

COMBAT & OPERATIONAL STRESS

Research Quarterly

RECENT PUBLICATIONS

The *Combat & Operational Stress Research Quarterly* is a compilation of recent research on combat and operational stress, including relevant findings on the etiology, course, and treatment of Posttraumatic Stress Disorder (PTSD). The intent of this publication is to facilitate translational research by providing busy clinicians with up-to-date findings, with potential to guide and inform evidenced-based treatment.

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ASSESSMENT AND TREATMENT

Hemodynamic responses of eye movement desensitization and reprocessing in posttraumatic stress disorder

Sample: Hospital outpatients and inpatients with PTSD
N= 13

Variables: PTSD symptoms, eye movement desensitization and reprocessing, oxygenated hemoglobin concentration in the lateral prefrontal cortex

KEY FINDINGS: Trauma-related recall with eye movements (EM), an integral part of eye movement desensitization and reprocessing (EMDR) treatment, was associated with a significant decrease in oxygenated hemoglobin concentration in the lateral prefrontal cortex (PFC) compared with recall without eye movements. The efficacy of EMDR may be explained by the reduction of lateral PFC over-activation during trauma-related recall with eye movements.

Summary and implications: Eye movement desensitization and reprocessing (EMDR) is a form of PTSD treatment thought to decrease the distress of the traumatic memory and reinforce positive cognition through quick eye movements during traumatic memory/positive thought recall. Several studies have used functional neuroimaging before and after EMDR treatment to understand the brain mechanisms underlying treatment effects, but no studies thus far have examined changes in brain function during an EMDR session. This study employed near-infrared spectroscopy (NIRS) to measure changes in brain function during EMDR by measuring regional cerebral blood volume in terms of oxygenated hemoglobin concentration. Thirteen hospital outpatients and inpatients with PTSD underwent a NIRS protocol during EMDR to evaluate the hemodynamic response to trauma-related recall and eye movements during recall. Trauma-related recall with concurrent eye movements led to a reduction in oxygenated hemoglobin concentration ([oxy-Hb]) in the lateral prefrontal cortex (PFC), indicating a reduction in lateral PFC over-activation, compared with trauma recall without eye movements. Post-treatment evaluation after several EMDR sessions demonstrated that [oxy-Hb] in the lateral PFC during trauma recall decreased compared with pre-treatment levels, and this decrease was correlated with clinical improvement in PTSD symptoms. These results suggest the efficacy of EMDR may be explained by the reduction of lateral PFC over-activation during trauma-related recall with eye movements.

Ohta ni, T., Matsuo, K., Kasai, K., Kato, T. & Kato, N. (2009). Hemodynamic responses of eye movement desensitization and reprocessing in posttraumatic stress disorder. *Neuroscience Research*, 65 (4), 375-83.

HEALTH AND FUNCTIONING

Suicidality and veterans with a history of traumatic brain injury: precipitating events, protective factors, and prevention strategies

Sample: Veterans with a history of both traumatic brain injury (TBI) and suicidal ideation or behavior

N= 13

Variables: TBI, suicidal ideation/behavior, suicidal risk/protective factors

KEY FINDINGS: Risk factors for suicidal ideation or behavior among veterans with a history of TBI include psychiatric and emotional disturbances, cognitive effects and loss-of-self following TBI. Protective factors noted were social support, religion/spirituality, a sense of purpose regarding the future and mental health care.

Summary and implications: Previous work has identified both military veterans and individuals with a history of TBI as being at increased risk for suicidal behavior. However, little research has focused on the precipitating and preventative factors of suicidal behavior among military veterans with a history of TBI. To better understand these factors, interviews were conducted with 13 veterans with a history of both TBI and clinically significant suicidal ideation or behavior. The interview gathered information on suicidal ideation, suicide prevention, social support, helpful resources for suicidal individuals with TBI and the effect of the military experience on suicide. The results showed that suicide risk factors common to this sample included loss-of-self post-TBI, cognitive deficits post-TBI and psychiatric and emotional disturbances, such as feelings of depression, worthlessness and feeling like a burden to others. Protective factors included a sense of purpose and hopefulness regarding the future, religion/spirituality, social support and mental health treatment. Means of improving care for suicidal individuals with TBI included greater education regarding available services and access to integrated treatment (more psychological services within TBI rehabilitation programs). Identification of these suicide risk/protective factors along with recommendations for treatment improvements aimed at suicide prevention could help facilitate best practices in assessment and treatment of veterans with a history of TBI.

Brenner, L.A., Homaifar, B.Y., Adler, L.E., Wolfman, J.H. & Kemp, J. (2009). Suicidality and veterans with a history of traumatic brain injury: precipitating events, protective factors, and prevention strategies. *Rehabilitation Psychology*, 54 (4), 390-397.

Risk and protective factors associated with suicidal ideation in veterans of Operations Enduring Freedom and Iraqi Freedom

Sample: Veterans who served in Operations Enduring and/or Iraqi Freedom (OEF/OIF) between 2003 and 2007

N= 272

Variables: Suicidal ideation, psychopathology, resilience, social support

KEY FINDINGS: Veterans who contemplated suicide were more likely to screen positive for PTSD, depression and alcohol abuse, and experienced more psychosocial difficulties, stigma and barriers to care. Suicidal ideation also was associated with lower resilience and social support.

Summary and implications: A significant proportion of OEF/OIF veterans are returning from their deployments with psychological problems that can increase the risk of suicide. However, little is known about the extent to which certain risk or protective factors can influence suicidal ideation in this population. This study aimed to provide a descriptive analysis of demographic, risk and protective correlates of suicide ideation in OEF/OIF veterans, and to determine which risk and protective variables are most strongly associated with suicidal ideation. A survey containing measures of psychopathology, resilience and social support was completed by 272 OEF/OIF veterans. Veterans who contemplated suicide were more likely to screen positive for PTSD, depression and alcohol problems, and experienced more psychosocial difficulties, stigma and barriers to care. Suicidal ideation was also associated with lower resilience and social support. Evaluating the factors together, multivariate regression analysis indicated that PTSD, depression and increased psychosocial difficulties were the factors most strongly linked to suicidal ideation, while increased post-deployment social support and a sense of purpose and control were the factors most protective against suicidal ideation. Interventions to promote psychological health and strengthen post-deployment social support and resilience may be helpful in preventing suicidal ideation among OEF/OIF veterans.

Pietrzak, R.H., Goldstein, M.B., Malley, J.C., Rivers, A.J., Johnson, D.C., & Southwick, S.M. (in press). Risk and protective factors associated with suicidal ideation in veterans of Operations Enduring Freedom and Iraqi Freedom. *Journal of Affective Disorders*.

Trauma, posttraumatic stress disorder, and physical illness: findings from the general population

Sample: General population individuals without trauma, with trauma but no PTSD, or trauma with PTSD

N= 3,171

Variables: Trauma exposure, PTSD, physical health conditions

KEY FINDINGS: PTSD is strongly associated with cardiovascular and pulmonary diseases; smaller associations also were found between trauma exposure and cardiovascular and pulmonary diseases.

Summary and implications: Both trauma exposure and PTSD have been linked to poor physical health. However, it is not known if PTSD mediates the relationship between trauma and physical illness, or if they each have separate effects on physical health. This study investigated the relationship of traumatic stress and PTSD with various medical conditions in a general population sample, controlling for several confounding factors. The 3,171 participants were categorized into the following groups: no trauma exposure (n=1,440), trauma but no PTSD (n=1,669) and trauma with PTSD (n=62). After adjusting for

potential confounding factors, participants with trauma history were more likely to have cardiovascular and pulmonary disorders compared with individuals without trauma history. Participants with PTSD were even more likely to have cardiovascular and pulmonary diseases than those with trauma exposure alone. Trauma exposure was uniquely associated with stroke, renal disease and arthritis, whereas PTSD was uniquely associated with liver and peripheral arterial diseases. Due to these unique associations and only a small decrease in the link between trauma and physical illness when PTSD is accounted for, the authors determined that the association between trauma and medical conditions is, at most, only partially mediated by PTSD. Due to the strong associations observed between PTSD and cardiovascular and pulmonary diseases (odds ratios, range = 2.4-3.4), these results suggest PTSD is an important determinant of physical health.

Spitzer, C., Barnow, S., Volzke, H., John, U., Freyberger, H.J. & Grabe, H.J. (2009). Trauma, posttraumatic stress disorder, and physical illness: findings from the general population. *Psychosomatic Medicine*, 71 (9), 1012-17.

PTSD onset and course following the World Trade Center disaster: findings and implications for future research

Sample: English- and Spanish-speaking adults living in New York City on the day of the World Trade Center disaster
N= 2,368

Variables: PTSD onset and progression, demographic, biological, psychosocial and environmental factors

KEY FINDINGS: The onset and course of PTSD is complex and appears to be influenced by pre-existing vulnerabilities and psychosocial and environmental factors, both related and unrelated to the traumatic event.

Summary and implications: Previous research on PTSD etiology and disease progression has been limited by numerous issues, including sample size and representativeness, length of follow-up and data collection measures. This study aimed to identify common risk factors associated with PTSD onset and course using a large community sample exposed to the 2001 World Trade Center disaster (WTC). One year after the event, baseline interviews (time 1) were conducted on 2,368 adults living in New York City during the WTC; follow-up interviews (time 2) were done one year after the baseline interviews. The results showed that, consistent with previous research, participants who were positive for any current PTSD at the baseline interview were more likely to be female, younger, have lower self-esteem, lower social support, higher WTC exposure, more lifetime traumatic events and a history of pre-WTC depression. Participants who were positive for any current PTSD at the follow-up interview were more likely to be Latino, non-native born, have lower self-esteem, more negative life events, more lifetime traumatic events and be ambidextrous. The authors classified participants as either resilient (no PTSD time 1 or 2), remitted (PTSD time 1, not 2), delayed (no PTSD time 1, but PTSD time 2) and persistent (PTSD both time 1 and 2). The results showed that remitted PTSD (from any trauma) participants were more likely than

resilient participants to be female, have more negative life events, have greater lifetime traumatic events and have pre-WTC depression. Delayed PTSD (from any trauma) participants were more likely to be Latino, be non-native born, have lower self-esteem, have more negative life events, have greater lifetime traumas and be ambidextrous. Persistent PTSD (from any trauma) participants were the only cases associated with greater WTC exposures and were more likely to have had a pre-WTC depression diagnosis. WTC-related PTSD examined at follow-up had a similar risk profile as any PTSD, except ambidexterity was no longer significant and WTC exposure was now significant for both remitted and persistent cases. The results suggest that changes in PTSD status over time and later onset PTSD are not simply due to minor fluctuations in symptom status, but also reflect the impact of other pre- and post-trauma psychosocial factors. The authors conclude that the onset and course of PTSD is complex and many factors appear to be associated with PTSD, including trauma exposure, individual predispositions and external factors not directly related to the original traumatic event.

Boscarino, J.A. & Adams, R.E. (2009). PTSD onset and course following the World Trade Center disaster: findings and implications for future research. *Social Psychiatry and Psychiatric Epidemiology*, 44 (10), 887-98.

Hospital admissions related to mental disorders in U.S. Army soldiers in Iraq and Afghanistan

Sample: U.S. Army soldiers deployed to Iraq and Afghanistan from September 2001 through December 2004
N= 473,964

Variables: Psychiatric hospitalizations, gender, age, rank, occupation

KEY FINDINGS: The most common psychiatric hospitalizations of soldiers deployed to Operation Iraqi Freedom and Operation Enduring Freedom (OIF/OEF) were due to mood, adjustment and anxiety disorders (including PTSD). Female soldiers, enlisted soldiers and those in combat units in Iraq were at increased risk for any mental disorder. Younger women had the highest incidence of suicide attempts or self-inflicted injuries.

Summary and implications: Previous research on the mental health of deployed OIF/OEF soldiers has been based primarily on self-report surveys given to non-random samples. This retrospective study examined deployment mental health by analyzing psychiatric hospitalizations of U.S. Army soldiers deployed to Iraq and Afghanistan between September 2001 and December 2004. The results showed that 1,948 hospitalizations (10%) of OIF/OEF deployed soldiers included a mental disorder diagnosis and 1,225 hospitalizations (6%) had a principal mental disorder diagnosis. Of the principal mental diagnoses, the most common were mood (29.7%), adjustment (30.8%) and anxiety disorders (9.7%). PTSD diagnoses comprised 4.8% of all principal psychiatric hospitalizations. Relative risks of mental disorder hospitalizations ranged from 1.6 to 3 for females compared with males and 2 to 6 for enlisted soldiers compared with officers. Soldiers younger than 20 years old had 30-60%

higher substance abuse disorder hospitalizations compared with older soldiers. Combat units in Iraq had a higher risk of any mental disorder compared with combat-support units. The highest incidence of attempted suicide/self-inflicted injuries occurred among younger women. This study supports the findings of several previous studies, and continued evaluation of mental disorder trends in OIF/OEF deployed troops is recommended.

Wojcik, B.E., Akhtaw, F.Z. & Hassell, L.H. (2009). Hospital admissions related to mental disorders in U.S. Army soldiers in Iraq and Afghanistan. *Military Medicine*, 174 (10), 1010-1018.

Postdeployment, self-reporting of mental health problems, and barriers to care

Sample: Active-duty Air Force members following deployment
N= 200

Variables: Mental health symptoms, gender, help-seeking behaviors

KEY FINDINGS: Service members with greater self-reported mental health symptoms were less likely to seek mental health treatment. Females were more likely than males to access mental health services.

Summary and implications: A significant number of troops serving in the current overseas wars return from deployment with PTSD symptoms, yet the service members most in need of mental health services are least likely to seek treatment, typically due to stigma issues. Stigma has been identified as a huge barrier to accessing mental health services in Marines and soldiers, but it has not been widely studied in the Air Force. This study attempted to better understand stigma in the Air Force by exploring the relationship between self-reported mental health symptoms and access to treatment in the Air Force, as well as the effect of gender on mental health symptoms and access to care. A retrospective record review and follow-up phone interview were conducted on a sample of 200 Air Force members who had completed the Post-Deployment Health Reassessment Program (PDHRA) questionnaire following deployments from December 2005 to June 2006. Analysis of the sample data showed that as the reported rate of mental health symptoms increased, the rate of accessing treatment decreased. Additionally, although a greater proportion of males reported that their mental health symptoms increased post-deployment, females were more likely than males to receive assistance for mental health problems (26% vs. 10%). There was a significant gender difference between reporting needing assistance and actually accessing services. Stigma appeared to play a large role in this phenomenon, with 40% of men reporting feeling hesitant or uncomfortable accessing mental health services compared with only 6% of women. These findings support previous findings regarding stigma and accessing care among other service branches, and further efforts are needed to make mental health care less stigmatized and more accessible to service members.

Visco, R. (2009). Postdeployment, self-reporting of mental health problems, and barriers to care. *Perspectives in Psychiatric Care*, 45 (4), 240-53.

Mental Health Diagnoses and Utilization of VA Non-Mental Health Medical Services Among Returning Iraq and Afghanistan Veterans

Sample: Veterans of Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) newly utilizing VA healthcare between October 2001 and March 2007
N= 249,440

Variables: PTSD, mental disorders, non-mental health care utilization

KEY FINDINGS: Veterans with PTSD had 91% higher non-mental health care utilization, and those with mental disorders other than PTSD had 55% higher utilization compared with veterans without mental disorders. Mental health status, lower rank, older age, active duty status and female gender were associated with the greatest increases in utilization.

Summary and implications: An increasing number of OEF/OIF veterans are being diagnosed with PTSD and other mental disorders. Recognition of this has led to an effort to expand VA mental health services, but less is known to determine whether non-mental health services should also be expanded to accommodate this population, given that mental disorders, particularly PTSD, are associated with higher rates of physical illness. This study utilized data on 249,440 returning OEF/OIF veterans who were new users of VA healthcare between October 2001 and March 2007 to examine the association of PTSD and other mental disorders with non-mental health service utilization. Of this population, 21.5% had been diagnosed with PTSD, 15.2% had a mental health diagnosis not including PTSD and 63.3% had no mental health diagnosis. Over the study period, total outpatient utilization of non-mental health services was 55% higher in veterans with mental disorders other than PTSD and 91% higher in veterans with PTSD compared with those with no mental health diagnoses. A mental health diagnosis, especially PTSD, was most strongly predictive of higher service utilization, as were demographic characteristics to a lesser extent, including female gender, older age, active duty status and lower rank. These findings could be used to guide resource allocation to ensure the medical needs of our returning veterans are met.

Cohen, B.E., Gima, K., Bertenthal, D., Kim, S., Marmar, C.R. & Seal, K.H. (2009). Mental Health Diagnoses and Utilization of VA Non-Mental Health Medical Services Among Returning Iraq and Afghanistan Veterans. *Journal of General Internal Medicine*, 25 (1), 18-24.

PSYCHO-BIO

Ethnic differences in posttraumatic distress: Hispanics' symptoms differ in kind and degree

Sample: Hispanic and non-Hispanic adult physical trauma survivors

N= 677

Variables: PTSD symptoms, ethnicity

KEY FINDINGS: Hispanics reported greater overall PTSD symptom severity compared with non-Hispanic Caucasians, but the size of this effect varied by symptom. Hispanics tended to report greater symptoms of intensified cognitive or sensory perceptions (hypervigilance, flashbacks), but not symptoms of impaired psychological functioning (difficulty concentrating or sleeping).

Summary and implications: Several studies have suggested that Hispanics endorse more severe PTSD symptoms compared with non-Hispanic Caucasians. However, most of this research has focused on PTSD symptoms overall, and no studies yet have investigated the nature or scope of differences at the individual PTSD symptom level. Investigating ethnic differences in individual PTSD symptoms may provide support for the hypotheses of why such an ethnic disparity exists. Adult physical trauma survivors (N=677) were assessed with the PTSD Symptom Checklist-Civilian (PCL-C) within days of trauma exposure and again at six and 12 months post-trauma. Results indicated that Hispanics reported greater overall PTSD symptom severity compared with non-Hispanic Caucasians, but this effect varied by each individual symptom. Hispanics tended to report greater symptoms of intensified cognitive or sensory perceptions (hypervigilance, flashbacks), but not symptoms of impaired psychological functioning (difficulty concentrating or sleeping). These findings suggest that the PTSD symptoms endorsed by Hispanics are not only more severe overall, but also differ according to symptom type. Given that this study does not support an existing hypothesis explaining the ethnic disparity, more research is needed to elucidate the underlying origins of Hispanic differences in post-traumatic distress.

Marshall, G.N., Schell, T.L. & Miles, J.N. (2009). Ethnic differences in posttraumatic distress: Hispanics' symptoms differ in kind and degree. *Journal of Consulting and Clinical Psychology*, 77 (6), 1169-78.

Substantial reduction of naïve and regulatory T cells following traumatic stress

Sample: Individuals with war-related PTSD, trauma-exposed controls without PTSD and controls with little to no trauma exposure

N= 46

Variables: PTSD, trauma exposure, peripheral T cell lymphocyte subpopulations

KEY FINDINGS: Several peripheral T cell differences were observed among PTSD-positive individuals, including a reduction in naïve T cells and regulatory T cells, and an increase

in certain memory T cells, compared with non-PTSD individuals. These stress-related changes of the peripheral T cell pool could be a significant factor in the enhanced susceptibility of individuals with PTSD to various physical illnesses.

Summary and implications: Traumatic stress and PTSD have been associated with a higher risk for physical disorders, including cardiovascular, respiratory, gastrointestinal, musculoskeletal, inflammatory and autoimmune disorders. The mechanisms underlying this link are not yet defined, but may be related to changes in the composition or responsiveness of the peripheral T cell subpopulations, which has been implicated in a variety of immunological disorders. The distribution of peripheral T cell lymphocyte subsets was examined in 19 individuals with chronic and severe PTSD, 14 individuals with substantial trauma exposure but without PTSD, and 13 individuals with little to no trauma exposure and no PTSD. Several peripheral T cell differences were observed among PTSD-positive individuals, including a reduction in naïve T cells and regulatory T cells, and an increase in certain memory T cells compared with non-PTSD individuals. The reduction in naïve and increase in memory T cells was observed to a smaller extent in trauma-exposed non-PTSD individuals. Functionally, these changes were accompanied by enhanced proliferation of antibody-stimulated T cells among PTSD-positive individuals. These alterations in T cell populations are correlated in the literature with an enhanced susceptibility to infectious, inflammatory and autoimmune diseases. These stress-related changes of the peripheral T cell pool could be a significant factor in the enhanced susceptibility of individuals with PTSD to various physical illnesses, and effective treatment for PTSD may improve immune function and reduce physical ailments in these individuals.

Sommershof, A., Aichinger, H., Engler, H., Adenauer, H., Catani, C., Boneberg, E.M., et al. (2009). Substantial reduction of naïve and regulatory T cells following traumatic stress. *Brain, Behavior, and Immunity*, 23 (8), 1117-24.

Associations among pain, PTSD, mTBI, and heart rate variability in veterans of Operation Enduring and Iraqi Freedom: a pilot study

Sample: Veterans of Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF)

N= 28

Variables: PTSD, mild traumatic brain injury (mTBI), heart rate variability, pain ratings

KEY FINDINGS: OEF/OIF veterans had significantly lower heart rate variability (HRV) than available normative data, suggesting they may have dysregulated autonomic nervous systems. Over half of the sample reported having pain, PTSD or mTBI; 36% reported having all three conditions. Pain and the combination of pain, PTSD and mTBI were associated with reduced HRV.

Summary and implications: A significant proportion of OEF/OIF veterans develop PTSD following deployment, and the condition is often co-morbid with chronic pain and/or mild traumatic brain injury (mTBI). One potential mechanism in the

development and maintenance of PTSD is dysregulation of the autonomic nervous system (ANS), reflected by high hyperarousal and low parasympathetic activity, the branch of the ANS that normally allows the body to rest and relax. Heart rate variability (HRV) has often been used as an indicator of ANS dysregulation; high HRV has been associated with a greater ability to regulate or resist stress, while low HRV has been associated with psychological disorders, cardiac complications and mortality. Limited research has identified associations between ANS dysregulation/HRV and pain, PTSD or TBI, but the effect of all three conditions combined on ANS has not been investigated. Twenty-eight OEF/OIF veterans recruited from a polytrauma center were assessed for pain, PTSD and mTBI, as well as HRV. The sample of veterans had much lower HRV than available normative data. Over half of the sample reported having pain, PTSD or mTBI; 36% reported having all three conditions. Pain and the combination of pain, PTSD and mTBI were associated with reduced HRV. These findings suggest that many OEF/OIF veterans with polytrauma display compromised ANS function, and ANS dysregulation may contribute to or be the result of co-morbid pain, PTSD and mTBI.

Tan, G., Fink, B., Dao, T.K., Hebert, R., Farmer, L.S., Sanders, A., et al. (2009). Associations among pain, PTSD, mTBI, and heart rate variability in veterans of Operation Enduring and Iraqi Freedom: a pilot study. *Pain Medicine, 10* (7), 1237-45.

BRAIN AND COGNITION

Post-traumatic amnesia and the nature of post-traumatic stress disorder after mild traumatic brain injury

Sample: Survivors of traumatic injury with or without mild traumatic brain injury

N= 1,167

Variables: PTSD, mild traumatic brain injury (mTBI), post-traumatic amnesia

KEY FINDINGS: At three-month follow-up, more patients with mTBI met criteria for PTSD than patients without TBI (11.8% vs. 7.5%). Longer post-traumatic amnesia was associated with less severe intrusive memories in the immediate aftermath of the traumatic injury.

Summary and implications: There is increasing evidence that mild traumatic brain injury (mTBI) increases the risk of developing PTSD, possibly due to impaired functioning of damaged neural networks implicated in PTSD, or impairment of cognitive resources used to adapt and cope with psychological trauma. In contrast, impaired memory for the event, which can occur in mTBI, may be protective against developing PTSD. This study examined the prevalence and nature of PTSD following mTBI and the relationship between PTSD symptoms and posttraumatic amnesia. Assessments for mTBI, PTSD symptoms and post-traumatic amnesia were conducted on 1,167 survivors of traumatic injury during hospitalization. A follow-up PTSD assessment was conducted three months later. The results showed that at follow-up, 90 (9.4%) patients met criteria for PTSD. mTBI patients were significantly more likely to develop

PTSD than patients without TBI after controlling for injury severity. Longer post-traumatic amnesia was associated with less severe intrusive memories at the initial assessment, but not the follow-up assessment. These findings suggest that PTSD may be more likely following mTBI and that longer post-traumatic loss of memory appears to be protective against intrusive memories in the immediate aftermath of trauma, but not indefinitely.

Bryant, R.A., Creamer, M., O'Donnell, M., Silove, D., Clark, C.R. & McFarlane, A.C. (2009). Post-traumatic amnesia and the nature of post-traumatic stress disorder after mild traumatic brain injury. *Journal of the International Neuropsychological Society, 15* (6), 862-867.

Smaller global and regional cortical volume in combat-related posttraumatic stress disorder

Sample: Combat-exposed Vietnam and Persian Gulf War veterans

N= 97

Variables: PTSD, cerebral cortical volume

KEY FINDINGS: Combat-related PTSD was associated with smaller cerebral cortical volume, thickness and area. The association between PTSD and smaller cortical volumes was especially pronounced in the parahippocampal gyrus, superior temporal cortex, lateral orbital frontal cortex and pars orbitalis of the inferior frontal gyrus, which may have implications for how PTSD patients interpret and relate to civilian environments post-trauma.

Summary and implications: Adult PTSD has been associated with smaller total brain volume in only one study, although numerous studies have found associations with smaller hippocampal and anterior cingulate cortical volumes. Given the known associations between PTSD and IQ, and between IQ and brain volume, an association between PTSD and total brain volume could reasonably be expected. Veterans of the Vietnam and Persian Gulf wars, either with combat-related PTSD (n=50) or without PTSD (n=47) were analyzed using structural neuroimaging to measure global and regional cerebral cortical volumes. Combat-related PTSD was associated with smaller cerebral cortical volume, thickness and area. However, the cortical structure variables analyzed did not mediate the relationship between intelligence and PTSD. The association between PTSD and smaller cortical volumes was especially pronounced in the parahippocampal gyrus, superior temporal cortex, lateral orbital frontal cortex and pars orbitalis of the inferior frontal gyrus. These regions are involved in facilitating the identification of objects and words. These findings suggest that individuals with chronic severe combat-related PTSD may have difficulty in relearning and interpreting civilian physical and social environments post-trauma.

Woodward, S.H., Schaer, M., Kaloupek, D.G., Cediell, L. & Eliez, S. (2009). Smaller global and regional cortical volume in combat-related posttraumatic stress disorder. *Archives of General Psychiatry, 66* (12), 1373-82.

Understanding the relationship between posttraumatic stress disorder and trauma cognitions: The impact of thought control strategies

Sample: Individuals who had experienced a serious motor vehicle accident (MVA) and were seeking mental health evaluation at a university-based clinic

N= 295

Variables: PTSD, dysfunctional beliefs, thought control strategies (worry, self-punishment, social control, reappraisal, distraction)

KEY FINDINGS: Worry and self-punishment are maladaptive thought control strategies that are linked to greater levels of PTSD symptoms and dysfunctional trauma beliefs. Social control and distraction appeared to be adaptive strategies, associating with lower levels of PTSD and dysfunctional trauma cognitions. Reappraisal showed no relationship with PTSD severity.

Summary and implications: Dysfunctional beliefs are thought to play a central role in the maintenance of PTSD. Negative thought control strategies, such as worry and self-punishment, have also been associated with PTSD, but research has yet to determine if thought control strategies may mediate the relationship between PTSD and dysfunctional trauma beliefs. This study aimed to examine whether specific thought control strategies intervene in the relationship between PTSD symptoms and negative post-trauma cognitions. Participants who had experienced a serious MVA were assessed for PTSD, thought control strategies and dysfunctional trauma-related cognitions. The results showed that worry and self-punishment are maladaptive thought control strategies that were associated with greater levels of PTSD symptoms and trauma cognitions, contributing to the maintenance of PTSD. Social control and distraction were shown to be adaptive strategies, associating with lower levels of PTSD and trauma cognitions. Worry, self-punishment, social control and distraction all partially accounted for the relationship between PTSD and trauma cognitions. The adaptive thought control strategy of reappraisal showed no relationship with PTSD severity, suggesting that rationally analyzing a traumatic event may have little impact on PTSD severity. These findings emphasize thought control strategies as potential maintenance factors that may impact the prevalence and course of PTSD.

Bennett, S.A., Beck, J.G. & Clapp, J.D. (2009). Understanding the relationship between posttraumatic stress disorder and trauma cognitions: The impact of thought control strategies. *Behaviour Research and Therapy*, 47 (12), 1018-1023.

Long-term psychiatric outcomes following traumatic brain injury: a review of the literature

Sample: Individuals with traumatic brain injury (TBI)

Variables: TBI, long-term psychiatric health outcomes

KEY FINDINGS: TBI is associated with a range of psychiatric disorders among individuals at least six months post-injury, including PTSD in military populations.

Summary and implications: Traumatic brain injury (TBI) is a major health problem in the United States, with about 230,000 TBI survivors experiencing long-term disability each year, including psychiatric disorders. This review of the literature was conducted to determine the relationship between TBI and long-term psychiatric outcomes occurring at least six months post-TBI. All severity levels of TBI were analyzed for associations with psychiatric outcomes if relevant studies were available; results stating associations with TBI include all severities unless otherwise noted. After analyzing approximately 350 peer-reviewed studies, the authors determined there was sufficient evidence of an association between TBI and both depression and aggressive behavior. There was also suggestive evidence of associations between TBI and completed suicide, PTSD in military populations (only for mild TBI), psychosis (only for moderate and severe TBI) and decreased drug and alcohol use. TBI is associated with several psychiatric disorders among individuals surviving at least six months post-injury, and recognition and treatment of such co-morbidity is necessary to reduce the burden of TBI disability.

Hesdorffer, D.C., Rauch, S.L. & Tamminga, C.A. (2009). Long-term psychiatric outcomes following traumatic brain injury: a review of the literature. *The Journal of Head Trauma Rehabilitation*, 24 (6), 452-59.

Comparison of immediate-onset and delayed-onset posttraumatic stress disorder in military veterans

Sample: United Kingdom veterans receiving a war pension for PTSD or physical disability

N= 142

Variables: Immediate- vs. delayed-onset PTSD, life stressors, trauma exposure, PTSD symptoms, other psychological disorders

KEY FINDINGS: The delayed-onset PTSD group showed a more gradual accumulation of PTSD symptoms from previous traumas than the immediate-onset group, often beginning before the main traumatic event. The delayed-onset group was also more likely to report major depressive disorder and alcohol abuse prior to onset and was more likely to report a severe life stressor in the year before onset.

Summary and implications: Delayed-onset PTSD, defined as occurring when onset is more than six months after a traumatic event, accounts for nearly 40% of military PTSD cases. However, the validity of this diagnosis remains in question due to the lack of information on how the presentation and etiology of delayed-onset PTSD differs from immediate-onset PTSD. The aim of this study was to examine differences in symptoms, trauma exposure, dissociative and emotional reactions to trauma and subsequent life stress in veterans reporting immediate- or delayed-onset PTSD. Retrospective interviews were used to assess 142 United Kingdom war veterans receiving a war pension for PTSD or physical disability. The delayed-onset group differed from the immediate-onset group by displaying a gradual accumulation of PTSD symptoms that stemmed from earlier traumas separate from the subsequent main traumatic event and current PTSD. Many of the individuals with delayed-

onset PTSD (44%) displayed sub-threshold PTSD symptoms prior to the main service-related trauma and as a group were more symptomatic than those with immediate-onset PTSD by the time their main trauma occurred. Both groups were similar in terms of severity at onset, type of symptoms, number of current PTSD cases and described amounts of trauma exposure. However, the delayed-onset group reported significantly less peritraumatic dissociation, anger and shame at the time of trauma and was more likely than veterans with no PTSD to report a severe life stressor in the year before PTSD onset. The delayed-onset group appeared to have been better able to contain or inhibit thoughts and memories of the main trauma, which may have comprised an additional form of stress. The delayed-onset group was also more likely than the immediate-onset group to report other stress-related disorders, such as major depressive disorder and alcohol abuse, prior to PTSD onset. The findings suggest that delayed-onset PTSD involves a progressive failure to adapt to continued stress exposure such that symptomatic veterans are in a weakened state post-trauma, and additional stressors experienced can eventually result in the emergence of full-blown PTSD.

Andrews, B., Brewin, C.R., Stewart, L., Philpott, R. & Hejdenberg, J. (2009). Comparison of immediate-onset and delayed-onset posttraumatic stress disorder in military veterans. *Journal of Abnormal Psychology, 118* (4), 767-777.

Temporal allocation of attention toward threat in individuals with posttraumatic stress symptoms

Sample: Individuals with PTSD symptoms, trauma-exposed individuals without PTSD symptoms and non-anxious controls
N= 44

Variables: PTSD, trauma exposure, target detection and processing

KEY FINDINGS: Individuals with PTSD were significantly more accurate in detecting a neutral target presented quickly after threat-related stimuli compared with the target following neutral stimuli. This suggests that individuals with PTSD may process trauma-related information more efficiently than neutral information.

Summary and implications: Previous research indicates that individuals with PTSD selectively pay more attention to threatening stimuli compared with neutral stimuli. However, little research has studied the temporal stream of attentional processing in PTSD (i.e., how a continuous string of stimuli, much like that encountered in daily life, is processed). A rapid serial visual presentation paradigm (RSVP) computer task was used to examine temporal allocation of attention to threat-related and neutral stimuli in individuals with PTSD symptoms (n=15), trauma-exposed individuals without PTSD symptoms (n=14) and non-anxious controls without trauma exposure (n=15). Individuals were asked in the single task to indicate whether a neutral or “threat” target word appeared on-screen. In the dual task, they were asked to first identify whether the target word presented was a threat or neutral word, and then indicate whether a specific neutral target word was presented after the first target word. Individuals with high levels of PTSD symptoms were more accurate at detecting a neutral stimulus word presented 300 or 500 ms after a trauma-related word compared with the neutral word following another neutral word. These findings suggest that individuals with PTSD may process threat-related stimuli more rapidly and efficiently than neutral stimuli. This conclusion is consistent with cognitive theories of anxiety that implicate preferential processing of threat-related information in the maintenance of PTSD.

Amir, N., Taylor, C.T., Bomyea, J.A. & Badour, C.L. (2009). Temporal allocation of attention toward threat in individuals with posttraumatic stress symptoms. *Journal of Anxiety Disorders, 23* (8), 1080-85.

