stressful experience	1	2	3	4	5
Having physical reactions (like heart pounding, trouble breathing, sweating) when something reminded you of the stressful experience	1	2	3	4	5
Avoiding activities or situations because they reminded you of the stressful experience	1	2	3	4	5
Having difficulty concentrating	1	2	3	4	5

How much trouble or concern has each of the following been for you IN THE LAST MONTH?

	Very low trouble or concern				Very high trouble or concern
Being separated from family	1	2	3	4	5
Illness or problems back home	1	2	3	4	5
Lack of time off, for personal time	1	2	3	4	5
Not getting enough sleep	1	2	3	4	5

Only answer the *next 10* questions if you live with a spouse or with someone as a couple.

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
1 I have a good marriage	1	2	3	4	5
2 My relationship with my spouse is very stable	1	2	3	4	5
3 I really feel like a part of a team with my spouse	1	2	3	4	5
4 In the LAST MONTH, I am pleased with my spouse's handling of finances.	1	2	3	4	5
5 I am pleased with my spouse's running of the household.	1	2	3	4	5

6 My spouse and I have become more psychologically distant.	1	2	3	4	5
7 My spouse and I have a new agreement about the control of our finances.	1	2	3	4	5
8 My spouse and I trust each other less than we did.	1	2	3	4	5
9 My spouse is not very good with finances.	1	2	3	4	5
10 I resent my spouse's new friends.	1	2	3	4	5

Everyone answer the rest of the questions

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
Overall, this deployment has had a positive effect on my life	1	2	3	4	5
This deployment has made me more confident in my abilities	1	2	3	4	5
I feel that what I am doing during this mission is important	1	2	3	4	5
I am making a real contribution to accomplishing this mission	1	2	3	4	5

Please rate the following:

Your personal morale	very low	low	medium	high	very high
Morale in your **company**	very low	low	medium	high	very high

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
The members of my **platoon**…					
know they can depend on each other	1	2	3	4	5
would risk their lives for each other	1	2	3	4	5
stand up for each other	1	2	3	4	5

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
I think the level of training in my platoon is high	1	2	3	4	5
I have real confidence in my platoon's ability to perform its mission	1	2	3	4	5

MONTHLY QUESTIONNAIRE AFGHANISTAN

TODAY'S DATE IS _____

Please Enter Your Survey Code Number_____

PLEASE ANSWER THE FOLLOWING QUESTIONS BY CIRCLING THE WORDS OR NUMBERS THAT INDICATE YOUR RESPONSE, OR BY WRITING YOUR ANSWER ON THE BLANK LINE BESIDE THE QUESTION.

Did you take a leave during the last month? Yes___ No___
If yes, did you leave Afghanistan during this leave? Yes___ No___

Overall, in the PAST MONTH, how would you rate your physical health, on a one-to-ten scale?

Very poor									Excellent
1	2	3	4	5	6	7	8	9	10

How many times in the PAST MONTH have you gone to sick call or visited a doctor or other medical professional?

Zero once twice three times four times five or more times

How many DAYS OF WORK did you miss due to illness in the PAST MONTH?

0 days 1 day 2 days 3 days 4 days 5 days 6 or more days

During the last month, were you knocked out (lost consciousness)? Yes No

Over the LAST MONTH, how often have you been bothered by any of the following problems?

	Not At all	Few or Several Days	More than Half the Days	Nearly Every Day
Little interest or pleasure in doing things.	1	2	3	4
Feeling down, depressed, or hopeless.	1	2	3	4
Trouble falling or staying asleep, or sleeping too much.	1	2	3	4

During the last month, how many times did you experience any event that caused fear, helplessness or shock?

Zero times once twice three times four times five times or more

On average, how many hours of sleep do you get per day? _____
How many hours of sleep do you need per day in order to feel well-rested? _____

Below is a list of reactions that soldiers sometimes experience during deployment or in response to other stressful life experiences. Please mark how much you have been bothered by each problem IN THE LAST MONTH.

	Not at all	A little bit	Moderately	Quite a bit	Extremely
Repeated disturbing memories, thoughts, or images of the stressful experience	1	2	3	4	5
Having physical reactions (like heart pounding, trouble breathing, sweating) when something reminded you of the stressful experience	1	2	3	4	5
Avoiding activities or situations because they reminded you of the stressful experience	1	2	3	4	5
Having difficulty concentrating	1	2	3	4	5

How much trouble or concern has each of the following been for you IN THE LAST MONTH?

	Very low trouble or concern				Very high trouble or concern
Being separated from family	1	2	3	4	5
Illness or problems back home	1	2	3	4	5
Lack of time off, for personal time	1	2	3	4	5
Not getting enough sleep	1	2	3	4	5

Only answer the *next 10* questions if you live with a spouse or with someone as a couple.

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
1 I have a good marriage	1	2	3	4	5
2 My relationship with my spouse is very stable	1	2	3	4	5
3 I really feel like a part of a team with my spouse	1	2	3	4	5
4 In the LAST MONTH, I am pleased with my spouse's handling of finances.	1	2	3	4	5
5 I am pleased with my spouse's running o the household.	1	2	3	4	5
6 My spouse and I have become more	1	2	3	4	5

psychologically distant.					
7 My spouse and I have a new agreement about the control of our finances.	1	2	3	4	5
8 My spouse and I trust each other less than we did.	1	2	3	4	5
9 My spouse is not very good with finances.	1	2	3	4	5
10 I resent my spouse's new friends.	1	2	3	4	5

Everyone answer the rest of the questions

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
Overall, this deployment has had a positive effect on my life	1	2	3	4	5
This deployment has made me more confident in my abilities	1	2	3	4	5
I feel that what I am doing during this mission is important	1	2	3	4	5
I am making a real contribution to accomplishing this mission	1	2	3	4	5

Please rate the following:

Your personal morale	very low	low	medium	high	very high
Morale in your **company**	very low	low	medium	high	very high

The members of my **platoon**…	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
know they can depend on each other	1	2	3	4	5
would risk their lives for each other	1	2	3	4	5
stand up for each other	1	2	3	4	5

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
I think the level of training in my platoon is high	1	2	3	4	5
I have real confidence in my platoon's ability to perform its mission	1	2	3	4	5

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