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An exploration of self-reported neurological-psychological symptoms in an OEF

Elga Kinnear
George Fox University

An Exploration of Self-Reported Neurological-Psychological Symptoms in an OEF/OIF Veterans Administration Polytrauma Clinic Sample

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Elga Kinnear

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Elga Kinnear, M.A.

has been approved

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Graduate School of Clinical Psychology

George Fox University

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Approval

Signatures:

Wayne Adams, PhD, Chair

Members:

Mary Peterson, PhD

Kathleen Gathercoal, PhD

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Elga Kinnear

Graduate Department of Clinical Psychology at

George Fox University

Newberg, Oregon

Abstract

Background: Traumatic Brain Injury, specifically mild (mTBI), has been labeled a "signature injury" of the wars in Iraq and Afghanistan and is not uncommon among Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans. Many veterans report lingering cognitive difficulties following the injury. Further, an mTBI diagnosis has also been made more challenging due to a symptom overlap with Posttraumatic Stress Disorder (PTSD) symptoms. **Rationale:** Little is known of the response patterns of mTBI patients on commonly used self-report measures, the Neurobehavioral Symptom Inventory (NSI) and PTSD Checklist (PCL). Of special interest was the similarity of overlapping neurological-psychological symptoms found within these 2 measures. The current research examined whether veterans with a history of mTBI undergoing Secondary TBI Evaluations reported higher neurological-psychological symptoms on the NSI (a neurologically-focused measure) when compared to the PCL (a psychologically-focused questionnaire). Factors such as blast vs. other types of injuries,

number of blast exposures, treatment participation, education, and marital status were also evaluated. **Methods:** Records of 507 recent veterans (482 males and 25 females; mean age = 31.0 years) were utilized. The 5 overlapping items on the NSI and PCL were selected for comparison. **Results:** Overall, self-reporting of forgetfulness, anxiety, and irritability were higher on the NSI than the PCL. Poor concentration and sleep difficulties were not found to differ. Some form of TBI treatment, types of mTBIs, number of mTBIs, marital status, and education status were also not found to be important predictors in report of symptom severity on the NSI. **Conclusions:** Findings suggest that following up on forgetfulness, anxiety, and irritability, conducting comprehensive TBI evaluations (including clinical diagnostic interviewing), as well as referring veterans with post-concussive symptoms for full neuropsychological assessments will further help providers to rule-out or give an accurate mTBI diagnosis.

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On a personal note, I could have not made it through the life challenges without my mother, Dr. Tatiana Afezolli, the best life teacher. Thank you for nourishing my passion for neuropsychology. A special thanks goes to my sister, Dr. Enika Cocoli, who opened the path toward psychology and taught me what it means to be a great psychodynamic psychologist. Lastly and most importantly, I would like to thank my husband, Doug Kinnear. I could have never completed this journey without his unconditional love and support. Everyday I am amazed about his dedication and eagerness to learn about TBI. I may never fully understand the sacrifices he made for my career dreams, but I plan to spend the rest of my life showing him my appreciation.

I would like to dedicate this project to the military men and women and their families, who have been greatly impacted by the effects of war trauma.

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Chapter 1

Introduction

One of the fastest-growing causes of Traumatic Brain Injury (TBI) is blast exposure (DePalma, Burris, Champion, & Hodgson, 2005). Currently, there is growing concern that explosion-related brain injuries are a major problem for service members returning from Iraq (OIF – Operation Iraqi Freedom) and Afghanistan (OEF – Operation Enduring Freedom), as well as the leading cause of death in war zones (Department of Defense [DoD], 2007). "Traumatic Brain Injury has been labeled a signature injury of the wars in Iraq and Afghanistan" (Hoge et al., 2008, p. 454) and has been called "the silent epidemic" (DoD, 2006).

The effects of brain injury remain controversial and poorly understood (Vasterling et al., 2006). Non-war related TBI is the leading cause of disability and death in young individuals in the United States and many other countries (Lucas & Addeo, 2006). TBI accounts for 85% of new diagnoses each year in the US, while breast cancer accounts for 11% of diagnoses, HIV/AIDS accounts for 3% of diagnoses, spinal cord injuries account for 1% of diagnoses, and Multiple Sclerosis accounts for slightly greater than 1%. The relative prevalence of these conditions is shown in Figure 1 (Brain Injury Association of America, 2006). As can be seen, TBI accounts for more new diagnoses each year than all other common medical conditions combined.

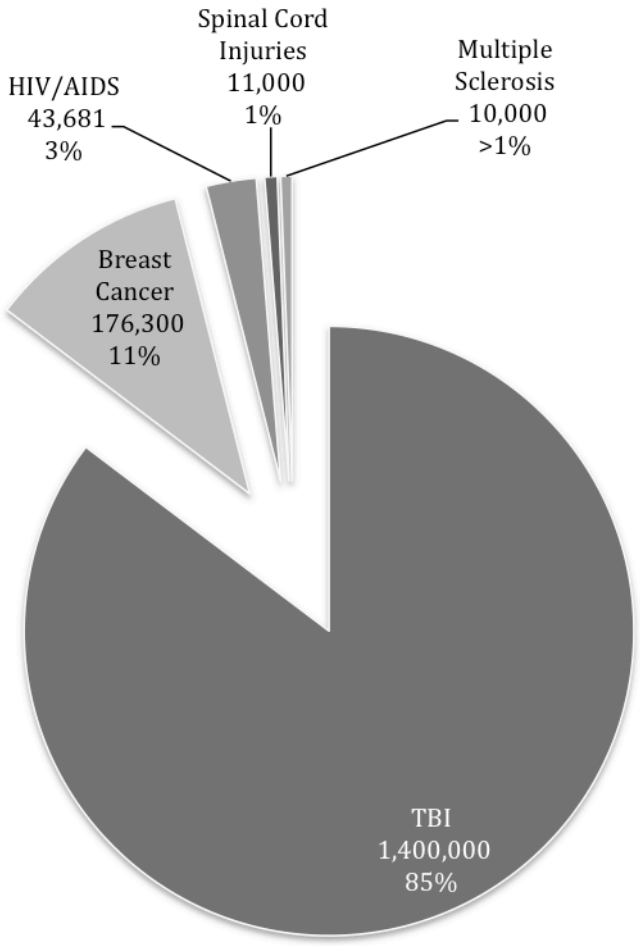

Figure 1. A comparison of TBI and leading injuries/diseases.

The prevalence and outcome of TBI are important variables when considering patients who have sustained a brain injury, as many of them suffer long-term consequences. Of the 1.4 million individuals who suffer a TBI each year, 50,000 die, 235,000 are hospitalized, and 1.1 million are never treated or are treated and released from an emergency department with no further follow-up (Brain Injury Association of America, 2006; Center for Neuro Skills, 2006). The number of individuals who have sustained TBI but have never been treated or admitted to a hospital is unknown (Brain Injury Association of America, 2006; Center for Neuro Skills, 2006).

The leading causes of TBI are presented in Figure 2. These leading etiologies are: falls (28%), motor-vehicle accidents (20%), gunshot wounds and other missile wounds (19%), assaults (11%), and pedestrian/sporting accidents (4%; Brain Injury Association of America, 2006; Center for Neuro Skills, 2006). Furthermore, males are 1.5 times more likely to sustain a TBI than females, and the three age groups at highest risk are 0-4 years old, 15-19 years old, and those older than 70 years (Brain Injury Association of America, 2006; Center for Neuro Skills, 2006).

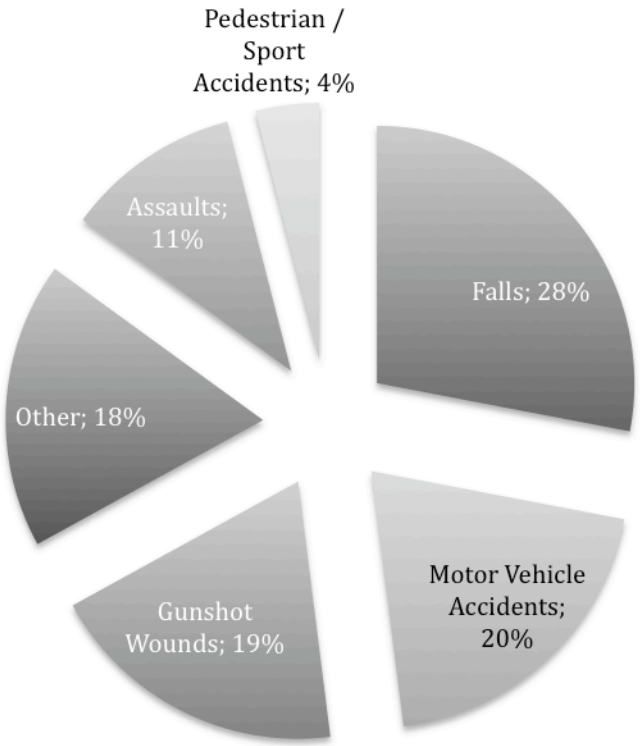

Figure 2. Proportions of known causes of TBI in the U.S.

According to Taber, Robin, and Hurley (2006), 88% of military personnel treated at a medical unit in Iraq, were injured by improvised explosive devices (IEDs). Forty-seven percent

of these injuries involved the head. Further, Taber et al. (2006) found that 97% of the injuries to one Marine unit in Iraq were due to explosions (65% IEDs, 32% mines). Little is known about the long-term effects of TBI on the veterans returning from Iraq and Afghanistan (Taber et al., 2006). Hence, prompt diagnosis, treatment, and monitoring the effects of TBI are urgent areas in need of investigation in returning military personnel.

The earliest research on blast injury dates back to the early 20th century. Franchino Rusca, a Swiss researcher, observed three soldiers being killed by a blast explosion without obvious external injuries (Stewart, 2006). Rusca's research focused on the Balkan wars of 1918 (Stewart, 2006). According to Cernak, Savic, Ignjatovic, and Jevtic (1999), and the Yugoslavia conflicts occurring between 1991 and 1994, 200 blast-exposed patients (30%) had long-term signs and symptoms reflecting central nervous system (CNS) disorders one year following the injury. In contrast, similar signs and symptoms were found in only 4% of the non-blast-exposed patients.

TBI has received considerable empirical attention over the past two decades. A search of the Academic Search Premier database, using "*TBI*," resulted in more than 6,500 entries detected from 1990 to 2010. Even though TBI research is expanding, a consensus definition still remains elusive (Hoge et al., 2008; Iverson, Lange, Gaetz, & Zasler, 2006; Lezak, Howieson, & Loring, 2004; Rosenthal & Ricker, 2000; Rotto, 1998). According to the Brain Injury Association of America (2006) and Defense and Veterans Brain Injury Center (DVBIC; 2006), TBI results from a blow to the head or an object penetrating the skull that disrupts the function of the brain. Not all blows to the head result in a TBI. A TBI can cause long- or short-term impairments in independent function. The U.S. DoD (2007) defines TBI as a:

> Traumatically induced structural injury and/or physiological disruption of brain functions as a result of external force that is indicated by new onset or worsening of at least one of the following clinical signs, immediately following the event: any period of loss of or a decreased level of consciousness; any loss of memory for events immediately before or after the injury; any alteration in mental state at the time of the injury (confusion, disorientation, slowed thinking, etc.); neurological deficits (weakness, loss of balance, change in vision, praxis, paresis/plegia, sensory loss, aphasia, etc.) that may or may not be transient; intracranial lesion. (p. 2)

TBI is neither degenerative nor congenital; rather, it often is an acute injury that shows some impairment before evolving into a chronic condition (Begali, 1992). It results from an external physical force of sufficient magnitude producing mild to severe structural or physiological changes in the brain, and causes transient to permanent changes in behavior and/or cognition (Begali, 1992; Savage & Wolcott, 1994). An external force that causes injury may involve "the head being struck by an object, the head striking the object, the brain undergoing an acceleration/deceleration movement without direct external trauma to the head, a foreign body penetrating the brain, forces generated from events such as a blast or explosion, or other forces yet to be defined" (DoD, 2007, p. 3).

TBI often is classified using two categories: closed head injuries (CHIs), also called blunt head injuries, and open head injuries, also called penetrating head injuries (PHIs). In CHIs, the skull remains intact; in contrast, PHIs involve penetration of the skull and *dura mater* by objects such as bullets or flak (Lezak et al., 2004). The majority of TBIs are classified as CHIs (Lezak et al., 2004). Current research from the Defense and Veterans Brain Injury Center (DVBIC; 2006)

has reported that over 90% of war-related head injuries are CHIs. Because they often result in damage to multiple sites in the brain, CHIs may be more severe (Lezak, 1995). Multiple-site damage may result in abnormal structural imaging findings, prolonged loss of consciousness (more than 30 minutes), and prolonged cognitive deficits. The severity of the injury may range from mild (a brief change in mental state or consciousness) to severe (an extended period of amnesia or unconsciousness following the injury).

Diagnosis of TBI is typically based on the assessment of the status of the central nervous system, as measured through the Glasgow Coma Scale (GCS; Jennett & Bond, 1975; Rimel, Giordani, Barth, & Jane, 1982, as adopted by Lezak et al., 2004), posttraumatic amnesia (PTA), and/or duration of loss of consciousness/alteration of consciousness (LOC/AOC; Lezak et al., 2004). Table 1 shows three classifications in which TBI severity is defined. A copy of the GCS is found in Appendix A. The GCS assesses three domains: eye opening (E), motor response (M),

Table 1

Classifications of severity of traumatic brain injury

Measures	Mild	Moderate	Severe
Glasgow Coma Scale	13-15	9-12	3-8
Loss of Consciousness	< 30 min.	30 min. – 35 hrs.	> 36 hrs.
Posttraumatic Amnesia	< 24 hrs.	1 – 7 days	> 7 days

and verbal activity (V; Jennett, 2002). Each of these areas is rated and total GCS scores of 8 or below are suggestive of a severe TBI, GCS scores ranging from 9 to 12 are suggestive of

moderate TBI, and GCS scores of 13 and above are believed to indicate mild TBI (mTBI; Lezak et al., 2004). Furthermore, the duration of LOC also is used as a measure of severity of the injury. Usually, the longer the patient is in a noticeably altered state of consciousness, the more severe the injury. The patient's report of PTA is also used to classify TBI. PTA is a state of confusion that, in some cases, occurs immediately after an individual has sustained a TBI. The individual is unable to state his or her name or other simple personal facts, and this altered ability may last only seconds to hours or days. Besides scores derived from the GCS, LOC/AOC, and PTA, the DoD (2007), also uses structural imaging techniques to measure the severity of TBI. The criteria used to determine the severity of TBI, including imaging techniques, is shown in Table 2. If the above criteria for mTBI are met, and the structural imaging results are normal or abnormal, the diagnosis of mTBI is sustained.

Table 2

Criteria used in the determination of brain injury severity.

Mild	Moderate	Severe
Normal or Abnormal Structural Imaging	Normal or Abnormal Structural Imaging	Normal or Abnormal Structural Imaging
LOC = 0-30 minutes	LOC > 30 minutes and < 24 hours	LOC > 24 hours
AOC = a moment up to 24 hours	AOC > 24 hours. Severity based on other criteria	AOC > 24 hours. Severity based on other criteria
PTA = 0-1 day	PTA > 1 and < 7 days	PTA > 7 days

Note. AOC = Alteration of consciousness; LOC = Loss of consciousness; PTA = Posttraumatic amnesia.

There is increasing interest in the management and outcome of mTBI, because 75 to 85% of TBIs are classified as mild (Iverson et al., 2006; Jennet, 2002; National Center for Injury Prevention and Control, 2003; US National Coma Data Bank, 2005; Williamson, Scott, & Adams, 1996). During 2003-2004, 59% of at-risk soldiers seen at Walter Reed Army Medical Center suffered at least one mTBI (DVBIC, 2006; Taber et al., 2006). According to McCrea (2008), establishing a minimum threshold for mTBI diagnosis still remains a challenging task for clinicians. In order to assist clinicians in recognizing the signs and symptoms of mTBI, as well as formulate accurate diagnosis, a working definition and the most commonly cited definition of mTBI has been published by the Mild Traumatic Brain Injury Committee (1993) to clarify classification and improve cross-study comparisons.

> A traumatically induced physiological disruption of brain function, as manifested by at least one of the following: (1) any loss of consciousness; (2) any loss of memory for events immediately before or after the incident; (3) any alteration in mental state at the time of the incident (e.g., feeling dazed, disoriented, or confused); and (4) focal neurological deficit(s) that may or may not be transient, but where the severity of the injury does not exceed (a) loss of consciousness of approximately 30 minutes or less; (b) after 30 minutes, an initial Glasgow Coma Scale (GCS) of 13-15; and (c) posttraumatic amnesia (PTA) not greater than 24 hours. (p. 86)

Symptoms caused by TBI fall into three categories: physical (e.g., headaches, vomiting, nausea, weakness, sensory loss, and balance problems), cognitive (e.g., memory, attention/concentration, planning, reasoning, processing speed, and abstract thinking), and behavioral/emotional (e.g., irritability, anxiety, depression, and impulsivity; DoD, 2007). These

symptoms are not accounted for by pre-existing medical, neurological, or psychological conditions. TBI symptoms can appear immediately after the injury, or emerge days or weeks after the injury. These symptoms can resolve immediately, within weeks of the injury or not at all (Schneiderman, Braver, & Kang, 2008). If the symptoms do not resolve within a few hours or days, individuals develop what is often labeled "post-concussive syndrome" (Schneiderman et al., 2008).

Along with post-concussive symptoms, mTBI in war zones has also been associated with symptoms of posttraumatic stress disorder (PTSD; American Psychiatric Association, 2000). The frontal and inferior temporal lobes are the most negatively affected areas following TBI; therefore, it is not surprising that anxiety-like symptoms are the most common complaint following TBI (Taber et al., 2006; Williamson et al., 1996). According to Hoge et al. (2008), the rate of PTSD (43.9%) is dramatically higher than those in other injured (16.2%) or non-injured (9.1%). Moreover, Riddle et al. (2007) suggest that PTSD is currently the second most common diagnosis in the military affecting 2.4% of the current Millennium cohort. Furthermore, combat veterans are considered an "at risk" group, with a higher likelihood of developing PTSD (National Center for PTSD, 2010). Moreover, researchers believe that PTSD occurs in 11-20% of veterans of the Iraq and Afghanistan conflicts (National Center for PTSD, 2010).

Research conducted at the Palo Alto Veterans Administration (VA) Polytrauma Clinic (Lew et al., 2007), indicated that 55% of patients seen at this Polytrauma Clinic (a specialty clinic designed to diagnose and treat traumatic injuries from the current conflicts, including the effects of TBI) were diagnosed with cognitive disorder. Moreover, 71% of these individuals were also diagnosed with PTSD. Currently, considerable research has focused on the differences

between PTSD and TBI. Because of conflicting research data, controversy exists regarding the distinction between PTSD and mTBI (Hoge et al., 2008). To date, no definitive count is available of service members and veterans who were ever deployed to the Iraq and Afghanistan conflicts and are impaired by PTSD or TBI (DoD, 2007). Research by Hoge and colleagues (2008) found that 49% of OEF/OIF returning soldiers who reported LOC also reported symptoms of PTSD. These individuals also were more likely to report greater physical-health concerns. According to the DoD (2007), the most common symptom overlap between PTSD and TBI are: disturbed sleep, fatigue, irritability, and cognitive deficits. Even though symptoms of mTBI and PTSD co-exist, patients with PTSD do not manifest symptoms commonly encountered in TBI, such as vertigo, vision problems, or sensitivity to light and noise. Current research indicates that PTSD is a predictor for neurocognitive changes following OEF/OIF deployment (Brailey, 2009) as well as poorer psychosocial functioning (Gewirtz, Polusny, Degarmo, Khaylis, & Erbes 2010). Further, research by Suhr and Gunstad (2002), suggests that the context of the evaluation matters. For instance, when the researchers informed or "threatened" the participants that those with a history of concussions perform more poorly on cognitive tasks than individuals without concussions, those who were threatened did indeed perform more poorly than participants who were not "threatened."

Several confounding variables have made the differentiation between mTBI and PTSD complex. Research on the effects of blast exposure mTBI vs. other types of mTBI remains inconclusive (Kochanek, 2009). In a study by Garcia, Franklin, and Chamblis (2010), OEF/OIF veterans who have experienced blast exposure mTBI report higher severity of symptoms on psychiatric measures than those with other types of injuries (e.g., motor vehicle accident (MVA),

fall, and bullet). Moreover, as previously noted, research by Cernak et al. (1999) report, that in contrast to 4% of non-blast-exposed patients with ongoing post-concussive symptoms, 30% of blast-exposure patients had ongoing signs and symptoms reflecting central nervous system (CNS) disorders one year following the injury. However, Belanger, Kretmer, Yoash-Gantz, Pickett, and Tupler (2009) found that on neuropsychological testing performance, no differences existed between individuals with blast mTBI when compared to non-blast mTBI. Other studies by Mac Donald et al. (2011) as well as Sayer et al. (2008) also reported no significant differences between blast exposure TBI and other types of head injuries.

Additionally, there is much debate about how experiencing multiple concussions influence self-report of post-concussive symptoms. Currently, there is no consensus on how many concussions are too many, in either sport head injuries or military concussions (DVBIC, 2011). A study by Collins et al. (1999) found that individuals who have suffered one concussion differed in neuropsychological testing outcomes from individuals who have two or more concussion. However, research by Macciocchi, Barth, Littlefield, and Cantu (2001) indicates that neurobehavioral and neurocognitive consequences of two or more concussions were not significantly different from individuals with one concussion. Overall, Hoge and colleagues (2008) suggest that sustaining multiple concussions increases the risk for persistent post-concussive symptoms, but they warn that findings supporting this are inconclusive at this time.

Whether one concussion or multiple concussions, veterans continue to endorse ongoing post-concussive symptoms. The DoD and VA medical centers across the nation have opened rehabilitation centers for management and treatment of moderate to severe brain injuries.

Currently, no evidence-based treatments for mTBI and post-concussive symptoms exist (Hoge, Goldberg, & Castro, 2009; Real Warriors, 2010; U.S. Government Accountability Office, 2008).

Although demographic characteristics have been found to play a role in recovery from PTSD (U.S. Army Surgeon General, 2008), no studies currently examine their effects on veterans with a history of mTBI. Previous studies have indicated that lower education status is associated with increased risk of self-report of psychological symptoms (Brewin, Andrews, & Valentine, 2000; Iverson et al., 2007). Besides the impact of the level of education on this population, family support has also shown to be of influence in recovery from PTSD. Family and relationship problems are a serious concern (U.S. Army Surgeon General, 2008). Although no research exists on the education level and marital status, the importance of educating family members on the effects and outcomes of TBI as well as the impact of TBI on family members have been qualitatively discussed. Research by Bay, Blow, and Yan (2011) indicates that a sense of belonging was a significant predictor for psychological post-injury functioning. However, no studies document the value of this informal support (i.e., marital status) on mTBI recovery and symptom endorsement overtime.

As previously noted, research on mTBI and PTSD has shown that there are overlapping symptoms between the two disorders (Hoge et al., 2008, Schneiderman et al., 2008). Despite the reported overlap in symptom endorsement between mTBI and PTSD, no research currently exists that examines the overlapping endorsement of neurological-psychological symptoms on a neurological measure, such as the Neurobehavioral Symptom Inventory (NSI) when compared to a psychological measure, such as the PTSD Checklist (PCL). The NSI and PCL are widely used questionnaires in the Polytrauma Clinics across the nation's VA medical centers. Therefore,

better understanding of reported symptoms on self-report questionnaires will assist providers to better differentiate between mTBI and PTSD when evaluating veterans following mTBI. Improved differentiation between these overlapping diagnoses should allow clinicians to provide patients with information pertinent to their injury as well as future treatment plans.

Based on the overlapping neurological-psychological symptoms between mTBI and PTSD, as well as lack of research in the area of this overlap, the research, which follows, examined whether veterans who screen positive for mTBI reported higher neurological-psychological symptoms on the NSI (which examines neurological symptoms) than on the PCL (which examines psychological symptoms). Overall, veterans are completing the questionnaires during a Secondary TBI Evaluation in a Polytrauma Clinic setting, with a focus on neurological symptoms. Upon literature review, it appears that the setting of the evaluation matters (Suhr & Gunstad, 2002). Therefore, it was predicted that veterans are more likely to report higher overlapping neurological-psychological symptoms on the NSI (a neurologically focused measure) than the PCL (a psychologically focused questionnaire). This overlap, as well as differentiation between the two disorders, has been made more challenging because of confounding variables, such as types of concussions (i.e., blasts, MVA, falls), number of blast exposures, and TBI treatment participation, among others. Demographic characteristics, such as education and marital status were also evaluated to further understand their influence on self-report of neurological-psychological symptom endorsement. Although mTBI literature has expanded significantly in the last decade, several important factors remain poorly understood.

Based on literature review, in an attempt to better understand the effects and clinical implications of mTBI diagnosis in a veteran population, the following hypotheses were evaluated.

The Current Study's Hypotheses

Hypothesis 1: Veterans will obtain higher aggregate scores on five overlapping neurological-psychological symptoms on the NSI than on the PCL (i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties). No research has been conducted to explore symptom severity of overlapping neurological-psychological symptoms on a neurological measure when compared to a psychological measure. This absence of information may be based on the fact that veterans are completing these questionnaires during a Secondary TBI Evaluation in a Polytrauma Clinic that focuses on neurological symptoms. As Suhr and Gunstad (2002) suggest, the setting in which evaluations are conducted matters.

Hypothesis 2: Veterans who report that they have received some form of TBI treatment will report lower aggregate scores on five overlapping neurological-psychological symptoms on the NSI (i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties), than veterans who are currently attending some form of TBI treatment or who do not have a history of participating in any form of TBI treatment. Many of the veterans participating in the current study reported participation in some form of TBI treatment, although the details of the treatments remain unknown. It was predicted that some form of past TBI treatment would result in lower scores compared to those receiving no TBI treatment.

Hypothesis 3: It was predicted that veterans who have suffered a blast injury will report higher aggregate scores on five overlapping neurological-psychological symptoms on the NSI

(i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties) than veterans who experienced other types of injuries (i.e., MVA, falls, and unspecified). The pathophysiology of blast mTBI is not fully understood and quite complex (Martin, Lu, Helmick, French, & Warden, 2008). However, researchers believe that rapid pressure changes, likely intensified in confined spaces that lead to concussions, subdural hematoma, and diffuse axonal injuries, as well as gaseous embolisms that form in the brain lead to more severe injuries than other types of injuries (Arnold, Halpern, Ming, & Smithline, 2004; Martin et al., 2008). Although the overall research remains inconclusive, research by Garcia et al. (2010) reported that OEF/OIF veterans who have experienced blast exposure mTBI report higher severity of symptoms on psychiatric measures than those with other types of injuries (e.g., MVA, fall, and bullet). Therefore, it was predicted that injuries secondary to blast exposures would result in increased symptom endorsement than injuries secondary to MVA, falls, bullets, or unspecified.

Hypothesis 4: It was predicted that veterans who have sustained three or more blast injuries will report higher aggregate scores on five overlapping neurological-psychological symptoms on the NSI (i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties) than veterans who report no blast injuries, one blast injury, or two blast injuries. Although the research with OEF/OIF veterans remains inconclusive regarding the difference in post-concussive symptoms following one or multiple blast injuries, Hoge and colleagues (2008) suggest that sustaining multiple concussions increases the risk for persistent post-concussive symptoms.

Hypothesis 5: It was predicted that veterans who have higher education (i.e., college or post graduate training) will report lower aggregate scores on the five overlapping neurological-

psychological symptoms on the NSI (i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties) than veterans with a high school diploma or less. Previous studies have also indicated that lower education status is associated with increased risk of self-report of psychological symptoms (Brewin et al., 2000; Iverson et al., 2008; Riddle et al., 2007). No research currently exists describing the impact of education status on neurological-psychological symptoms.

Hypothesis 6: It was predicted that veterans who are married/partnered will report lower aggregate scores on the five overlapping neurological-psychological symptoms on the NSI (i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties) than individuals who are single/never married or separated/divorced. The importance of educating family members on the effects and outcomes of TBI as well as the impact of a family member with TBI on other family members has been qualitatively discussed (Bay et al., 2011). However, no studies exist that that look at the impact of marital status on the severity of reported post-concussive symptoms.

Chapter 2

Method

Participants

Participant archival data used for this investigation were collected as part of a multi-site collaborative study of OEF/OIF veterans in a Polytrauma Clinic setting in 2008 at Veterans Affairs Medical Centers. This dataset was chosen because of its availability and its large number of veterans sustaining war injuries. All available archival data were combined across sites and de-identified to maintain participant confidentiality. Similar data belonging to soldiers from 2009 and 2010 were not archived, and 2010 data were incomplete due to ongoing procedures with the most recently returned soldiers.

The data used for this study were obtained from a number of veterans who participated in OEF/OIF and who screened positive for TBI (see Appendix B for the initial TBI screening questions). A subgroup of these veterans was then referred to the Polytrauma Clinic. Approximately one-third of all veterans who were initially screened because of exposure to blast and/or concussive history had been referred to the Polytrauma Clinic for Secondary TBI Evaluation (J. Romesser, personal communication, September 16, 2010). This resulted in an initial group of 529 veterans who had screened positive for TBI and were referred to the Polytrauma Clinic for a Secondary TBI Evaluation. Of these 529 veterans, 10 did not complete the PCL and 12 met criteria for a moderate/severe TBI (LOC > 30 minutes, AOC > 24 hours)

and were excluded, resulting in a sample of 507 who screened positive for mTBI and had completed both required questionnaires.

Measures

Demographic information was obtained from the Polytrauma Injury Self-Report Form, including marital and education status, types of injuries, number of blast exposures, and prior, current, or some form of TBI treatment. The Polytrauma Injury Self-Report Form also contains the Neurobehavioral Symptom Inventory (NSI), found in Appendix C. The measure's clinical validity has not yet been established. The NSI is a 22-item self-report measure. The items were derived from a larger structured clinical interview originally created by Levin et al. (1987), to capture common complaints following mTBI. Each of the 22 items uses a 5-point Likert-type scale ranging from 0 (*none*) to 4 (*very severe*). However, to make NSI and PCL comparison easier, and to allow statistical analyses to use a consistent metric, the NSI scale values were changed from a 0 – 4 range to a 1 – 5 range by simply adding one-point to all NSI scores. Therefore, all NSI values reported hereafter, reflect that transformation. For the current study, and as noted in Table 3, five items on the NSI that measure neurological-psychological symptoms were selected for comparison with five similar items on the PCL, namely, poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties. The sum of scores of these five items was calculated for each participant. This sum is the one used on certain hypothesis for final analyses in the current study. This will be referred to as NSI Item Aggregate. The internal consistency reliability of NSI Item Aggregate was calculated for the sample with a coefficient $\alpha = .79$ being obtained. The internal consistency reliability of the total NSI items was also calculated with a coefficient $\alpha = .93$ being obtained.

Table 3

Overlapping Domains and Items on the NSI and PCL Questionnaires

NSI Items	PCL Questions
Poor Concentration 15m. Poor concentration, can't pay attention, easily distracted	15. Having difficulty concentrating
Forgetfulness 15n. Forgetfulness, can't remember things	8. Trouble remembering important parts of a stressful military experience
Anxiety 15s. Feeling anxious or tense	5. Having physical reactions (e.g., heart pounding, trouble breathing, sweating) when something reminded you of a stressful military experience
Irritability 15u. Irritability, easily annoyed	14. Feeling irritable or having angry outbursts
Sleep Difficulties 15r. Difficulty falling or staying asleep	13. Trouble falling or staying asleep

Note. NSI = Neurobehavioral Symptoms Inventory; PTSD = Posttraumatic Stress Disorder; PCL = PTSD Checklist.

The PTSD Checklist – Military Version (PCL-M), found in Appendix D, is a highly reliable, well-validated, and widely used instrument to measure PTSD symptoms (coefficient α = .97; Weathers, Litz, Herman, Huska, & Keane, 1993). For ease of reading, the PCL-M will be referred to as the PCL throughout the study. Further, the PCL has good sensitivity (.82) and specificity (.83) for diagnosing PTSD, when a cut-off score of 50 or above is used. The PCL is a 17-question, self-report measure. All 17 questions also use a 5-point Likert scale ranging from 1 (*none*) to 5 (*severe*).

For the current study, five items assessing concentration, forgetfulness, anxiety, irritability, and sleep difficulties were selected for comparison with the corresponding similar five items on the NSI, as shown in Table 3. The reliability of PCL Item Aggregate was calculated for the current sample, yielding a coefficient α of .81.

There is an overlap between symptom report on the NSI and the PCL as there is overlap in report of symptoms between those who have been diagnosed with mTBI and PTSD (i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties). Thus, responses to items/questions that tap the same symptoms on both instruments were compared to each other. Particularly, NSI deals with neurological symptoms following a concussion, while PCL appears within a PTSD-related symptom context. Responses to the remaining 13 NSI and 12 PCL questions were not the main focus of this study because of their lack of symptom overlap.

Procedures

The archival data set used for this study was obtained from existing records that included veterans served by both the George E. Whalen Department of Veterans Affairs Medical Center in Salt Lake City, Utah and the Michael E. Debakey Veterans Affairs Medical Center in Houston, Texas. Following approval from George Fox University's and Salt Lake City VA Medical Center's Institutional Review Boards (IRBs), data collection for the current study began.

The veterans evaluated in the Polytrauma Clinic completed the PCL, NSI, and a medical provider evaluation. Endorsement of the five items from the NSI measuring neurological-psychological symptoms were compared with the similar five items on the PCL. For the purposes of the current study, based on PCL specificity and a well-established cutoff (Weathers et al., 1993; Hoge et al., 2004), participants who obtained PCL $\geq$ 50 will be labeled PTSD

positive (n = 307, PCL ≥ 50, M = 65.03, SD = 9.09) and the rest of the participants will be labeled PTSD negative (n = 200, PCL < 50, M = 37.50, SD = 8.19). All veterans in the current study screened positive for mTBI.

The purpose of the current study was to assess if veterans who screened positive for mTBI are more likely to report greater severity of neurological-psychological symptoms on a neurologically-oriented questionnaire than when rating similar symptoms found on a psychologically-oriented measure.

Chapter 3

Results

Demographics Characteristics

Of 529 veterans initially in the dataset, 10 participants did not complete the PCL and 12 participants met criteria for a moderate/severe TBI, and were, therefore, excluded. The final data set consisted of NSI and PCL results from 507 veterans. Mean age of these participants was 31.0 years old (*SD* = 8.19). Other relevant demographic information concerning the participants is found in Table 4.

Hypothesis 1 predicted that veterans would obtain higher NSI scores on the five overlapping items than PCL scores. Using the total sample, means and SDs for each overlapping item of each questionnaire appear in Table 5 along with the average of the summed five scores. Figure 3 also shows the average performance on each of the five items for the overall sample on both questionnaires. PTSD positive and PTSD negative subgroups' means and SDs on these same items and measures are provided in Table 6, as well as shown in Figures 4 and 5 respectively. Data were analyzed using a 2 x 2 x 5 mixed-design, repeated measures, MANOVA, with PTSD Diagnosis (Positive vs. Negative) as a between-subjects factor, and both Questionnaire (PCL vs. NSI) and Item (Concentration vs. Forgetfulness vs. Anxiety vs. Irritability vs. Sleep) as within-subjects, repeated factors. Preliminary assumption testing was conducted to check for normality, linearity, univariate, and multivariate outliers, homogeneity of

Table 4

Demographic Characteristics of the Sample (N = 507)

Characteristics	Frequency	%
Gender		
Male (%male)	482	95
Marital Status		
Single/Never Married	131	25.8
Married/Partnered	266	52.5
Divorced	106	20.9
Widowed	3	0.6
Unspecified	1	0.2
Race		
Caucasian	325	64
Hispanic	87	17.1
African-American	77	15.2
Asian	14	2.8
Native-American	3	0.6
Pacific Islander	1	0.2
Employment		
Unemployed – not looking for work	27	5.3
Unemployed – looking for work	96	18.9
Working part-time	52	10.2
Working full-time	268	52.8
Student	56	11.0
Volunteer	3	0.6
Homemaker	1	0.2
Unspecified	4	0.8
Education		
Less than HS	3	0.6
HS Diploma or Equivalent	271	53.3
Some college/AA/Technical	192	37.8
Degree	33	6.5
College Graduate	7	1.4
Greater than College Graduate	1	0.2
Unspecified		

Table 5

Results for Overlapping Questions on the NSI and PCL Questionnaires

NSI Variable Names	*M*	*SD*	PCL Variable Names	*M*	*SD*
NSI Poor Concentration	3.35	1.11	PCL Poor Concentration	3.49	1.13
NSI Forgetfulness	3.55	1.04	PCL Forgetfulness	2.51	1.31
NSI Anxiety	3.62	1.08	PCL Physical Reactions	3.02	1.28
NSI Irritability	3.82	1.06	PCL Irritability	3.62	1.22
NSI Sleep Difficulties	3.72	1.17	PCL Sleep Difficulties	3.79	1.24

Note. NSI = Neurobehavioral Symptoms Inventory; PTSD = Posttraumatic Stress Disorder; PCL = PTSD Checklist.

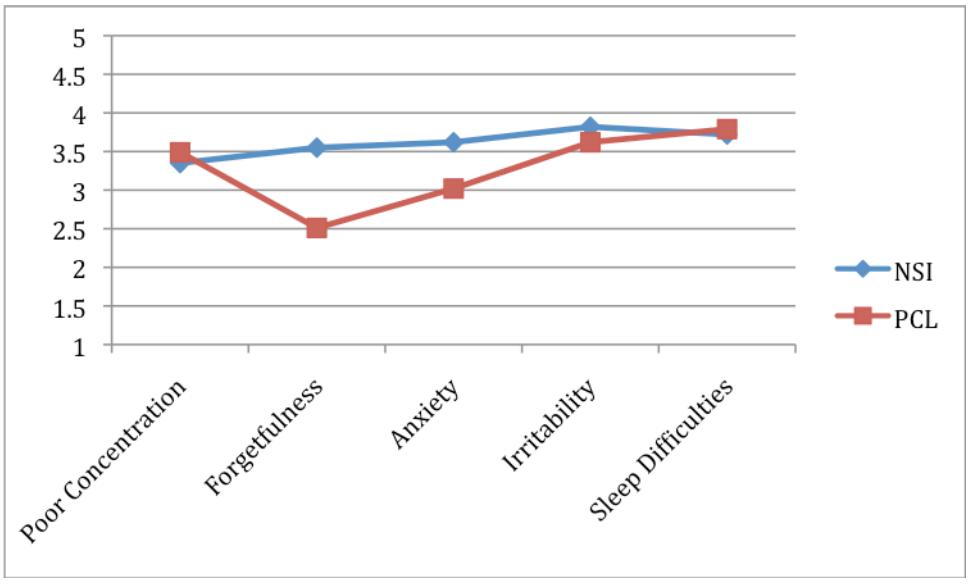

Figure 3. Performance of TBI sample on the overlapping item domains of the Neurobehavioral Symptoms Inventory and PTSD Checklist

Table 6

Results for the Overlapping Questions on the NSI and PCL Questionnaires by PTSD Grouping (SDs are in parentheses; PTSD +(n = 307); PTSD – (n = 200)

NSI Items	PTSD + *M* (*SD*)	PTSD - *M* (*SD*)	PCL Items	PTSD + *M* (*SD*)	PTSD - *M* (*SD*)
NSI Poor Concentration	3.74 (1.02)	2.74 (0.97)	PCL Poor Concentration	4.01 (0.89)	2.69 (0.97)
NSI Forgetfulness	3.90 (0.94)	3.01 (0.97)	PCL Forgetfulness	3.02 (1.30)	1.75 (0.90)
NSI Anxiety	4.07 (0.88)	2.95 (0.99)	PCL Physical Reactions	3.70 (1.05)	2.01 (0.86)
NSI Irritability	4.28 (0.84)	3.13 (0.98)	PCL Irritability	4.24 (0.88)	2.68 (1.05)
NSI Sleep Difficulties	4.15 (0.95)	3.05 (1.14)	PCL Sleep Difficulties	4.34 (0.93)	2.96 (1.18)
NSI Items Aggregate	15.11 (3.27)	9.88 (3.28)	PCL Items Aggregate	19.25 (3.20)	12.09 (2.82)

Note. NSI = Neurobehavioral Symptoms Inventory; PTSD = Posttraumatic Stress Disorder; PCL = PTSD Checklist.

variance-covariance matrices, and multicollinearity, with no serious violations noted. The main effect of PTSD Category was significant, $F(1, 500) = 600.1$, $p < .001$, $\eta^2 = .55$, with the PTSD positive subgroup's scores being higher than PTSD negative subgroup scores. The test for the within subjects effect of Questionnaire was also significant, $F(1, 500) = 195.2$, $p < .001$, $\eta^2 = .28$,

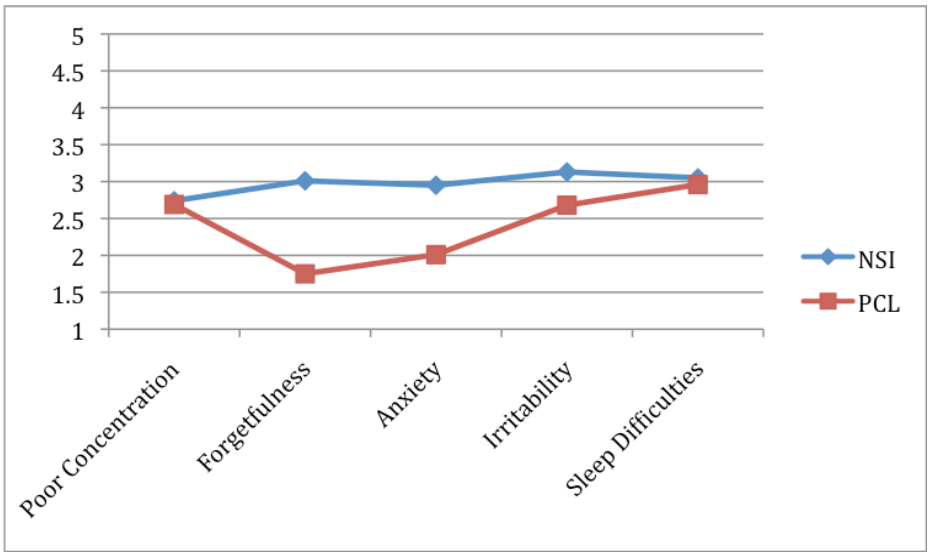

Figure 4. Performance of PTSD negative sample on the overlapping item domains of the Neurobehavioral Symptoms Inventory and PTSD Checklist.

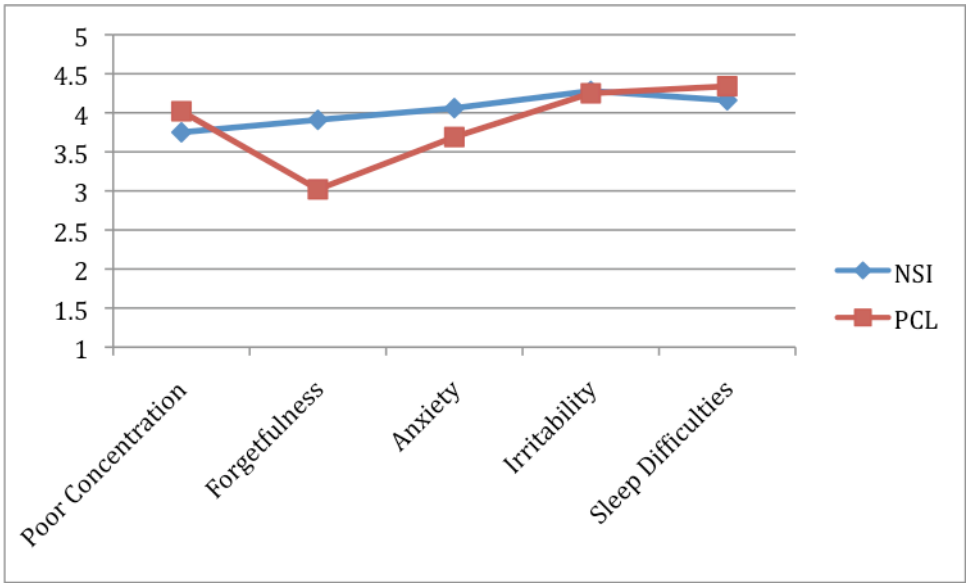

Figure 5. Performance of PTSD positive sample on the overlapping item domains of the Neurobehavioral Symptoms Inventory and PTSD Checklist.

as was the test for the within effect of Item, $F(4, 497) = 75.7$, $p < .001$, $\eta^2 = 0.38$. There was a significant two-way interaction between PTSD Diagnosis and Questionnaire, $F(1, 500) = 55.36$, $p < .001$, $\eta^2 = .10$. The two-way interaction between Questionnaire and Item was also significant, $F(4, 497) = 120.4$, $p < .001$, $\eta^2 = .49$. There was a significant two-way interaction between PTSD Diagnosis and Item, $F(4, 497) = 3.73$, $p < .001$, $\eta^2 = .03$. The three-way interaction among PTSD Diagnosis, Questionnaire, and Item was not significant, $F(4, 497) = 1.97$, $p = .10$, $\eta^2 = .06$.

Paired-samples t-tests were conducted to further clarify the interaction effects. To minimize Type I error, given the multiple comparisons being conducted, a $p < .01$ level of significance was used to compare NSI vs. PCL performance. Overall, veterans who screened positive for TBI but were PTSD-negative endorsed higher neurological-psychological symptoms on the NSI ($M = 14.88$) than on the PCL ($M = 12.09$). Because there was a significant Item x Questionnaire interaction, individual item comparisons across questionnaires were performed. Significant differences were found for four symptoms: poor concentration, $t(505) = 3.67$, $p < .001$, $\eta^2 = .03$, forgetfulness, $t(503) = -18.15$, $p < .001$, $\eta^2 = .08$, anxiety $t(505) = -11.67$, $p < .001$, $\eta^2 = .05$, and irritability, $t(505) = -5.18$, $p < .001$, $\eta^2 = .02$, with veterans endorsing higher symptom scores for forgetfulness, irritability, and anxiety on the NSI compared to the PCL. Conversely, veterans endorsed higher levels of poor concentration on the PCL ($M = 3.49$) than the NSI ($M = 3.34$), $t(505) = 3.67$, $p < .001$, $\eta^2 = .03$. Although significantly higher PCL symptom values are noted for poor concentration, the finding is of questionable clinical significance due to the small effect size. While PCL sleep difficulties were endorsed at higher levels ($M = 3.79$) than on the NSI ($M = 3.72$), the difference did not reach statistical significance, $t(505) = 2.30$, $p > .05$, $\eta^2 = .01$.

In summary, Hypothesis 1 predicted that veterans would obtain higher scores on the five overlapping NSI than PCL Items. Statistically and clinically significant findings were found in areas of forgetfulness, anxiety, and irritability. As predicted, symptom endorsement of overlapping items was higher on the NSI than the PCL, but only for three of the five items. Further, forgetfulness and anxiety yielded higher scores on the NSI than PCL, regardless of a PTSD diagnosis. Contrary to expectation, higher PCL poor concentration scores resulted, although yielded a small effect size.

Hypothesis 2 predicted that veterans who have received some form of TBI treatment would report lower neurological-psychological NSI Item Aggregate scores (i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties) than veterans who are currently attending some form of TBI treatment or who do not have a history of participating in any form of TBI treatment. For this analysis, the sum of scores across the five overlapping items on the NSI and PCL was calculated for each participant, and is referred to as the NSI Item Aggregate and PCL Item Aggregate. A one-way between-groups analysis of covariance (ANCOVA) was initially conducted to compare the effectiveness of past TBI treatment vs. current TBI treatment vs. no TBI treatment and the NSI Item Aggregate as the dependent variable. Means and standard deviations for the NSI Item Aggregate and PCL Item Aggregate can be found in Table 7. Total PTSD scores for each treatment group are also provided. In order to remove the possibly confounding influence of PTSD on NSI performance (PTSD often overlaps with post-concussive symptom), PTSD (i.e., PTSD positive and negative) was chosento be a covariate, and was operationalized as the PCL Aggregate. After adjusting for PTSD scores, there was no significant difference between participants with a history of TBI treatment

Table 7

Group Differences in Mean and Standard Deviation as a Function of Current (n = 34), Past (n = 51), or No TBI Treatment (n = 422)

TBI Treatment	NSI Item Aggregate		PCL Item Aggregate		PTSD +		PTSD -	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Current	18.85	4.46	17.29	4.66	67.73	9.35	40.75	9.27
Past	18.53	4.10	16.88	4.33	65.00	8.61	37.81	6.46
None	17.92	4.16	16.30	4.68	64.80	9.13	37.24	8.25

Note. TBI = Traumatic Brain Injury; NSI = Neurobehavioral Symptom Inventory; PTSD = Posttraumatic Stress Disorder; PCL = PTSD Checklist.

versus currently receiving some form of TBI treatment vs. no history of TBI treatment, $F(1, 504) = .05$, $p = .83$, $\eta^2 = .00$, suggesting that some form of TBI treatment history as it stands, does not impact higher endorsement of neurological-psychological symptoms for veterans who have received or are currently receiving some form of TBI treatment.

Hypothesis 3 predicted that veterans who have suffered a blast injury would demonstrate higher neurological-psychological NSI Item Aggregate scores than veterans who experienced other types of injuries (i.e., MVA, falls, and unspecified injuries). MVA ($n = 14$) and fall ($n = 25$) categories were combined with "other" ($n = 91$) unspecified types of mTBI due to the small number of reported MVA/falls/other when compared with blast mTBI. As described under Hypothesis 2, the sum of scores across the five overlapping items was calculated for each participant and labeled NSI Item Aggregate. The sum across all NSI items was calculated and labeled NSI Aggregate. Means and standard deviations for these created variables can be found

in Table 8. In order to remove the influence of PTSD on NSI performance, participants' aggregate PCL scores were again used as the covariate. There was no significant difference in NSI Item aggregate scores between participants who had suffered blast mTBIs vs. other types of mTBI (i.e., MVA/falls/other), $F(1, 504) = .61$, $p > .05$, $\eta^2 = .05$. Therefore, no difference in NSI symptom endorsement of the five overlapping items was found between veterans who experienced blast mTBI vs. veterans who experienced other than blast mTBI injuries (i.e., MVA/falls/other). Further exploratory analyses were conducted for symptom endorsement among veterans who experienced different types of mTBI across all 22 NSI items(i.e., NSI Aggregate). There was a statistically significant difference in NSI aggregate

Table 8

Group Differences in Mean and Standard Deviation as a Function of Blast Injury (n = 377) versus MVA/Falls/Other (n = 130)

	NSI Item Aggregate		NSI Aggregate	
TBI Categories	*M*	*SD*	*M*	*SD*
Blast TBI	18.25	4.18	67.85	15.41
MVA/Falls/Other	17.43	4.06	63.00	14.93

Note. TBI = Traumatic Brain Injury; NSI = Neurobehavioral Symptom Inventory; MVA = Motor Vehicle Accident.

scores between participants who had suffered blast mTBI and other types of mTBI (i.e., MVA/falls/other), $F(1, 504) = 8.73$, $p < .05$, $\eta^2 = .02$. Although statistically significant, this finding is of questionable clinical significance due to the small effect size.

Hypothesis 4 predicted that veterans who have sustained three or more blast injuries would report higher neurological-psychological NSI Item Aggregate scores than veterans who have sustained no blast injuries, veterans who have sustained no blast injuries, one blast injury, or two blast injuries. In order to control for outliers, affecting statistical findings, two participants, with reported 36 and 150 blast exposures, were excluded from data analysis for the current hypothesis. Like with Hypotheses 2 and 3, the sum of scores across the five overlapping items was calculated for each participant and was labeled NSI Item Aggregate. A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of the number of blast injuries on the symptoms comprising the NSI Item Aggregate (the sum of the five overlapping neurological-psychological items) as the dependent variable. Means and standard deviations for the NSI Item Aggregate and PCL Item Aggregate can be found in Table 9. A statistically significant difference between groups was found, $F(3, 501) = 2.65$, $p < .05$, $\eta^2 = .02$. Despite reaching statistical significance, the actual difference in mean scores between the groups was quite small, as observed by the effect size. Post-hoc comparisons using Tukey's HSD test indicated that the mean score for veterans who have experienced three or more blast injuries ($M = 18.61$, $SD = 4.14$) are statistically approaching statistical significance at the $p < .05$ level with veterans who have never experienced blast injuries ($M = 17.44$, $SD = 4.06$). However, this finding was of minimal clinical significance.

Further exploratory analyses were conducted for symptom endorsement among veterans who have sustained three or more blast injuries ($M = 67.08$, $SD = 14.73$), no blast injury ($M = 63.00$, $SD = 14.94$), one blast injury ($M = 68.84$, $SD = 15.72$), and two blast injuries ($M = 68.90$, $SD = 17.20$) across all 22 NSI items (i.e., NSI Aggregate). Again, there was a statistically

Table 9

Group Differences in Mean and Standard Deviation as a Function of No Blast Injuries (n = 130) versus One (n = 105) vs. Two (n = 59) vs. Three or More Blast Injuries (n = 212)

Number of Blast Injuries	NSI Item Aggregate		PCL Item Aggregate	
	M	*SD*	*M*	*SD*
No Blast Injuries	17.44	4.06	15.62	4.66
One Blast Injury	17.60	4.20	16.10	4.81
Two Blast Injuries	18.15	4.18	17.02	4.55
Three or More Blast Injuries	18.61	4.14	16.91	4.54

Note. TBI = Traumatic Brain Injury; NSI = Neurobehavioral Symptom Inventory; PTSD = Posttraumatic Stress Disorder; PCL = PTSD Checklist.

significant difference in NSI aggregate scores between the three groups, $F(3, 501) = 3.66$, $p < .05$, $\eta^2 = .02$. However, despite reaching statistical significance, the actual difference in mean scores between the groups was quite small, as observed by the effect size. Post-hoc comparisons using Tukey's HSD test indicated that the mean score for veterans who have experienced three or more blast injuries ($M = 18.61$, $SD = 4.14$) did not statistically differ from the other three groups on overall NSI symptom endorsement. However, veterans who have experienced one blast injury ($M = 17.60$, $SD = 4.20$) are statistically different, at the $p < .05$ level, than veterans who have never experienced blast injuries ($M = 17.44$, $SD = 4.10$), an expected finding.

Hypothesis 5 predicted that veterans who have higher education (i.e., college degree or greater; $n = 40$, $M = 16.80$, $SD = 4.54$) will report lower neurological-psychological NSI Item Aggregate scores than veterans with a high school diploma or less ($n = 274$, $M = 18.24$, $SD =$

3.95). Like with Hypotheses 2, 3, and 4, the sum of scores across the five overlapping items was calculated for each participant was labeled NSI Item Aggregate. A one-way between-groups ANOVA was conducted to explore the impact of the level of education on the symptoms comprising the NSI Item Aggregate (the sum of the five overlapping neurological-psychological items) as the dependent variable. There was a statistically significant difference at the $p < .05$ level for the two groups, $F(1, 312) = 4.46$, $p < .05$, $\eta^2 = .01$. However, due to the minimal effect size, hence minimal clinical significance, interpretation of these results is unsuitable.

Further exploratory analyses were conducted for symptom endorsement between veterans with a college degree or greater ($M = 71.63$, $SD = 16.94$) and individuals with a high school diploma or less ($M = 65.66$, $SD = 15.07$) across all 22 NSI items (i.e., NSI Aggregate). There was a statistically significant difference in NSI aggregate scores between participants with a college degree or greater, $F(1, 312) = 5.30$, $p < .05$, $\eta^2 = .02$. Although statistically significant, this finding has minimal clinical significance resulting from a small effect size.

Hypothesis 6 predicted that veterans who are married/partnered ($n = 266$, $M = 17.86$, $SD = 4.31$) will report lower neurological-psychological NSI Aggregate scores than veterans who are single/never married ($n = 131$, $M = 18.05$, $SD = 4.29$) or divorced/separated ($n = 106$, $M = 18.52$, $SD = 3.62$). Like with Hypotheses 2, 3, 4, and 5, the sum of scores across the five overlapping items was calculated for each participant and was labeled NSI Item Aggregate. A one-way between-groups ANOVA was conducted to explore the impact of marital status on the symptoms comprising the NSI Item Aggregate (the sum of the five overlapping neurological-psychological items). There was no statistically significant difference between groups, $F(2, 500)$

= .95, p = .39, η^2 = .00. Overall, it appears that marital status does not impact self-report of neurological-psychological symptoms.

Further exploratory analyses were conducted for symptom endorsement between veterans who were married/partnered (M = 65.87, SD = 16.41), single/never married (M = 66.56, SD = 13.90), and divorced/separated (M = 68.71, SD = 14.58) across all 22 NSI items (i.e., NSI Aggregate). Again, there was no statistically significant difference in NSI aggregate scores between the three groups, $F(2, 500) = 1.29$, p = .28, η^2 = .01.

Chapter 4

Discussion

The purpose of the current study was to assess if veterans who screened positive for mTBI are more likely to report greater severity of neurological-psychological symptoms on a neurologically-oriented questionnaire than when rating similar symptoms found on a psychologically-oriented measure. Veterans who are referred to Polytrauma Clinics for Secondary TBI Evaluations are asked to fill out two commonly used questionnaires, namely the NSI and the PCL. Similar to the overlap between mTBI and PTSD (Hoge et al., 2008, Schneiderman et al., 2008), there is an overlap between symptom report on the NSI and the PCL (i.e., poor concentration, forgetfulness, anxiety, irritability, and sleep difficulties). However, no previous studies have been conducted that examine self-reports of these overlapping neurological and psychological symptoms. The current study predicted that veterans who have screened positive for mTBI are more likely to report higher overlapping neurological-psychological symptoms on the NSI (a questionnaire which examines neurological symptoms) when compared to the PCL (a questionnaire which examines psychological symptoms). This prediction was based on prior research by Suhr and Gunstad (2002), who, as previously noted, suggest that the context of the evaluation matters. The participants' data for the current study were obtained from a Secondary TBI Evaluation in a Polytrauma Clinic with a focus on evaluation of post-concussive symptoms.

As predicted, the study found that veterans endorsed higher levels of symptom severity in areas of forgetfulness, anxiety, and irritability on the NSI than the PCL, especially if they did not also show symptoms of PTSD. As evidenced by prior research, the frontal and inferior temporal lobes, as principal structures involved in storing new learning, are the most negatively affected areas following TBI; therefore, it is not surprising that memory loss or impairment is the most common complaint following TBI (Barrash, Kealey, & Janus, 1996; Taber et al., 2006; Williamson et al., 1996). Moreover, research by Morton and Wehman (1995) suggests that there is an increase in anxiety symptoms following memory loss secondary to TBI. Consequently, it seems reasonable to expect that as veterans struggle with forgetfulness and increased anxiety symptoms of irritability also increase. The frustration created by forgetfulness and increased anxiety as well as decreased ability to regulate emotions, makes forgetfulness, anxiety, and irritability stand out more on the NSI than the PCL.

Contrary to expectation and although not statistically significant, veterans endorsed higher symptoms of poor concentration and sleep difficulties on the PCL than on the NSI. Poor concentration has been noted to occur in 39.5% returning veterans (Wheeler, 2007). This high prevalence is most likely a result of veterans being "preoccupied" by other PTSD-like symptoms, such as hyper-vigilance and flashbacks (38%), anger (43%), and work stress (43%), among others (Wheeler, 2007). A similar finding also occurred for sleep difficulties. Although statistically non-significant, veterans endorsed higher levels of sleep difficulties on the PCL than the NSI. However, a subsequent review of the literature shows this finding is consistent with prior investigations. Seventy-one percent of veterans with PTSD endorse having nightmares

when compared to 40 to 60% of veterans with a history of mTBI (Ayalon, Borodkin, Dishon, Kanety, & Dagan, 2007; Leskin, Woodard, Young, & Sheikh, 2002).

In summary, self-reporting of forgetfulness, anxiety, and irritability were higher on the NSI than on the PCL. The study indicates that it is important to further understand and distinguish between mTBI and PTSD during a Secondary TBI Evaluation, while gathering self-report information from screening measures, particularly in areas of forgetfulness, anxiety, and irritability. One suggestion to better differentiate between mTBI and PTSD is through the following: When veterans endorse difficulty concentrating, asking what precedes these difficulties may be an appropriate question. If concentration difficulties are associated with: (a) experiencing several flashbacks a day, (b) daily struggle with depression, or (c) feeling emotionally numb and detached, then difficulty concentrating is most likely due to PTSD-like symptoms rather than mTBI. However, when veterans endorse that: (a) concentration difficulties began soon after the concussion, (b) concentration difficulties have not improved or worsened, (c) flashbacks are not the distracters making for poor concentration, and (d) family members do not associate poor concentration with PTSD-like symptoms (i.e., flashbacks, irritability, feeling numb), poor concentration is likely a post-concussive rather than PTSD symptom. Similarly, when veterans endorse memory difficulties, additional clarifying questions should be asked about the presence of physical reactions related to recall attempts, loss of interest in activities, or difficulty remembering traumatic military experiences.

Gathering additional qualitative information (e.g., self-report of open-ended questions) also increases the length of Secondary TBI Evaluations, which is not always practical for providers. In order to avoid the increased length of the Secondary TBI Evaluation, providers

should refer all veterans, who endorse ongoing post-concussive symptoms, for comprehensive neuropsychological testing to provide better understanding of post-concussive symptoms, which will help with more accurate diagnosis or rule out a mTBI diagnosis. Further, providers should also refer veterans, who endorse some PTSD-like symptoms, to complete a full PTSD evaluation, (in order to allow for time to ask open-ended questions regarding all the PTSD-like symptoms veterans experience), even if they have screened negative for PTSD in the past.

Besides the importance of comprehensive evaluations and accurate diagnosis, the VA system is facing yet another challenge with veterans with PTSD, which potentially complicates the clinical presentation of veterans with a history of mTBI. According to research, the increased number of veterans who screened negative for PTSD upon discharge from the military, but who continue to suffer from undetected PTSD, is a new and developing factor in military personnel who are followed by VAs across the nation. Research by Grieger et al. (2006) indicates that 80% of injured soldiers who screened positive for PTSD or depression several months following injury had screened negative for both conditions immediately following returning from deployment. Moreover, Hoge and colleagues (2008) found that 49% of veterans who reported LOC also screened positive for PTSD. The current study found that 71% of the participants who experienced LOC also screened positive for PTSD. This finding is the same as the 71% found by Lew et al. (2007) conducted at the Palo Alto VA Medical Center. Although the average time for military discharge is unknown for the current study and that conducted by Lew at al. (2007), these numbers are much higher than the 49% found by Hoge et al. (2008). The difference between the numbers of PTSD diagnosis may be related to timing of data collection. Hoge et al. (2008) study was conducted immediately following return from deployment, while the current

and Lew et al. (2007) studies were conducted within VA settings, likely several months post deployment. Hence, it appears that veterans are more likely to report higher PTSD-like symptoms several months post-deployment when compared to immediately returning from deployment. Therefore, continued comprehensive TBI and PTSD evaluations upon veterans' enrollment in the VA system are indicated, even if they have a history negative of mTBI and/or PTSD.

TBI Treatment

Over the past decade, veterans of the wars in Iraq and Afghanistan have suffered blast exposures, which have often led to ongoing post-concussive syndrome, a clinically challenging disorder for patients and providers alike. Although treatment programs have been developed at VA hospitals across the nation to manage moderate and severe TBI, no evidence-based treatments currently exist to manage the symptoms of mTBI that haunt returning veterans and their families (Hoge et al., 2009; Real Warriors, 2010; US Government Accountability Office, Feb. 2008). In an effort to better understand treatment implications for the mTBI population, the effects of TBI treatment on the overlapping neurological-psychological were evaluated. This study suggests that overall, the current impact of treatment, in aggregate, seemed the same as those receiving no treatment. Furthermore, even though veterans are reporting involvement in some form of TBI treatment, it is not necessarily resulting in reduced symptomatology. However, this finding remains inconclusive for the current study due to missing details of the reported TBI treatments. Therefore, we are unable to compare symptoms changes before and after treatment. In addition, as seen below, the effects of blast exposure when compared to other types of injuries, education, and marital status also do not appear to make a difference in

symptom endorsement. These lack of findings could suggest that the post-concussive symptoms that develop following mTBI are quite mild, which could result in little to no apparent improvement. However, results of longitudinal studies monitoring symptom changes are needed to evaluate the effects of mTBI rehabilitation interventions (van der Naalt, 2001).

Effects of Blast mTBI

It was predicted that participants who suffered blast exposure mTBI would report higher neurological-psychological symptoms than participants who experienced other types of injuries (i.e., MVA/falls/other). Research by Garcia et al. (2010) reported that OEF/OIF veterans who have experienced blast exposure mTBI report higher severity of symptoms on psychiatric measures than those with other types of injuries (e.g., MVA, fall, and bullet). Contrary to prediction, the intensity of self-reported neurological-psychological symptoms did not differ between veterans with a history of blast mTBI and those with other types of mTBIs. Although this finding was unexpected, it replicates previous findings, which also suggest no differences between individuals with blast mTBI when compared to individuals with non-blast mTBI (Belanger et al., 2009; Mac Donald et al., 2011; Sayer et al., 2008). Therefore, while conducting a Secondary TBI Evaluation, exploration of the development and progress of post-concussive symptoms in general, rather than the events that lead to the injury, seem to be more appropriate and indicated.

Effects of Multiple Blast Exposures

Contrary to expectation, the data of the current study suggest that the number of blast exposures did not appear to impact the intensity of neurological-psychological symptoms between veterans with one, two, three, or more blast exposures. Supporting this finding is

research by Macciocchi et al. (2001) that reports that neurobehavioral and neurocognitive consequences from two or more concussions do not differ from those incurred from one concussion. However, inconsistent with the current finding, Hoge and colleagues (2008) suggest that sustaining multiple concussions increases the risk for persistent post-concussive symptoms. Moreover, a meta-analysis conducted by VA/DoD (2009) suggests that sustaining multiple concussions resulting in increased symptomatology and longer recovery remains inconclusive. "Many studies are based on self-reported data of historical concussions. As a whole, many studies are difficult to interpret because of potential confounders" (VA/DoD, 2009, p. 26). Although the current study was consistent with some of the research indicating no difference in post-concussive symptoms between veterans with three or more concussions when compared to veterans with one or two concussions, the findings remain inconclusive. To date, more research is being conducted and is needed to better understand the impact of blast exposure. Although war conflicts and subsequent blast exposures are not unknown to researchers, the impact of the current conflicts, which includes, multiple deployments, higher incidence of PTSD, and other confounding variables remain poorly understood and are in need of further investigation.

Education

With such a complex symptom presentation following mTBI, education and marital status were evaluated in order to look at the impact these characteristics have on veterans' symptom endorsement. It was predicted that veterans who have a college degree or higher would report lower neurological-psychological symptoms than veterans with a high school degree or less. This prediction was based on previous studies, which have shown that lower education status is associated with higher self-report of psychological symptoms (Brewin et al., 2000;

Iverson et al., 2008; Riddle et al., 2007). However, no previous studies have been conducted evaluating the impact of education on neurological-psychological symptoms as compared to psychological symptoms alone. The current study indicated that the level of education did not impact the severity of reported neurological-psychological symptoms. It is likely that although higher education impacts psychological symptoms, it does not necessarily impact severity of neurological-psychological symptoms. This finding is encouraging since the majority of the veterans of the current study (53.3%) have a high school diploma or equivalent, when compared to veterans with a college degree or higher education (37.8%).

Marital Status

The current study predicted that veterans who were married/partnered would report less severe neurological-psychological symptoms than individuals who were single/never married or separated/divorced. This prediction was based on the assumption that marital status equaled family closeness, empathy, and understanding, which would help veterans re-adjust to civilian life as well as life changes following mTBI. Contrary to expectation, marital status did not impact the level of severity of neurological-psychological symptoms. Prior research has indicated that family support is fundamental to a service member's recovery from PTSD, particularly feelings of belonging, empathy, and decreased interpersonal conflicts (Bay et al., 2011). However, no current studies exist documenting the impact of marital status on mTBI symptom changes overtime, even though family members are the first to identify that the veteran is experiencing difficulty and encourage them to seek treatment (US Army Surgeon General, 2008). Therefore, marital status does not necessarily impact symptom severity endorsement. Rather, feelings of belongingness, empathy, and decreased interpersonal conflicts by family

members are important to veterans' symptom endorsement (Bay et al., 2011). Therefore, it is as important educating any involved family members regarding the nature of mTBI and its treatment, as it is to treat veterans affected by mTBI, regardless of the veterans' marital status.

Clinical Implications

Overall, from the current study, it appears important for providers to further evaluate and gather subjective and collateral information on the overlapping mTBI and PTSD symptoms, particularly forgetfulness, anxiety, and irritability. Although the NSI and PCL should not be used as diagnostic tools, the two questionnaires (i.e., NSI and PCL) will likely continue to provide good information to providers, particularly lead the way for clinical diagnostic evaluations while incorporating open-ended questions regarding symptom severity. As previously noted, gathering information as well as conducting clinical evaluations will help to better differentiate between mTBI and PTSD. Referring veterans, who continue to endorse post-concussive symptoms, for comprehensive neuropsychological testing, may help to better diagnose or rule out a mTBI diagnosis. Another way of better differentiating between mTBI and PTSD is to recommend that all veteran who undergo comprehensive Secondary TBI Evaluations (VA/DoD, 2009) also undergo comprehensive PTSD evaluations (VA/DoD, 2010). It appears that conducting comprehensive evaluations (including clinical interviewing) is a better way of differentiating between the two disorders, rather than relying solely on self-report measures or screeners. This procedure will most likely prevent misdiagnosing mTBI patients with PTSD and vice versa (Benge, Pastorek, & Thornton, 2009; Hoge et al., 2008). Participation in some form of non evidence-based mTBI treatment appears to have no effect on the level of endorsed neurological-psychological symptoms. However, since no evidence-based treatments for mTBI exist that have

been approved by VA and/or DoD, development of appropriate treatment options for management of mTBI remains important for future research and clinical practice. Furthermore, conducting longitudinal studies to better understand the effect of TBI treatment is also important. Moreover, the effects of one *vs*. multiple concussions remain controversial and poorly understood. Further, understanding of the effects of post-concussive syndrome and PTSD on returning soldiers will most likely lead to better understanding of results of multiple concussions. Education and marital status appear to not have significant effects for the current study. Although others have researched the positive impact of positive family relationships, no studies currently exist showing the effectiveness of marital status on ongoing post-concussive symptoms. Therefore, continuing to involve close family members in the understanding and treatment of mTBI remains important for providing support to veterans as well as provide family members with resources to deal with daily stressors occurring as a result of ongoing post-concussive symptoms.

Study Limitations

Some study limitations merit comment. The principal limitation of the study is the cross-sectional design that relied on self-reported data/measures/screeners. Using self-report for screening is likely to result in mislabeling service members as "brain-injured" when there are other reasons for their symptoms (Hoge et al., 2008; Spencer, Drag, Walker, & Bieliuskas, 2010). Subjective reports based on questionnaires alone constitute a weakness of this and many other studies involving combat-related mTBI. It does not allow for the more detailed and open-ended questions that can be used in face-to-face contact while conducting comprehensive evaluations. Self-report screenings do not substitute an unstructured interview by clinical

providers. Another limitation that stands out is the ambiguity of the questions. Veterans may interpret the questions differently, which may lead to possibly inaccurate self-report responses. As previously described, future research may benefit from the inclusion of a qualitative approach (i.e., gather sufficient information regarding the severity and precursor of each symptom endorsed) to better understand and refine patients' report of neurological-psychological symptoms. Moreover, all of the study's participants screened positive for a history of mTBI, and consequently participated in a Secondary TBI Evaluation. However, the outcome (i.e., the diagnosis) of the evaluation is missing from the database and therefore not available for review.

Another limitation of the study was the missing data on past or current TBI treatment participation. The results suggest that the TBI treatment did not impact self-report of neurological-psychological symptoms. Future researchers should focus on pre- and post-treatment symptom presentation in order to better understand the impact of treatment on symptoms.

The participants of the current study did not undergo a formal PTSD evaluation prior to attending the Secondary TBI Evaluation; therefore, a PTSD diagnosis was assumed only from the PCL aggregate score of 50 or above. Although a PCL score equal to or greater than 50 is a good indicator for a diagnosis of PTSD, it does not mean a definite PTSD diagnosis (Hoge et al., 2008). Thus, the PTSD diagnoses utilized in the current study are questionable. Furthermore, the complications of potential secondary gain (e.g., compensation for combat-related symptoms) were not addressed in this study and bear further investigation. The current study did not include veterans undergoing compensation and pension evaluations. Because these veterans have a

higher motivation to over-report problems, a replication of the current study among these participants is needed.

Future Research

Future research efforts are needed to develop effective strategies for improving understanding of mTBI, appropriate diagnosis, and ongoing post-concussive symptoms, which impacts development of treatment programs and appropriate recommendations. It is likely that the current increasing demand for mental health services in VA settings will require the implementation of treatments that have not been adequately investigated or that do not have adequate empirical support to meet the needs of veterans. It will therefore be important that as they are implemented, there also be an evaluation component included that will allow degree of effectiveness to be determined. Further understanding of symptom presentations, particularly symptom overlap, will be important in understanding the subtle differences between mTBI and PTSD and will assist providers in providing accurate treatments for both disorders.

References

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders,* 4th ed., *Text Revision.* Washington, DC: Author.

Arnold, J., Halpern, P., Ming, C. T., & Smithline, H. (2004). Mass casualty bombings: A comparison of outcomes by bombing type. *Annals of Emergency Medicine, 43*, 263-273.

Ayalon, L., Bordkin, K., Dishon, L., & Kanety, H., & Dagan, Y. (2007). Circadian rhythm sleep disorders following mild traumatic brain injury. *Neurology, 68*, 1136-1140.

Barrash, J., Kealey, G. P., & Janus, T. J. (1996). Neurobehavioral sequelae of high voltage electrical injuries: Comparison with traumatic brain injury. *Applied Neuropsychology, 3*, 75-81.

Bay, E. H., Blow, A. J., & Yan, X. (2011). Interpersonal relatedness and psychological functioning following Traumatic Brain Injury: Implications for marital and family therapists. *Journal of Marital and Family Therapy, 37*, 273-275.

Begali, V. (1992). *Head injury in children and adolescents: A resource and review for school and allied professionals*, 2nd ed. Brandon, VT. Clinical Psychology Publishing.

Belanger, H. G., Kretzmer, T., Yoash-Gantz, R., Pickett, T., & Tupler, L. A. (2009). Cognitive sequelae of blast-related versus other mechanisms of brain trauma. *Journal of the International Neuropsychological Society, 15*, 1-8.

Benge, J. F., Pastorek, N. J., & Thornton, G. M. (2009). Postconcussive symptoms in OEF/OIF veterans: Factor structure and impact of posttraumatic stress. *Rehabilitation Psychology, 54*, 270-278.

Brailey, K (September, 2009). *MTBI effects on emotion symptoms, neurocognitive performance, and functional impairment: a longitudinal study of deployed and non-deployed Army soldiers.* Boston, MA: Boston VA Research Institute.

Brain Injury Association of America. (2006). *Facts about traumatic brain injury.* Washington DC: Centers for Disease Control and Prevention.

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma exposed adults. *Journal of Consulting and Clinical Psychology, 68*, 748-766.

Center for Neuro Skills. (2006). TBI facts and stats. Retrieved from: http://www.neuroskills.com/tbi/facts.shtml

Cernak, I., Savic, J., Ignjatovic, D., & Jetvic, M. (1999). Blast injury from explosive munitions. *Journal of Trauma, 47*, 96-103.

Collins, M., Grindel, S., Lovell, M., Dede, D. E., Moser, D. J., Phalin, B. R., … McKeag, D. B. (1999). Relationship between concussion and neuropsychological performance in college football players. *Journal of the American Medical Association, 282*, 964-970.

Defense and Veterans Brain Injury Center. (2006). US Department of Defense. Washington D.C.

Defense and Veterans Brain Injury Center. (2011). US Department of Defense. Washington D.C.

DePalma, R. G., Burris, D. G., Champion, H. R., & Hodgson, M. J. (2005). Blast injuries. *The New England Journal of Medicine, 352*, 1335-1342.

Department of Defense. (2006). U.S. Department of Defense, Washington D. C.

Department of Defense. (2007). U.S. Department of Defense, Washington D.C.

Garcia, H. A., Franklin, L. C., & Chambliss, J. (2010). Examining MMPI-II F-family scales in PTSD-diagnosed veterans of Operation Enduring Freedom and Operation Iraqi Freedom. *Psychological Trauma: Theory, Research, Practice, and Policy, 2*, 126-129.

Gewirtz, A. H., Polusny, M. A., Degarmo, D. S., Khaylis, A., & Erbes, C. R. (2010). Posttraumatic stress symptoms among National Guard soldiers deployed to Iraq: Associations with parenting behaviors and couple adjustment. *Journal of Consulting and Clinical Psychology, 75*, 599-610.

Grieger, T. A., Cozza, S. J., Ursano, R. J., Hoge, C., Martinez, P. E., Engel, C. C., & Wain, H. J. (2006). Posttraumatic stress disorder and depression in battle-injured soldiers. *American Journal of Psychiatry, 163*, 1777-1783.

Hoge, C. W., Castro, C. A., Messer, S. C., McGurk, D., Cotting, D. I., & Koffman, R. L. (2004). Combat duty in Iraq and Afghanistan mental health problems, and barriers to care. *The New England Journal of Medicine, 351*, 13-22.

Hoge, C. W., Goldberg, H. M., & Castro, C. A. (2009). Care of war veterans with mild Traumatic Brain Injury – flawed perspective. *The New England Journal of Medicine, 360*, 1588-1591.

Hoge, C. W., McGurk, D., Thomas, J. L., Cox, A. L., Engel, C. C., & Castro, C. A. (2008). Mild traumatic brain injury in U.S. soldiers returning from Iraq. *The New England Journal of Medicine, 358*, 453-463.

Iverson, A. C., Fear, N. T., Ehlers, H., Hughes, J., Hull, L., Earnshaw, M., … Hotopf, M. (2008). Risk factors for post-traumatic stress disorder among UK Armed Forces personnel. *Psychological Medicine, 38*, 511-522.

Iverson, G. L., Lange, R. T., Gaetz, M., & Zasler, N. D. (2006). Mild TBI. In N. D. Zasler, D. I. Katz, & R. D. Zafonte (Eds.), *Brain Injury Medicine: Principles and Practice* (pp. 333-371). New York, NY: Demos Medical.

Jennett, B. (2002). The Glasgow Coma Scale: History and current practice. *Trauma, 4*, 91-103.

Jennett, B., & Bond, M. (1975). Assessment of outcome after severe brain damage. *Lancet, 1*, 480-487.

Kochanek, P. M. (2009). Blast-inducted traumatic brain injury and polytrauma: A critical problem begging for new insight and new therapies. *Journal of Neurotrauma, 26*, 813-814.

Leskin, G. A., Woodward, S. H., Young, H. E., & Sheikh, J. I. (2002). Effects of comorbid diagnoses on sleep disturbances in PTSD. *Journal of Psychiatric Research, 36*, 449-452.

Levin, H. S., Mattis, S., Ruff, R. M., Eisenberg, H. M., Marshall, L. F., Tabaddor, K., High, W. M., & Frankowski, R. F. (1987). Neurobehavioral outcome following minor head injury: a three-center study. *Journal of Neurosurgery, 66*, 234-243.

Lew, H. L., Poole, J. H., Vanderploeg, R. D., Goodrich, G. L., Dekelboum, S., Guillory, S. B., Sigford, B., & Cifu, D. (2007). Program development and defining characteristics of returning military in a VA Polytrauma Network Site. *Journal of Rehabilitation Research & Development, 44*, 1027-1034.

Lezak, M. D. (1995). *Neuropsychological Assessment*, 3rd ed. New York, NY: Oxford University Press.

Lezak, M. D., Howieson, D. B., & Loring, D. W. (2004). *Neuropsychological Assessment*, 4th ed. New York, NY: Oxford University Press.

Lucas, J. A., & Addeo, R. (2006). Traumatic brain injury and postconcussion syndrome. In: P. J. Snyder, P. D. Nussbaum, D. L. Robins, (Eds). *Clinical neuropsychology: A pocket handbook for assessment*, 2nd ed. (pp. 351-380). Washington, DC: American Psychological Association.

Macciocchi, S. N., Barth, J. T., Littlefield, L., & Cantu, C. (2001). Multiple concussions and neuropsychological functioning in collegiate football players. *Journal of Athletic Training, 364*, 2091-2100.

Mac Donald, C. L., Johnson, A. M., Cooper, D., Nelson, E. C. Werner, N. J., Shimony, J. S., … Brody, D. L. (2011). Detection of blast-related traumatic brain injury in U.S. military personnel. *The New England Journal of Medicine, 358*(5), 453-463.

Martin, E. M., Lu, W. C., Helmick, K., French, L., & Warden, D. (2008). Traumatic Brain Injuries sustained in Afghanistan and Iraq wars. *American Journal of Nursing, 108*(4), 40-47.

McCrea, M. A. (2008). Challenges in defining and diagnosing MTBI. In G. J. Lamberty, I. S. Baron, R. Kaplan, S. Koeffler, & J. Sweet (Eds.), *Mild traumatic brain injury and postconcussion syndrome: The new evidence base for diagnosis and treatment* (pp. 13-28). New York, NY: Oxford University Press.

Mild Traumatic Brain Injury Committee. (1993). Head injury interdisciplinary special interest group of the American congress of rehabilitation medicine. *Journal of Head Trauma Rehabilitation, 8*(3), 86-87.

Morton, M. V., & Wehman, P. (1995). Psychosocial and emotional sequelae of individuals with traumatic brain injury: A literature review and recommendations. *Brain Injury, 9*, 81-92.

National Center for Injury Prevention and Control. (2003). *Report to congress on mild traumatic brain injury in the United States: Steps to prevent a serious public health problem.* Atlanta, GA. Center for Disease and Prevention.

National Center for PTSD. (2010). Retrieved from: http://www.ptsd.va.gov/public/pages/how-common-is-ptsd.asp

Real Warriors. (2010). Cognitive rehabilitation helps warriors with mild TBI. Retrieved from: http://www.realwarriors.net/active/treatment/mildtbirecovery.php

Riddle, J. R., Smith, T. C., Smith, B., Corbeil, T. E., Engel, C. C., Wells, T. S., … Blazer, D. (2007). Millennium cohort: The 2001-2003 baseline prevalence of mental disorders in the U. S. military. *Journal of Clinical Epidemiology, 60*, 192-201.

Rimel, R. W., Giordani, B., Barth, J. T., & Jane, J. A. (1982). Moderate head injury: Completing the clinical spectrum of brain trauma. *Neurosurgery, 11*, 344-351.

Rosenthal, M., & Ricker, J. (2000). Traumatic brain injury In: R. G. Frank & T. R. Elliott (Eds.), *Handbook of rehabilitation psychology*. (pp. 49-74). Washington, DC: American Psychological Association.

Rotto, P. C. (1998). Traumatic brain injury. In: L. Phelps. *Health-related disorders in children and adolescents: A guidebook for understanding and educating*. (pp. 652-671). Washington, DC: American Psychological Association.

Savage, R. C., & Wolcott, G. F. (1994). *Educational dimensions of acquired brain injury*. Austin, TX: Pro ed.

Sayer, N. A., Chiros, C. E., Sigford, B., Scott, S., Clothier, B., Picket, T., & Lew, H. L. (2008). Characteristics and rehabilitation outcomes among patients with blast and other injuries

sustained during the Global War on Terror. *Archives of Physical Medicine and Rehabilitation, 89*, 163-170.

Schneiderman, A. I., Braver, E. R., & Kang, H. K. (2008). Understanding sequelae of injury mechanisms and mild traumatic brain injury incurred during the conflicts in Iraq and Afghanistan: Persistent postoncussive symptoms and posttraumatic stress disorder. *American Journal of Epidemiology, 167*, 1446-1452.

Spencer, R. J., Drag, L. L., Walker, S. J., & Bieliauskas, L. A. (2010). Self-reported cognitive symptoms following mild traumatic brain injury are poorly associated with neuropsychological performance in OIF/OEF veterans. *Journal of Rehabilitation Research & Development, 47*, 521-530.

Stewart, C. (2006). Blast injuries: Preparing for the inevitable. *Emergency Medicine, 8*(4), 1-26.

Suhr, J. A., & Gunstad, J. (2002). "Diagnosis Threat": The effect of negative expectations on cognitive performance in head injury. *Journal of Clinical and Experimental Neuropsychology, 24*, 448-557.

Taber, K. H., Robin, D. L., & Hurley, R. A. (2006). Blast related traumatic brain injury: What is known? *Journal of Neuropsychiatry and Clinical Neurosciences. 18*, 141-145.

U.S. Army Surgeon General. (2008). Retrieved from: http://www.armymedicine.army.mil /reports/mhat/mhat_v/mhat-v.cfm

U.S. Government Accountability Office. (2008). Retrieved from: http://www.gao.gov/new.items/ d08276.pdf

U.S. National Coma Data Bank. (2005). American College of Surgeons. Retrieved from: http://www.facs.org/trauma/ntdb/ntdbannualreport2005.pdf.

VA/Department of Defense practice guidelines for management of concussion/mild Traumatic Brain Injury. (2009). Retrieved from: http://www.healthquality.va.gov/mtbi/concussion_mtbi_full_1_0.pdf

VA/Department of Defense practice guidelines for management of post-traumatic stress. (2010). Retrieved from: http://www.healthquality.va.gov/ptsd/ptsd_full.pdf

van der Naalt, J. (2001). Prediction of outcome in mild to moderate head injury: a review. *Journal of Clinical and Experimental Psychology, 23*, 837-851.

Vasterling, J. J., Proctor, S. P., Amoroso, P., Kane, R., Heeren, T., & White, R. (2006). Neuropsychological outcomes of army personnel following deployment to the Iraq war. *Journal of American Medical Association, 296*, 519-529.

Weathers, F. W., Litz, B. T., Herman, D. S., Huska, J. A., & Keane, T. M. (1993). The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility, 9th Annual Meeting of the International Society for Traumatic Stress Studies. San Antonio, TX.

Wheeler, E. (2007). *Self-Reported mental health status and needs of Iraq veterans in the Maine Army National Guard.* Retrieved from: http://www.ptsd.ne.gov/publications/MENG-veterans-study-full-report.pdf

Williamson, D. J. G., Scott, J. G., & Adams, R. L. (1996). Traumatic brain injury. In: R. L. Adams, O. A. Parsons, J. L. Culbertson, & S. J. Nixon (Eds). *Neuropsychology for clinical practice: Etiology, assessment, and treatment of common neurological disorders*. (pp. 9-64). Washington, DC: American Psychological Association.

Appendix A

GCS Indicators of Traumatic Brain Injury.

EYE OPENING	
None	1 Even to supra-orbital pressure
To Pain	2 Pain from sternum/limb/supra-orbital pressure
To Speech	3 Non-specific response, not necessarily to command
Spontaneous	4 Eyes open, not necessarily aware
MOTOR RESPONSE	
None	1 To any pain; limbs remain flaccid
Extension	2 Shoulder adducted and should and forearm internally rotated
Flexor Response	3 Withdrawal response or assumption of hemiplegic posture
Withdrawal	4 Arm withdrawal to pain, should abducts
Localizes pain	5 Arm attempts to remove supra-orbital/chest pressure
Obeys commands	6 Follows simple commands
VERBAL RESPONSE	
None	1 No verbalization of any type
Incomprehensible	2 Moans/groans, no speech
Inappropriate	3 Intelligible, no sustained sentences
Confused	4 Converses but confused, disoriented
Oriented	5 Converses and oriented

Appendix B

TBI Screening Reminder

The first step of the reminder is to identify possible OEF and OIF participants based on whether date of separation from military duty or active duty status occurred after September 11, 2011.

The initial questions address location of deployment.

The definition of OEF participants includes service in Afghanistan, Georgia, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan, or the Philippines.

OIF participants includes service in Iraq, Kuwait, Saudi Arabia, or Turkey.

The screening is done once for all individuals who report deployment of OEF and OIF Theaters, and it is to be repeated if the date of separation has changed due to repeat deployment. The reminder recognizes if screening was completed prior to the most recent date of separation.

The reminder then asks whether the patient has already been diagnosed as having TBI during OEF or OIF deployment. Positive answers may be based on patient or caregiver self-report or health records from VA or non-VA resources. Positive answers lead to an option to order a referral for follow-up if the patient does not have current follow-up and wants assistance.

For those who confirm OEF or OIF deployment and do not have a prior diagnosis of TBI, the instrument proceeds using four sequential sets of questions. The four sections are:

1. Events that may increase risk of TBI.
2. Immediate symptoms following the event.
3. New or worsening symptoms following the event.
4. Current symptoms.

If a person responds negatively to any of the sets of questions, the screen is negative and the reminder is completed. If the patient responds positively to one of more possible answers in this section, the next section opens in the reminder to continue the screening process. If a person responds positively to one or more question in each of the four sections, the screen is positive, the clinician discusses the results of the screen with the patient, and arrangements for further evaluation are offered. The reminder proms the user to place a consultation for further evaluation or documents refusal. Not all patients who screen positive have TBI. It is possible to respond positively to all four sections due to the presence of other conditions, such as Post Traumatic Stress Disorder (PTSD), cervico-cranial injury with headaches, or inner ear injury. Therefore, it is critical that patients not be labeled with the diagnosis of TBI on the basis of a positive screening test. Patients need to be referred for comprehensive evaluation to substantiate the diagnosis.

The VHA task force has developed a defined protocol for completing the additional evaluation by a specialized team. The Comprehensive TBI Evaluation is a comprehensive evaluation which includes the origin or etiology of the patient's injury, assessment of neurobehavioral symptoms (using the 22-question Neurobehavioral Symptom Inventory), a targeted physical examination, and a follow up treatment plan. An electronic template of documentation of this evaluation has been developed and deployed.

Appendix C

Polytrauma Injury Self Report Form

Instructions: Do not leave any question blank. Please answer each question to the best of your ability.

Name (Last, first):
Last four of SSN:
Date:

1) Current marital status (please check one):
   - ☐ Single, never married
   - ☐ Married or partnered
   - ☐ Divorced or separated
   - ☐ Widowed

2) Pre-military education (please check one):
   - ☐ Less than high school
   - ☐ High school diploma or equivalent
   - ☐ Some college, Associates degree, or technical degree
   - ☐ College graduate
   - ☐ Greater than college graduate

3) Current employment status (please check one):
   - ☐ Unemployed, looking for work
   - ☐ Unemployed, not looking for work
   - ☐ Working part-time
   - ☐ Working full-time
   - ☐ Student
   - ☐ Volunteer
   - ☐ Homemaker

4) Please provide dates of most serious OEF/OIF deployment related injuries
   1)

   2)

   3)

5) Were you injured by any of the following:
   - ☐ Bullet # of episodes:_____
   - ☐ Vehicular # of episodes:_____
   - ☐ Fall # of episodes:_____
   - ☐ Blast # of episodes:_____
   - ☐ Blunt trauma other than from blast/vehicular injury, e.g., assault, blunt force, sports, related or object hitting head. # of episodes:_____

6) Did you lose consciousness immediately after any of these experiences?
   - ☐ Uncertain
   - ☐ No
   - ☐ Yes

If yes, please indicate the number of occurrences
___ Number of occurrences

If yes, please indicate the duration of longest period of loss of consciousness (check one)

- ☐ less than 1 minute
- ☐ 1 minute to 30 minutes
- ☐ greater than 30 minutes to 6 hours
- ☐ greater than 6 hours to 24 hours
- ☐ greater than 24 hours to 7 days
- ☐ greater than 7 days

7a) Did you experience a period of disorientation or confusion immediately following the incident?

- ☐ Uncertain
- ☐ No
- ☐ Yes

If yes, please indicate the number of occurrences
___ Number of occurrences

If yes, please indicate the duration of longest period of disorientation or confusion (check one)

- ☐ less than 30 minutes
- ☐ greater than 30 minutes to 24 hours
- ☐ greater than 24 hours to 7 days
- ☐ greater than 7 days to 1 month
- ☐ greater than 1 month to 3 months
- ☐ greater than 3 months

7b) Did you experience a period of memory loss immediately before or after the incident?

- ☐ Uncertain
- ☐ No
- ☐ Yes
  - If yes, please indicate the number of occurrences
    ___ Number of occurrences
  - If yes, please indicate the duration of longest period of *loss of memory immediately <u>after</u> the accident* (check one)
    - ☐ less than 30 minutes
    - ☐ greater than 30 minutes to 24 hours
    - ☐ greater than 24 hours to 7 days
    - ☐ greater than 7 days to 1 month
    - ☐ greater than 1 month to 3 months
    - ☐ greater than 3 months

8) During this / these experience(s), did an object penetrate your skull/cranium:

- ☐ No
- ☐ Yes

9) Were you wearing a helmet at the time of most serious injury?

- ☐ No
- ☐ Yes

10) Were you evacuated from the theatre?

- ☐ No
- ☐ Yes, for traumatic brain injury
- ☐ Yes, for other medical reasons

11) Prior to this evaluation, had you received any professional treatment (including medications) for deployment related TBI symptoms?

- ☐ No
- ☐ Yes, in the past
- ☐ Yes, currently
  - 11a) (only if 11 is yes) Have you ever been prescribed medications for symptoms related to your deployment related traumatic brain injury?
    - ☐ No
    - ☐ Yes, in the past
    - ☐ Yes, currently

12) Prior to your OEF/OIF deployment, did you experience a brain injury or concussion?

 Yes
 No
 Uncertain
 Not assessed

13) Since your OEF/OIF deployment, have you experienced a brain injury or concussion?
 Yes
 No
 Uncertain
 Not assessed

14) Since the time of your deployment related injury/injuries, has anyone told you that you were acting differently?
 No
 Yes

15) P**lease rate the following symptoms with regard to how much they have disturbed you <u>SINCE YOUR INJURY</u>. Please circle one number for each symptom.**

0 = None - Rarely if ever present; not a problem at all

1 = Mild - Occasionally present, but it does not disrupt activities; I can usually continue what I'm doing; doesn't really concern me.

2 = Moderate - Often present, occasionally disrupts my activities; I can usually continue what I'm doing with some effort; I feel somewhat concerned.

3 = Severe - Frequently present and disrupts activities; I can only do things that are fairly simple or take little effort; I feel like I need help.

4 = Very Severe - Almost always present and I have been unable to perform at work, school or home due to this problem; I probably cannot function without help.

15a. Feeling dizzy:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15b. Loss of balance:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15c. Poor coordination, clumsy:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15d. Headaches:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15e. Nausea:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15f. Vision problems, blurring, trouble seeing:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15g. Sensitivity to light

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15h. Hearing difficulty:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15i. Sensitivity to noise:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15j. Numbness or tingling on parts of my body:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15k. Change in taste and/or smell:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15l. Loss of appetite or increase appetite:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15m. Poor concentration, can't pay attention, easily distracted:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15n. Forgetfulness, can't remember things:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15o. Difficulty making decisions:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15p. Slowed thinking, difficulty getting organized, can't finish things:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15q. Fatigue, loss of energy, getting tired easily:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15r. Difficulty falling or staying asleep:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15s. Feeling anxious or tense:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15t. Feeling depressed or sad:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15u. Irritability, easily annoyed:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15v. Poor frustration tolerance, feeling easily overwhelmed by things:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

16) Overall, in the last 30 days how much did these difficulties interfere with your life? (check one)

- Not at all
- Mildly
- Moderately
- Severely
- Extremely

16a) In what areas are you having difficulties because of these symptoms?

_____

_____

17a) In the last 30 days, have you had any problems with pain?

- ☐ No
- ☐ Yes

→ 17a) If yes, check all locations that apply

- ☐ Head/headaches
- ☐ Leg(s)
- ☐ Arm(s)
- ☐ Neck
- ☐ Shoulders
- ☐ Low back
- ☐ Upper back
- ☐ Other (please explain):

→ 17b) If yes, in the last 30 days, how much did pain interfere with your life?

- ☐ Not at all
- ☐ Mildly
- ☐ Moderately
- ☐ Severely
- ☐ Extremely

→ 17c) In what areas of your life are you having difficulties because of pain?

_____

_____

18) Since the time of your deployment related injury/injuries, are your overall symptoms:

- ☐ Better
- ☐ Worse
- ☐ About the same

Appendix D

PTSD Checklist – Military Version (PCL-M)

Patient's Name: _____

Instruction to patient: Below is a list of problems and complaints that veterans sometimes have in response to stressful military experiences. Please read each one carefully, put an "X" in the box to indicate how much you have been bothered by that problem in *the last month.*

No.	Response:	Not at all (1)	A little bit (2)	Moder-ately (3)	Quite a bit (4)	Extreme-ly (5)
1.	Repeated, disturbing *memories, thoughts*, or *images* of a stressful military experience?					
2.	Repeated, disturbing *dreams* of a stressful military experience?					
3.	Suddenly *acting* or *feeling* as if a stressful military experience *were happening again* (as if you were reliving it)?					
4.	Feeling *very upset* when *something reminded* you of a stressful military experience?					
5.	Having *physical reactions* (e.g., heart pounding, trouble breathing, or sweating) when *something reminded* you of a stressful military experience?					
6.	Avoid *thinking about* or *talking about* a stressful military experience or avoid *having feelings* related to it?					
7.	Avoid *activities* or *situations* because *they remind you* of a stressful military experience?					
8.	Trouble *remembering important parts* of a stressful military experience?					
9.	Loss of *interest in things that you used to enjoy?*					
10.	Feeling *distant* or *cut off* from other people?					
11.	Feeling *emotionally numb* or being unable to have loving feelings for those close to you?					
12.	Feeling as if your *future* will somehow be *cut short*?					

No.	Response:	Not at all (1)	A little bit (2)	Moder-ately (3)	Quite a bit (4)	Extreme-ly (5)
13.	Trouble *falling* or *staying asleep*?					
14.	Feeling *irritable* or having *angry outbursts*?					
15.	Having *difficulty concentrating*?					
16.	Being *"super alert"* or watchful on guard?					
17.	Feeling *jumpy* or easily startled?					

Appendix E

Curriculum Vitae

ELGA KINNEAR

14111 NE. 24Th St. Suite #4, Bellevue, WA 98007 ■ 206-321-9391 ■

elga.kinnear@gmail.com

Education

George Fox University, Newberg, OR (2006-2011)
Currently enrolled in doctoral program: Clinical Psychology
APA Accredited

Expected Graduation: October, 2011

George Fox University, Newberg, OR (2008)
MA in Clinical Psychology

Seattle Pacific University, Seattle, WA (2004)
BA in Psychology and Philosophy Studies

Languages:

Native Albanian Speaker
Fluent in: Italian
Knowledge of: French

Honors, Awards, and Grants

Michael Warner Ministry and Service Award (May 2010; $700)
George Fox University, Newberg, OR

Christian Education for the International Community of Children Award (May 2010; $600)
GDQ School, Tirana, Albania
Ministry Award to conduct Learning Disability assessments to school-aged missionary children in Tirana, Albania.

Diversity Scholarship (2006-2010)
George Fox University, Newberg, OR
Departmental scholarship awarded from the Graduate Department of Clinical Psychology for facilitating cultural/ethnic diversity in the student community and encouraging the provision of psychological services to underserved groups.

Evalyn E. C. Richter Scholars Grant Programs for Independent Research (2007; $4,752)

George Fox University, Newberg, OR

Independent Research: Adapting Short-Term Memory Assessments to Measure Long-Term Memory in Individuals with mild Traumatic Brain Injuries (mTBI) and Alzheimer's disease.

Department of Psychology Faculty Award (2004)
Seattle Pacific University, Seattle, WA

First Place Poster (Presentation; 2003)
Washington State Psychological Association Conference, Seattle, WA

Career Progression

Supervised Clinical Experience

VA Salt Lake City Healthcare System, **Salt Lake City, UT**
500 Foothill Dr.
Salt Lake City, UT 84148
Predoctoral Internship Training (July, 2010 – July, 2011, 40 hrs/wk)
APA Accredited Internship

Major Rotations (3 months each)

Behavioral Health Primary Care (August, 2010 – October, 2010)

- Provide mental health triage, consult, and liaison services in primary care clinics
- Conduct brief individual psychotherapy for veterans with medical and mental health difficulties
- Conduct brief behavior modification interventions for patients with diabetes, pain, and re-adjustment
- Conduct brief cognitive screenings
- Participate in weekly team meetings with psychologists, psychiatrist, and nurse case manager

OEF/OIF Post-Deployment Clinic and Polytrauma Clinic (November, 2010 – January, 2011)

- Provide mental health consultation to OEF/OIF post-deployment clinic providers
- Conduct brief individual psychotherapy for re-adjustment difficulties, PTSD, sleep, pain, and various mental health conditions
- Conduct brief assessment and pain reduction interventions for patients with chronic pain and phantom limb pain
- Conduct Secondary TBI Evaluations and follow-up

Inpatient Psychiatric Unit (January, 2011 – April, 2011)

- Provide brief individual psychotherapy to psychiatrically hospitalized veterans
- Co-lead daily inpatient Interpersonal Process Group
- Participate in daily treatment team meetings
- Administer and interpret various formal cognitive screeners, neuropsychological assessments, and personality measures

Geriatric Clinic and Home Based Primary Care Clinic (April, 2011 – July, 2011)
- Administer and interpret formal cognitive assessments
- Provide home visit assessments and brief psychotherapy to patients with various medical and mental health conditions
- Provide brief psychotherapy regarding end of life issues to patients and families

Minor Rotations (6 months each)

Neuropsychological Assessment (August, 2010 – January, 2011)
- Provide neuropsychological assessments to patients with various medical and neurological conditions
- Participate in weekly neuropsychological case presentation and journal club
- Provide surgery and organ transplant evaluations

PTSD Clinic (January, 2011 – July, 2011)
- Conduct weekly PTSD diagnostic evaluations and diagnostic interviews
- Conduct individual Evidence Based Treatments (e.g., PE and CPT) to OEF/OIF, Desert Storm, and Vietnam Veterans
- Co-lead weekly "Insomnia and Nightmares" group

Informal Rotation

Rehabilitation Psychology (August, 2010 – December, 2010)
- Provide consultation services to Rehabilitation Unit staff
- Provide brief psychotherapy for re-adjustment, community re-entry, and behavior modifications to patients with varying degrees of stroke, neurodegenerative conditions, amputations, addiction, spinal cord injury, cardiac problems, etc.
- Provide psychoeducation to patients and family regarding recovery expectations
- Conduct neurocognitive assessments as needed and provided recommendations accordingly
- Participate in weekly PM&R team treatment planning

Brain Injury Rehabilitation Center, Progressive Rehabilitation Associates
Pre-internship: (September, 2009 – May, 2010)
Population: Adults with Mild, Moderate, and Severe Traumatic Brain Injuries
Supervisor: Alana Raber, PhD
Duties:
- Conduct clinical evaluations/intakes

- Provide individual and group psychotherapy
- Provide psychotherapy to patients and family members when necessary
- Provide biofeedback services
- Attend daily interdisciplinary clinical meetings

Supplemental Practicum for 08-10

On-Call Consultation Team, Providence Newberg Medical Center (July, 2008 – May, 2010)
Population: Children, Adolescents, and Adults
Supervisor(s): Clark Campbell, PhD/ABPP; Mary Peterson, PhD; William Buhrow, Jr. PsyD; Joel Gregor, PsyD
Duties:

- Provide 1 day (24 hours) behavioral health consultation services for emergency department, medical/surgical unit, and ICU
- Primary referral reasons include: suicide assessment, chronic pain, dementia, and mental status
- Medical chart review
- Consult with ED physicians and provide them with diagnosis and recommendations
- Assisted with development of new narcotic policy for chronic pain patients
- Conducted a program evaluation and presented the results to the medical staff

Mother Teresa Hospital, Tirana, Albania (August, 2009)
Population: Adults and Adolescents
Supervisor: Proff. Mentor Petrela, MD (Chief of Neurosurgery), Proff. Ilir Ohri, MD (Chief of Rehabilitation)
Duties:

- Provide brief psychological services to individuals (and their families) with moderate to severe TBIs, mental illnesses, and various psychological complaints
- Attended neurosurgery staff clinical presentations
- Consulted with physicians and provided psychological feedback
- Medical chart review

Practicum II: (May, 2008 – May, 2009)
Portland VA Medical Center, Portland, OR
Population: Veterans in Alaska, Oregon, Idaho, and Washington.
Supervisor: Adam Nelson, PhD
Duties:

- Conduct clinical evaluations/intakes
- Administer, score, and write reports of comprehensive neuropsychological assessment batteries
- Medical chart review in CPRS
- Provide feedback to veterans and families
- Attend bi-weekly neuropsychology staff clinical presentations

- Attend bi-weekly neuropsychology staff journal club

Practicum I: (August, 2007 – May, 2008)
Clark County Juvenile Center, Vancouver, WA
Population: Adjudicated Adolescents
Supervisors: Shirley Shen, PhD; Christine Krause, PsyD
Duties:

- Provide individual and group process psychotherapy
- Administer, score, and write comprehensive psychological assessments
- Provide feedback to family, probation officers, and multidisciplinary staff
- Consultation and case presentation with multidisciplinary mental health team

Pre-Practicum (January, 2006 – April, 2007)
George Fox University, Newberg, OR
Graduate Department of Clinical Psychology
Population: Adolescents and Adults
Supervisors: Clark Campbell, PhD; Scott Koeneman, MA
Duties:

- Provide individual psychotherapy
- Complete comprehensive psychological intake interviews and treatment plans
- Present cases to clinical team.

Depression Group Facilitator, Newberg, OR. (2006)
Depression Recovery presented by Neil Nedley, MD. An eight week, mental health education series on DVD using a practical workbook approach to individuals suffering with Depression.
Population: Adults
Supervisor: Tami Rodgers, MD
Duties:

- Facilitate group therapy
- Provide crisis intervention

University of Washington Autism Center, Seattle, WA
Therapy Assistant (2004 – 2005)
Population: Toddlers
Supervisor: Geraldine Dawson, PhD; Christina Whalen, PhD
Duties:

- In-home individual therapy to toddlers with Autism
- Create individual lesson plans
- Weekly supervision and case presentation

Current and Past Research Involvement

Research Vertical Team Member: (2007 – current)

George Fox University, Newberg, OR
Graduate Department of Clinical Psychology
Supervisor: Wayne Adams, PhD, ABPP/CL
Duties:

- Participated in a research team focusing in neuropsychology
- Attended bi monthly meetings discussing and evaluating issues pertaining to research design, methodology, procedures, analysis of dissertation, and supplemental research projects.

Dissertation Project: An Exploration of Self-Reported Neurological-Psychological Symptoms in an OEF/OIF Veterans Administration Polytrauma Clinic Sample: The project is a collaboration between George Fox University, Salt Lake City VA Medical Center, and Houston VA Medical Center. **E. Cocoli,** W. Adams, J. Romesser.

Portland Veteran Administration Medical Center, Portland, OR
Supplemental Research Practicum II: (2008 – 2009)
Population: Veterans in Alaska, Oregon, Idaho, and Washington.
Supervisor: Marilyn Huckans, PhD
Duties:

- Coordinate assessment, blood draws, and imaging technique (fMRI) schedules
- Administer structured intake interviews and neuropsychological measures
- Score neuropsychological measures
- Medical chart review in CPRS

Seattle Pacific University, Department of Psychology, Seattle, WA.
Women's Health Research – Research Assistant (2004 – 2005)
Population: College Students
Supervisor: M. Kathleen B. Lustyk, PhD
Duties:

- Study coordinator
- Participant recruitment
- Use of physiological equipment (Power Lab)
- Measure blood pressure, heart rate, and respiration in women before, during, and after an applied stressor (PASAT)
- Training and supervision of graduate and undergraduate assistants
- Manage data entry
- Data analysis
- Prepare poster conference presentations

Seattle Pacific University, Department of Psychology, Seattle, WA.

Needs Assessment of the Cowlitz Indian Nation – Independent Research (2002)
Population: Adults
Supervisor: Micheal D. Roe, PhD
Duties:

- Content Analysis
- Data entry
- Prepare paper for publication of limited circulation
    - Results published and presented to the Cowlitz Indian Nation, Longview, WA

Seattle Pacific University, Department of Psychology, Seattle, WA.
Developmental Psychology Laboratory – Research Assistant (2002 – 2004)
Population: Elementary School Children
Supervisor: Beverly J. Wilson, PhD
Duties:

- Conduct research assessments such as: WAIS-III, WISC-IV, Kusche, Forgiveness Questionnaire, Home Interview with Children, etc.
- Parent and teacher interviews and in-home visits
- Provide training for test administration to undergraduate and graduate students
- Provide supervision for undergraduate students
- Coordinate lab visits
- Data entry
- Content analysis
- Prepare posters for presentation

University of Washington, Department of Social Work, Seattle, WA.
Developmental Research Group – Research Assistant (2002 – 2004)
Population: Adults
Projects:

1. Social Development Research Group (SDRG)
2. Seattle Social Development Group (SSDP)
3. Intergenerational Project (TIP)
4. Raising Healthy Children (RHC)
5. International Youth Development Study (IYDS)

Duties:

- Study coordinator
- Conduct telephone interviews
- Participant follow-up

Academic Appointments

Clinical Presentation (November, 2010)
Salt Lake City VA Medical Center
Salt Lake City, UT
Psychology Department

- "Fish out of Water" – Non-traditional treatment methodologies for OEF/OIF veterans

Clinical Presentation (June, 2010)

TBI Program
Madigan Army Medical Center, Ft. Lewis, Tacoma, WA
- Medical practices in Albanian hospitals: Medication and psychotherapy compliance

Teacher Assistant/Senior Teacher Assistant: *Neuropsychological assessments: administration, scoring, and interpretation* (2009 –2010)
George Fox University, Newberg, OR
Duties:
- Leading labs/teaching multiple neuropsychological measures to clinical psychology doctoral students
- Evaluate students' performance on administration and scoring
- Assist students with test interpretations and conceptualizations
- Weekly supervision

Supervisor: Wayne Adams, PhD, ABPP/CL

Neuropsychological Assessment (3 credit graduate psychology course)

Guest Lecturer: *Multicultural considerations in therapy for culturally diverse populations* (2008)
George Fox University, Newberg, OR
Multicultural Psychotherapy (3 credit graduate psychology course)

Guest Lecturer: *Traumatic Brain Injury (*2008).
Chemeketa Community College, McMinnville, OR
General Psychology (5 credit undergraduate psychology course)

Guest Lecturer: *Adolescence – Biological Foundations and Puberty* (2008).
George Fox University, Newberg, OR
General Psychotherapy (5 credit undergraduate psychology course)

Teacher Assistant (2004 – 2005)
University of Washington Autism Center, Seattle, WA.
Population: Toddlers
Supervisor: Cheryl French, SLP
Duties:
- Organized activities for children with Pervasive-Developmental Disorders and Speech/Language delays
- Provide feedback to parents
- Weekly supervision and case presentations

University Involvement

Newsletter Editor (2007-2010)
George Fox University, Newberg, OR

Graduate Department of Clinical Psychology
Supervisor: Wayne Adams, PhD, ABPP/CL
Duties:

- Organize bi-yearly GDCP newsletter
- Gather information and prepare articles for the upcoming newsletter edition

Peer Mentor (2007-2010)
George Fox University, Newberg, OR
Graduate Department of Clinical Psychology
Duties:

- Mentored first year doctoral students in the Graduate Department of Clinical Psychology

Prospective Student Interviewer (2008-2009)
George Fox University, Newberg, OR
Graduate Department of Clinical Psychology
Duties:

- Interview prospective students
- Rate quality of student responses and provide opinion to faculty

Clinical Peer Supervisor (2009-2010)
George Fox University, Newberg, OR
Graduate Department of Clinical Psychology
Supervisor: Wayne Adams, PhD, ABPP/CL
Duties:

- Provide supplemental supervision to first and second year graduate students

Professional Presentations

M. Huckans, D. Lahna, D. Schwartz, A. Mitchell, H. Luber, D. Kriz, **E. Cocoli**, M. Kolessar, J. Loftis, & W. Hoffman (2009). White matter integrity and cognitive function during early recovery from methamphetamine abuse. American Academy of Clinical Neuropsychology, San Diego, CA.

K. C. Olson, M. K. B. Lustyk, **E. Cocoli**, A. E. Paschane (2005). The Relationship between Psychological and Physiological Stress Response in Women. American Psychological Association, Washington D.C.

M. K. B. Lustyk, Ph.D., **E. Cocoli**, K. Olson (2005). Can exercise habits explain gender differences in quality of life? Western Psychological Association, Portland, OR.

M. K. B. Lustyk, Ph.D., K. Worrell, K. C. Olson, **E. Cocoli**, A. E. Paschane (2005). Effect of Control on Premenstrual Symptomatology is Mediated by Stress. Western Psychological Association, Portland, OR.

S. Pickering, K. Peterson, M. Fuchs, H. Petaja-Benson, **E. Cocoli** (2004) Aggression, social information processing, and prosocial behavior in early elementary children: A longitudinal analysis, American Psychological Association, Honolulu, HI.

A. Leighty, **E. Cocoli**, V. Sandberg (2003) Social and emotional behavior in boys and girls: Equal but not the same, Washington State Psychological Association, Seattle, WA.

Publication of Limited Circulation

Roe, M. D., **Cocoli, E**., Fouts, R., Saeteurn, C., Sullivan, M., & Wellman, J. (2005). *Needs assessment of the Cowlitz Indian Nation, 2002 – 2005*. Technical report submitted to the Cowlitz Tribal Council, Longview, WA.

Professional Memberships and Licenses

American Psychological Association, Student Member
- Division 40 Neuropsychology, Student Member

National Academy of Neuropsychology, Student Member
National Honors Society in Psychology (Psi Chi), Student Member