



UNDER SECRETARY OF DEFENSE  
4000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-4000

PERSONNEL AND  
READINESS

JUN 18 2013

The Honorable Carl Levin  
Chairman  
Committee on Armed Services  
United States Senate  
Washington, DC 20510

Dear Mr. Chairman:

The enclosed report responds to section 721 of the National Defense Authorization Act for Fiscal Year 2007 that requires the Secretary of Defense submit the results of a 15-year longitudinal study on the effects of traumatic brain injury (TBI) incurred by members of the Armed Forces in Operation IRAQI FREEDOM and Operation ENDURING FREEDOM. Congress directed that reports be submitted every third, seventh, eleventh, and fifteenth years of the study. The study commenced in 2011, following a 2-year period of review by the Institutional Review Board. This report provides an overview of the first 3 years of the 15-year study, with the next report (7-year update) to be submitted in 2017.

The report reveals that a high proportion of Service members who sustain mild, moderate, and severe TBIs continue to report significant symptoms and problems within the first 5 years post-injury, requiring continued care and support. Annual Service member evaluations included as part of the study will allow the Department of Defense to determine the trajectory of ongoing symptom complaints and the type of health care, mental health care, and rehabilitation services needed to address ongoing symptoms after the completion of inpatient treatment.

A similar letter is being sent to the Chairpersons of the other congressional defense committees. Thank you for your interest in the health and well-being of our Service members, veterans, and their families.

Sincerely,

  
Jessica L. Wright  
Acting

Enclosure:  
As stated

cc:  
The Honorable James M. Inhofe  
Ranking Member



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WASHINGTON, DC 20301-4000

PERSONNEL AND  
READINESS

JUN 18 2013

The Honorable Howard P. "Buck" McKeon  
Chairman  
Committee on Armed Services  
U.S. House of Representatives  
Washington, DC 20515


Dear Mr. Chairman:

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Sincerely,

  
Jessica L. Wright  
Acting

Enclosure:  
As stated

cc:  
The Honorable Adam Smith  
Ranking Member



UNDER SECRETARY OF DEFENSE

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WASHINGTON, DC 20301-4000

PERSONNEL AND  
READINESS

JUN 18 2013

The Honorable Barbara A. Mikulski  
Chairwoman  
Committee on Appropriations  
United States Senate  
Washington, DC 20510

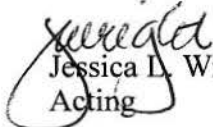
Dear Madam Chairwoman:

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Jessica L. Wright  
Acting

Enclosure:  
As stated

cc:  
The Honorable Richard C. Shelby  
Vice Chairman



UNDER SECRETARY OF DEFENSE

4000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-4000

PERSONNEL AND  
READINESS

JUN 18 2013

The Honorable Harold Rogers  
Chairman  
Committee on Appropriations  
U.S. House of Representatives  
Washington, DC 20515

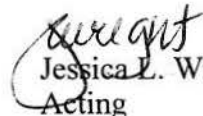
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Sincerely,

  
Jessica L. Wright  
Acting

Enclosure:  
As stated

cc:  
The Honorable Nita M. Lowey  
Ranking Member

# **REPORT TO CONGRESS**

**National Defense Authorization Act for Fiscal Year 2007,  
Section 721**

**3-Year Update**

**Longitudinal Study on Traumatic Brain Injury Incurred  
by Members of the Armed Forces in Operation IRAQI  
FREEDOM and Operation ENDURING FREEDOM  
“The 15-Year Studies”**



**March 2013**

The estimated cost of report or study for the Department of Defense is approximately \$3,650 in Fiscal Years 2012 - 2013. This includes \$0 in expenses and \$3,650 in DoD labor.

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(Please note that costs are for 3-year report production only. The final cost estimate that will be provided with the 15-year update will include all costs associated with the study)

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## Executive Summary

### KEY MESSAGES

- The Department of Defense (DoD) submits this report in accordance with the John Warner National Defense Authorization Act for Fiscal Year 2007, section 721, which directs the DoD to conduct a longitudinal study on the effects of Traumatic Brain Injury (TBI) incurred by members of the Armed Forces in Operation IRAQI FREEDOM (OIF) and Operation ENDURING FREEDOM (OEF).
- Congress directed that the study be conducted for a period of 15 years, with reports submitted to Congress every third, seventh, eleventh, and fifteenth years of the study. This comprehensive report provides an overview of the first three years of the “15-Year Studies.”
- The study is comprised of an integrated collection of three research sub-studies developed to respond to the congressional mandate — to date, the study has driven the completion of 24 research projects resulting in 11 publications and 24 scientific conference presentations.

### KEY POINTS

- Data analysis thus far reveals that a high proportion of Service members who sustain mild, moderate, and severe TBIs continue to report significant symptoms and problems within the first five years post-injury, requiring continued care and support. In addition, the diagnosis of Post-Concussion Syndrome (PCS) — an impairment of cognitive functioning that occurs as a result of TBI with symptoms that can last at least three months — is complicated. There are many factors that can cause, maintain, or mimic self-reported PCS symptoms (cognitive, physical, and behavioral); as a result, clinicians cannot assume that presence of post-concussion symptoms is indicative of PCS.
- Annual Service member evaluations included as part of this study will assess overall health status, medical status, mental health status, and a wide range of information regarding health-related quality of life. These data will allow the DoD to determine the trajectory of ongoing symptom complaints, and the type of health care, mental health care, and rehabilitation services needed to address ongoing symptoms after the completion of inpatient treatment.
- The DoD is currently collecting information on annual health care utilization, as well as access and barriers to health care and mental health services. The Department leverages existing large-scale government health care databases to determine the health care utilization of all injured Service members (not just those Service members enrolled in the study). The DoD also utilizes these databases to determine the type and availability of community-based and in-home rehabilitation programs and services for Service members by region, and to identify gaps in services.
- A sub-study is underway to assess the effect on family members of a Service member sustaining a TBI. By year five of the study, the DoD will have outcome data on caregivers' employment and financial status, and a multi-dimensional assessment of caregiver health-related quality of life (for example, anxiety, depression, self-evaluation, anger, and emotional and physical health).



## DoD POSITION/IMPACT

- The DoD designed all research studies comprising the “15-Year Studies” to address elements of the congressional mandate; all studies have received Institutional Review Board (IRB) approval. In addition, the Department has effectively developed research infrastructure and procedures in order to carry out these studies.
- While it is too early to draw recommendations from the longitudinal portion of the study, the structure of the ongoing study will allow for a significant contribution to the DoD’s understanding of the effects of TBI on Service members and their families.

## Study Overview

The John Warner National Defense Authorization Act for Fiscal Year 2007, section 721, directs the Secretary of Defense to “conduct a longitudinal study on the effects of traumatic brain injury incurred by members of the Armed Forces serving in Operation Iraqi Freedom or Operation Enduring Freedom on the members who incur such an injury and their families.” Congress directed that the study be conducted for a period of 15 years, with reports to Congress every third, seventh, eleventh, and fifteenth years of the study. In 2009, the Defense and Veterans Brain Injury Center (DVBIC), a component center of the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE), was charged with addressing this congressional mandate. This report provides an overview of the first three years of the “15-Year Studies.”

To most efficiently address the congressional mandate, the DoD divided the study into three sub-studies, each designed to address specific subsets of Service members and their families. The three components are: (1) the Natural History Study (Comprehensive Pathway and Brief Pathway); (2) the Caregiver Study; and (3) Archival Studies.

- (1) **Natural History Study (Comprehensive Pathway and Brief Pathway):** The Natural History Study addresses the long-term physical and mental health effects of TBI incurred by members of the Armed Forces during service in OIF/OEF. The study’s purpose is to: (a) document the natural recovery from TBI for up to 15 years post-injury; and (b) identify the long-term health care, mental health care, and rehabilitation needs of Service members that sustained a TBI. This portion of the overall study includes components to assess patient and family member perception of DoD and Department of Veterans Affairs (VA) care programs, and which programs individuals are accessing.
- (2) **Caregiver Study:** The Caregiver Study addresses the effects of injury on family members. This study’s purpose is to: (a) conduct a longitudinal study of the effects on the overall health and well-being of family members caring for a Service member with a TBI; (b) identify the types of health care and social services needed to foster better caregiver psychological and physical health, social well-being, and resilience; and (c) develop and validate a meaningful and relevant measure of health-related quality of life (QOL) for caregivers of a Service member with a TBI – the “TBI-CareQOL.”



- (3) **Archival Studies:** To help address elements of this congressional mandate and understand the effects of TBI incurred by members of the Armed Forces prior to 2008, investigators are analyzing data from previous studies conducted at Walter Reed Army Medical Center (WRAMC) and Walter Reed National Military Medical Center (WRNMMC). The purpose of this collection of studies is to examine acute and chronic outcomes from TBI in Service members evaluated at WRAMC/WRNMMC using data collected during routine clinical evaluations.

## Study Outcomes

To address the large scope of the congressional mandate, the DoD established collaborations and partnerships with multiple institutions from both military and civilian settings (that is, DVBIC network; Center for Neuroscience and Regenerative Medicine at the Uniformed Services University of the Health Sciences; National Institutes of Health; National Intrepid Center of Excellence; University of Michigan; Northwestern University; Texas Institute for Rehabilitation and Research Memorial Hermann; and Kessler Foundation). In addition, as the VA is expected to be the primary beneficiary of the report's findings over time, VA clinicians and researchers will be partners in the conduct of the study, its dissemination, and interpretation. As the study may require legislative, programmatic, or administrative modifications or changes to improve long-term care and rehabilitation programs for Service members who have sustained TBIs, the DoD proposes the formation of a programmatic council composed of DoD researchers involved in these studies, their VA counterparts, and others deemed necessary by the Secretaries of Veterans Affairs and Defense. The DoD estimates that details of this council, including a draft charter, will be completed over the next year with the approval of all interested parties.

Below is a brief summary of the key findings and possible implications of the 15-Year Studies thus far:

- A high proportion of Service members who sustain mild, moderate, and severe TBIs continue to report significant symptoms and problems within the first five years post-injury, therefore requiring continued care and support.
- Symptoms reported in the acute recovery phase following TBI are not reliably predictive of long-term post-concussion symptoms, Post Traumatic Stress Disorder (PTSD), or health-related quality of life after TBI.
- The presence of depression, traumatic stress, or both, is strongly associated with post-concussion symptom reporting following mild TBI.
- Neurocognitive or psychological outcome was not associated with: (a) TBI severity following mild to moderate TBI; or (b) TBI resulting from blast versus non-blast mechanism of injury.

## Conclusion

- The diagnosis of PCS is complicated. Clinicians cannot assume that presence of post-concussion symptoms is indicative of PCS. There are many factors that can cause, maintain, or mimic self-reported PCS symptoms; PCS is best considered a diagnosis of exclusion.
- Extended follow-up for all Service members who sustain a combat-related mild TBI with Polytrauma should be offered, regardless of the etiology of the symptoms reported or the presence/absence of symptoms within the first few months post-injury.

- The severity of TBI, or the mechanism by which a person sustained a TBI, should not be used as the primary variable to guide treatment. Clinicians should treat the presenting symptoms, rather than the cause of the symptoms.

## **APPENDIX A “The 15-Year Studies”**

### **OVERVIEW OF THE “15-YEAR STUDIES”**

The title “15-Year Studies” refers to an integrated collection of research studies designed to address section 721 of the John Warner National Defense Authorization Act for Fiscal Year 2007.

The 15-Year Studies focus on three broad areas designed to examine outcome from TBI in Service members and veterans, as well as its effect on their caregivers and family members.

These studies include:

- (1) **Natural History Study** (Comprehensive Pathway and Brief Pathway). Data collected from this study will inform elements 1, 2, and 3 of the congressional mandate.
- (2) **Caregiver Study**. Data from this study will inform element 4 of the congressional mandate.
- (3) **Archival Studies**. Data from these studies will inform elements 1, 2, and 3 of the congressional mandate.

Below is a brief description of these studies, as well as status updates on their current progress:

#### **(1) Natural History Study:**

The Natural History Study is the centerpiece of the 15-Year Studies. Through direct examination of a variety of Service members, the DoD expects to document the natural recovery from TBI for up to 15-years post-injury, and to identify the long-term health care, mental health care, and rehabilitation needs of Service members who sustained a TBI. This is accomplished through two pathways. The “Comprehensive Pathway” involves comprehensive examination of Service members using sophisticated neuroimaging, physical and cognitive examinations, blood-borne markers of injury and recovery, and other technologies. The “Brief Pathway” is less intensive and allows for the examination of a wide-range of Service members in greater numbers — taking advantage of web-based technologies to maximize participation.

#### ***Comprehensive Pathway:***

Service members complete an intensive two-day clinical evaluation at some timepoints (Baseline, Year 1, 3, 5, 10), and a brief 90-minute clinical evaluation at others (Year 2, 4, 6-9, 11-15+).

- Outcome Measures for Clinical Evaluations:
  - a. **Clinical Interview:** Includes measures of history of deployment, TBI, bodily injury, education, medical/mental health, return to duty/employment, medical/mental health treatment, access to health care and mental health services, and barriers to health care and mental health services.

- b. Neurobehavioral: Includes measures of alcohol use, combat exposure, post-concussion symptoms, posttraumatic stress symptoms, mental health, and health-related quality of life (including anxiety, depression, self-evaluation, anger, headaches, emotional and behavioral control, grief/loss, ability to participate in social roles and activities, fatigue, pain, resilience, positive feelings and well-being, and cognitive health).
- c. Neurocognitive (intensive evaluation only): Includes measures of intellectual ability, attention, visuospatial abilities, processing speed, executive functioning, language, immediate memory, delayed memory, working memory, cognitive effort, and symptom exaggeration.
- d. Neuroimaging (intensive evaluation only): Includes brain scans using the following neuroradiological methods – magnetic resonance imaging (MRI), Diffusion Tensor Imaging, magnetic resonance spectroscopy, functional MRI, Single-photon Emission Computed Tomography, and Positron Emission Tomography.
- e. Sensory/Motor (intensive evaluation only): Includes measures focusing on balance, speech, hearing, vision, and physical movement.
- f. Genomics/Proteomics (intensive evaluation only): Includes the measurement of genetic markers and neuroproteins related to brain injury (that is, interleukin-4, tumor necrosis factor, C-reactive protein, matrix metalloproteinases, and plasma E-selectin).
- In order to more fully address section 721(c)(3) of the legislation, the DoD will initiate a supplementary effort to conduct structured qualitative interviews with key stakeholders (that is, clinicians, Service members, veterans, family caregivers) regarding availability of services; existing gaps in services and how to best address these gaps; and additional recommendations for the future.

***Brief Pathway:***

- Recruitment Locations: The DoD chose recruitment locations based on concentration of current and projected patient populations that are eligible for inclusion in 15-year studies. These sites will provide a diverse sample of individuals from all Services, to include active duty, National Guard, and Reserve components. In addition, the sample includes Service members drawn from diverse geographic areas with a range of deployment experiences and injuries. While these sites will be the focus of recruitment efforts, other individuals who respond to advertisements, etc., will be included as much as possible. Recruitment efforts entail:
  - a. DoD medical treatment facilities and other DVBIC network site locations like:
    - WRNMMC
    - Naval Medical Center San Diego (NMCSA)
    - Naval Hospital Camp Pendleton (NHCP)
    - Carl R. Darnall Army Medical Center-Fort Hood (CRDAMC)
    - San Antonio Military Medical Center (SAMMC)
    - Charlottesville and Johnstown Rehabilitation Programs
    - Fort Belvoir, Fort Bragg, Fort Carson (pending)
  - b. Various military publicizing efforts (that is, social media and print media).
  - c. Military events (that is, Yellow Ribbon Reintegration Program).
  - d. DVBIC care coordinators, clinicians, and education providers in 17 DVBIC locations who treat, support, train, and monitor Service members, veterans, and their family members and providers who have been affected by TBI.

- **Target Sample:** (a) 1,000 Service members who sustained a mild, moderate, or severe TBI; (b) 500 Service members who sustained a non-TBI related physical injury (for example, orthopedic controls); and (c) 400 non-injured Service members (for example, healthy controls) with at least one deployment to OIF/OEF.
- **Study Procedure:** Service members partake in an initial baseline evaluation upon enrollment into the study, and up to 15 annual follow-up evaluations on: (a) the anniversary of their injury for TBI and orthopedic controls; or (b) the anniversary of their return to the United States from their most recent deployment at time of enrollment into the study for healthy controls. Every year, Service members will complete a brief 90-minute clinical evaluation either in person or via a telephone/web-based assessment.
- **Outcome Measures for Clinical Evaluations:**
  - a. **Clinical Interview:** Includes measures of history of deployment, TBI, bodily injury, education, medical/mental health, return to duty/employment, medical/mental health treatment, access to health care and mental health services, and barriers to health care and mental health services.
  - b. **Neurobehavioral:** Includes measures of alcohol use, combat exposure, post-concussion symptoms, posttraumatic stress symptoms, mental health, and health-related quality of life (including anxiety, depression, self-evaluation, anger, headaches, emotional and behavioral control, grief/loss, ability to participate in social roles and activities, fatigue, pain, resilience, positive feelings and well-being, and cognitive health).
  - c. **Neurocognitive:** Includes measures of attention, visuospatial abilities, processing speed, executive functioning, language, immediate memory, delayed memory, and working memory.

## **(2) Caregiver Study:**

- **Purpose:**
  - a. Conduct a longitudinal study of the effects on the overall health and well-being of family members caring for a Service member with TBI.
  - b. Identify the types of health care and social services needed to foster better caregiver psychological and physical health, social well-being, and resilience.
  - c. Address the scarcity of available caregiver health-related quality of life measures by developing and validating a meaningful and relevant measure of health-related quality of life (QOL) for caregivers of a Service member with TBI – the “TBI-CareQOL.”
- **Recruitment Locations:** The DoD chose locations based on concentration of current and projected patient populations and their family caregivers that are eligible for inclusion in 15-year studies. Recruitment efforts entail:
  - a. DoD medical treatment facilities and other DVBIC network site locations like:
    - WRNMMC
    - NMCS D
    - NHCP
    - CRDAMC
    - SAMMC



- Charlottesville and Johnstown Rehabilitation Programs
    - Fort Belvoir, Fort Bragg, Fort Carson (pending)
  - b. Various military publicizing efforts (that is, social media and print media).
  - c. Military events (that is, Yellow Ribbon Reintegration Program).
  - d. DVBIC care coordinators, clinicians, and education providers in 17 DVBIC locations who treat, support, train, and monitor Service members, veterans, and their family members and providers who have been affected by TBI.
- Target Sample: 400 caregivers of Service members who sustained a moderate or severe TBI during deployment to OIF/OEF.
  - Study Procedure: Caregivers will: (a) complete a series of self-report measures upon enrollment in the study and up to five additional times over the course of the five-year study; and (b) participate in focus groups, telephone interviews, and field testing in order to develop and validate the TBI-CareQOL.
  - Outcome Measures:
    - a. Self-report Measures: Includes measures of employment status, caregiving responsibilities, health and mental health status, financial status, health care and mental health service needs, caregiving satisfaction and burden, general health and well-being, the functional ability of the Service member with TBI, and the health and behavior of any children in the family.
    - b. Focus Groups: Includes an evaluation of caregiver perspectives on how their loved-ones' "disability/injury" has impacted their health-related quality of life; what the term "Quality of Life" means to them; and what they believe to be the most important aspects of health-related quality of life, obtained through a small group discussion.
    - c. TBI-CareQOL: Includes a multi-dimensional assessment of caregiver health-related quality of life (i.e., anxiety, depression, self-evaluation, anger, emotional and physical health, socialization, fatigue, resilience, and positive feelings and well-being); will be developed and validated throughout the course of the study and implemented during field testing.

### **(3) Archival Studies:**

To help address elements of this congressional mandate and understand the effects of TBI incurred by members of the Armed Forces prior to 2008, investigators are analyzing data from previous studies conducted at WRAMC and WRNMMC. The purpose of this collection of studies is to examine acute and chronic outcome from TBI in Service members evaluated at WRAMC/WRNMMC using data collected during routine clinical evaluations.

Through these studies, the DoD has examined important topics to include:

- a. Influence of bodily injury, motivational effort, blast exposure, and TBI severity on neurocognitive and neurobehavioral outcome.
- b. Identification of risk factors for acute stress disorder, PTSD, postconcussive disorder (PCD), and poor health-related quality of life.
- c. Documentation of neurobehavioral and health-related quality of life over the first five years of recovery following mild, moderate, and severe TBI.
- d. Development of new measures/tools to detect symptom exaggeration during routine clinical assessments.

Over the past 2½ years, the data from this study has resulted in 13 publications and 24 scientific conference presentations. Additional projects and manuscripts from the Archival Studies are underway. Below is a brief summary of the main findings and implications of these studies (see Appendix C for a complete list of projects and publications to date).

#### Summary of Findings and Implications:

- Symptoms reported in the acute recovery phase following TBI are not reliably predictive of long-term post-concussion symptoms, PTSD, or health-related quality of life after mild, moderate, or severe TBI.
- The presence of depression, traumatic stress, or both, is very strongly associated with post-concussion symptom reporting following mild TBI.
- Severe bodily injury is associated with lower post-concussion symptom reporting following mild, moderate, and severe TBI.
- A high proportion of Service members who sustain mild, moderate, and severe TBIs continue to report significant symptoms and problems within the first five years post-injury, requiring continued care and support.
- The diagnosis of PCS — an impairment of cognitive functioning that occurs as a result of TBI with symptoms that can last at least three months — is complicated. Clinicians cannot assume that presence of post-concussion symptoms is indicative of PCS. There are many factors that can cause, maintain, or mimic self-reported PCS symptoms; PCS is best considered a diagnosis of exclusion.
- Extended follow-up for all Service members who sustain a combat-related mild TBI with Polytrauma should be offered, regardless of the etiology of the symptoms reported or the presence/absence of symptoms within the first few months post-injury.
- The severity of TBI, or the mechanism by which a person sustained a TBI, should not be used as the primary variable to guide treatment. Clinicians should treat the presenting symptoms, rather than the cause of the symptoms.

The Archival Studies have allowed the DoD to partially address elements of the congressional mandate (that is, “the long-term mental health effects of TBI incurred by members of the Armed Forces during service in OIF/OEF,” and “the health care, mental health care, and rehabilitation needs of service members following TBI”). However, it is important to recognize the limits of the data used for the Archival Studies. These include: a) lack of a control group to determine whether the effects are solely due to TBI; b) variation in the times during which the data was collected; and c) limited number of outcome measures.

### **COLLABORATIONS & PARTNERSHIPS**

In order to address the large scope of the congressional mandate, the DoD established collaborations and partnerships with multiple institutions from both military and civilian settings:

#### **Department of Veterans Affairs**

As the VA will have long-term responsibility for the health care needs of many of these Service members, and it is expected that the study findings will influence health care structure and policy

changes over the coming years, the VA is a key partner in this effort. The DoD is currently drafting plans for use of VA sites for follow-up evaluations for some Service members in the study; increased financial support for the study with VA resources; and details of the dissemination plan. As the study progresses, it is anticipated that VA contributions will continue to increase. Sections 721 (c) (2) and (3) of the legislation require examination of VA efforts/programs around rehabilitation. This is best accomplished through both internal and external examination.

### **DVBIC Network**

At present, there are four key DVBIC sites involved in the 15-Year Studies research program that cover all military services: (a) WRNNMC, Bethesda, Maryland; (b) Naval Hospital Camp Pendleton, San Diego, California; (c) Naval Medical Center San Diego, California; (d) Carl R. Darnall Army Medical Center-Fort Hood, Texas; and (e) San Antonio Military Medical Center, Texas.

### **Center for Neuroscience and Regenerative Medicine (CNRM)**

CNRM (housed at Uniformed Services University of the Health Sciences (USUHS)) was established as a collaborative intramural Federal program (involving the DoD and the National Institute of Health (NIH)) to bring together multi-disciplined clinicians and scientists to create innovative approaches to TBI research. CNRM provides support to the Natural History Study (Comprehensive Pathway) with grant funding for some study staff and specific study assessment components including neuroimaging, sensory/motor assessments, blood banking, participant travel, and salary for some research personnel.

### **National Institutes of Health (NIH)**

NIH is the primary agency of the U.S. government responsible for biomedical and health-related research. In partnership with CNRM and senior research personnel involved in the Natural History Study (Comprehensive Pathway), researchers from NIH are conducting a parallel, five-year study examining outcome from TBI in civilians. The methodology of the civilian NIH TBI Outcome Study and the military Natural History Study (Comprehensive Pathway) was designed collaboratively by NIH and DoD researchers to ensure the ability to directly compare the results from both studies. The results from this five-year study will contribute to the Department's understanding of military-related TBI by comparison of civilian versus military-related TBI. In addition, the NIH provides support to the Caregiver Study with grant funding for some study staff, and operating costs at both military and civilian sites.

### **National Intrepid Center of Excellence (NICoE)**

NICoE is located on the campus of WRNNMC and provides staff, neuroradiological scanning equipment, and follow-up reports for 15-Year Studies participants. NICoE was selected to perform these evaluations due to its involvement in the National Capital Consortium TBI Neuroimaging Core Project — a collaborative research study with WRNNMC that brings together highly trained staff and state-of-the-art equipment.

### **University of Michigan and Northwestern University**

Collaboration with the University of Michigan provides recognized expertise in the field of item measurement development. Faculty from the University of Michigan, Center for Rehabilitation



Outcomes and Assessment Research, Department of Physical Medicine and Rehabilitation, will work closely with Caregiver Study staff to develop and validate the TBI-CareQOL for use among caregivers of Service members with a moderate-severe TBI. Collaborators at Northwestern University will perform specialized statistical analyses and develop computer-based assessment methods. The University of Michigan, Institute for Rehabilitation and Research Memorial Hermann, and Kessler Foundation will also collaborate to develop and validate the TBI-CareQOL items with caregivers of civilians with a moderate-severe TBI. The data collected from the civilian population will allow for a comparison of civilian versus military-related caregiver health-related quality of life. Funding for the research operations and salary support for the civilian sites is provided by NIH. The research operations and salary support for the military site is co-funded by the DoD and NIH.

## **CHALLENGES**

### **Defense Enrollment Eligibility Reporting System (DEERS)**

The DoD and Office of the Under Secretary of Defense for Personnel and Readiness (OUSDP&R) Specific and Unique Requirements, Section 10.3.0 Medical Care for Research Related Injury, states in part that "greater than minimal risk research cannot be approved unless there is a plan to protect participants from medical expenses that are the direct result of participating in the research." As such, it is required that all DoD research participants be "DEERS eligible" throughout the course of the study. DEERS eligibility refers to a person's enrollment in the DEERS that allows beneficiaries to receive care at military hospitals and clinics.

Section 721 of the legislation specifies that a study be undertaken that examines the long-term physical and mental health effects of TBIs incurred by members of the Armed Forces during service in OIF/OEF, and its effect on family members for a period of 15-years. Such a study requires Service members with injuries/deployments dating back to the start of OIF/OEF (2003/2001) and members of their families to be involved for up to 15 years. The DoD requirement for all research participants to be DEERS-eligible throughout the course of the study creates significant problems for the long-term success of the Natural History (Comprehensive and Brief Pathway) and Caregiver Studies. These problems are as follows:

1. The DoD is unable to enroll any Service member for the Natural History Study (Comprehensive Pathway and Brief Pathway) who has already separated from the military and is no longer DEERS-eligible. This prohibits the DoD from enrolling many Service members who sustained injuries dating back to the start of the OIF/OEF.
2. For participants who are recruited into the Natural History Study (Comprehensive Pathway and Brief Pathway), over the course of a 15-year follow-up period, there is a very high likelihood that many Service members will separate from service and no longer be DEERS eligible. As such, the DoD will be forced to exclude these Service members from extended follow-up evaluations, and will be unable to follow many Service members for up to 15 years as directed in the congressional mandate.

The inability to enroll Service members who are not DEERS eligible is a serious impediment to the feasibility of meeting the goals of the congressional mandate. The failure to enroll or retain non DEERS-eligible Service members will diminish the scientific integrity of the studies, and result in the

enrollment of a non-representative sample that will significantly limit the data's generalizability and utility.

### **Delay in Recruitment**

Due to a prolonged review by the IRB, there was a delay in recruitment for the first cohort enrolled in the studies. An interim report was sent to Congress in June 2008 stating the DoD's intent to submit the study design to the IRB for approval in 2008. Final approval was expected by October 2009, thus anticipating that recruitment of the first cohort would begin that same year. However, IRB approval was not attained until 2011 — therefore delaying recruitment of the first cohort by two years. It is important to note that all studies have now received IRB approval, and no other significant modifications to the study were made aside from recruitment/enrollment timeframe.

### **ESTIMATED BUDGET and EXTERNAL FUNDING EFFORTS**

Although DVBIC has been charged with addressing the congressional mandate, no financial resources have been assigned to DVBIC in order to specifically fund the operating costs of the 15-Year Studies. At present, the vast majority of the funding assigned for the operating costs of the 15-Year Studies is subsumed by DVBIC's operational budget. Based on preliminary projected costs for the projects over the course of 15 years, it is estimated that the 15-Year Studies will require an operating budget of, on average, \$2.5 million per year (Total = \$37.1 million). The DVBIC 15-year team is actively pursuing external funding to offset these costs to DVBIC's regular operating budget. It is anticipated that the VA will also provide funding support, but there is no identified funding mechanism at present.

**APPENDIX B**  
**Index of Acronyms**

|           |  |
|-----------|--|
| BRAC      | Base Realignment and Closure   |
| CRDAMC    | Carl R. Darnall Army Medical Center-Fort Hood                        |
| CNRM      | Center for Neuroscience and Regenerative Medicine                    |
| DEERS     | Defense Enrollment Eligibility Reporting System                      |
| DoD       | Department of Defense  |
| DVBIC     | Defense and Veterans Brain Injury Center                             |
| IRB       | Institutional Review Board   |
| JAG       | Judge Advocate General   |
| MRI       | Magnetic resonance imaging   |
| NICoE     | National Intrepid Center of Excellence                               |
| NIH       | National Institutes of Health  |
| NHCP      | Naval Hospital Camp Pendleton  |
| NMCSD     | Naval Medical Center San Diego                                       |
| OEF       | Operation Enduring Freedom   |
| OIF       | Operation Iraqi Freedom  |
| OUSD(P&R) | Office of the Under Secretary of Defense for Personnel and Readiness |
| PCD       | Postconcussive disorder  |
| PTSD      | Posttraumatic stress disorder  |
| REC       | Regional Education Coordinators                                      |
| RCC       | Regional Care Coordinators   |
| SAMMC     | San Antonio Military Medical Center                                  |
| TBI       | Traumatic brain injury   |
| USAMRMC   | United States Army Medical Research and Materiel Command             |
| USUHS     | Uniformed Services University of the Health Sciences                 |
| WRAMC     | Walter Reed Army Medical Center                                      |
| WRNMMC    | Walter Reed National Military Medical Center                         |

**APPENDIX C**  
**Projects and Publications from Archival Studies in Past Two Years**

**Publications (13)**

- Brickell, T.A., French, L.M. & Lange, R.T. (under review). Three Year Outcome Following Moderate to Severe TBI in U.S. Military Service Members: A Descriptive Cross-sectional Study. *Neuropsychological Rehabilitation*.
- Brickell, T.A., Lange, R.T., & French, L.M. (under review). Acute Symptom Reporting and Health-related Quality of Life within the first 5-Years Following Mild TBI in U.S. Military Service Members. *Rehabilitation Psychology*.
- Iverson, G.L., Lange, R.T., French, L.M. (under review). Acute Stress Disorder in US Military Service Members Following Polytrauma and Mild-Moderate Traumatic Brain Injury. Iverson, G.L., Lange, R.T., French, L.M. (under review). Examining the Proposed DSM-5 Criteria for Acute Stress Disorder in US Military Service Members Following Polytrauma and Mild-Moderate Traumatic Brain Injury.
- Lange, R.T., Brickell, T.A., Ivins, B., Vanderploeg, R., & French, L.M. (2013). Variable, Not Always Persistent, Postconcussion Symptoms Following Mild TBI in U.S. Military Service Members: A 5-Year cross-sectional outcome study. *Journal of Neurotrauma*. [Epub ahead of print] .
- Lange, R.T., Brickell, T.A., French, L.M., Ivins, B., Bhagwat, A., Pancholi, S., & Iverson, G.L. (2013). Risk Factors for Postconcussion Symptom Reporting Following Traumatic Brain Injury in U.S. Military Service Members. *Journal of Neurotrauma*, 30(4), 237-246.
- Lange, R.T., Edmed, S.L. Sullivan, K.A., French, L.M., & Cooper, D.B. (2013). Utility of the Mild Brain Injury Atypical Symptoms Scale to Detect Symptom Exaggeration: An Analogue Simulation Study. *Journal of Experimental and Clinical Neuropsychology*, 35(2), 192-209.
- Lange, R.T., Iverson, G.I., Brickell, T.A., Marden, T., Pancholi, S., Bhagwat, A., & French, L.M. (2012). Clinical Utility of the Conner's Continuous Performance Test-II to Detect Poor Effort in U.S. Military Personnel Following Traumatic Brain Injury. *Psychological Assessment*. [Epub ahead of print]
- Lange, R.T., Brickell, T.A., French, L.M., Merritt, V.C., Bhagwat, A., Pancholi, S., & Iverson, G.I. (2012). Neuropsychological Outcome from Uncomplicated Mild TBI, Complicated Mild TBI, and Moderate TBI in U.S. Military Personnel. *Archives of Clinical Neuropsychology*, 27, 480-494.
- Lange, R.T., Pancholi, S., Brickell, T., Sakura, S., Bhagwat, A., Merritt., & French, L. (2012). Neuropsychological Outcome from Blast versus Non-Blast Mild Traumatic Brain Injury in U.S. Military Service Members. *Journal of the International Neuropsychological Society*, 30, 1-11.
- Lange, R.T., Pancholi, S., Bhagwat, A., Anderson-Barnes, V., & French, L. (2012). Influence of Poor Effort on Neuropsychological Test Performance in Military Personnel following Mild Traumatic Brain Injury. *Journal of Clinical and Experimental Neuropsychology*, 34(5), 453-466.
- French, L.M., Lange, R.T., Iverson, G.L., Ivins, B., Marshall, K., & Schwab, K. (2012). Influence of Bodily Injuries on Symptom Reporting following Uncomplicated Mild Traumatic Brain Injury in U.S. Military Service Members. *Journal of Head Trauma Rehabilitation*, 27(1), 63-74.
- Lange, R.T., Brickell, T.A., Iverson, G.L., Parkinson, G., Bhagwat, A., & French, L.M. (2011). 12-month Outcome from Mild Traumatic Brain Injury and Polytrauma in U.S. Military Service Members. *NATO Science for Peace and Security Series-E: Human and Societal Dynamics. Coping with Blast-Related Traumatic Brain Injury in Returning Troops. Vol 86*, 171-186.

## Presentations (24)

- Brickell, T.A., Lange, R.T., Kennedy, J., Ivins, B., Marshall, K., Prokhorenko, O., & French, L.M. (June 2013). *Influence of the Severity and Location of Bodily Injuries on Symptom Reporting Following Military-related Concurrent Mild TBI and Poly-trauma*. International Neuropsychological Society mid-year conference, Amsterdam, Netherlands.
- Brickell, T.A., Lange, R.T., Bhagwat, A., French, L.M. (2013, June). *Self-reported Symptoms of Executive Dysfunction and Objective Neurocognitive Performance Following Military-related Traumatic Brain Injury*. International Neuropsychological Society mid-year conference, Amsterdam, Netherlands.
- Iverson, G.L., Lange, R.T., French, L.M. (November 2012). *Acute Traumatic Stress is Strongly Associated with Postconcussional Disorder Following Combat-Related Polytrauma*. Canadian Military and Veteran Health Research Forum, Kingston, Ontario, Canada.
- Lange, R.T., Brickell, T.A., & French, L.M. (November 2012). *Acute Symptom Reporting does not Predict Chronic Symptom Reporting within the first 3-years Following Moderate-Severe Traumatic Brain Injury in U.S. Military Service Members*. National Academy of Neuropsychology Annual Conference, Nashville, TN, USA.
- Brickell, T.A., Lange, R.T., Ivins, B., & French, L.M. (November 2012). *Health-related Quality of Life 4-Years Following Mild Traumatic Brain Injury in U.S. Military Service Members: Influence of Acute Symptom Reporting*. National Academy of Neuropsychology Annual Conference, Nashville, TN, USA.
- Brickell, T.A., Lange, R.T., Parkinson, G., & French, L.M. (June 2012). *Influence of Acute Symptoms on Health-related Quality of Life within the first 3-Years Following Moderate-Severe Traumatic Brain Injury in U.S. Military Service Members*. Annual conference of the American Academy of Clinical Neuropsychology, Seattle, WA.
- Lange, R.T., Brickell, T.A., Parkinson, G., Ivins, B., Vanderploeg, R., & French, L.M. (June 2012). *Variable, Not Persistent, Post-concussion Symptoms Following Mild TBI in U.S. Military Service Members: A 5-year cross-sectional cohort study*. Annual conference of the American Academy of Clinical Neuropsychology, Seattle, WA.
- Brickell, T.A., Lange, R.T., Parkinson, G., & French, L.M. (under review). *Health-related Quality of Life Following Moderate-Severe Traumatic Brain Injury in U.S. Military Service Members. A 3-year cross-sectional cohort study*. Annual conference of the American Congress of Rehabilitation Medicine, Vancouver, BC, Canada [submitted February 2012].
- Lange, R.T., Brickell, T.A., Ivins, B., Parkinson, G., & French, L.M. (under review). *Examination of Health-related Quality of Life within the first 5-Years Following Mild TBI in U.S. Military Service Members*. Annual conference of the American Congress of Rehabilitation Medicine, Vancouver, BC, Canada [submitted February 2012].
- Lange, R.T., French, L.M., Johnson, F.J., Bhagwat, A.A., & Iverson, G.L. (March 2012). *Post-Concussion and Traumatic Stress Symptoms Following Combat-Related Polytrauma: Influence of Traumatic Brain Injury*. International Brain Injury Association annual meeting, Edinburgh, Scotland.
- French, L.M., Brickell, T.A., & Lange, R.T. (March 2012). *Risk Factors for Development of PTSD in US Military Service Members Following Polytrauma and Mild-Moderate Traumatic Brain Injury*. International Brain Injury Association annual meeting, Edinburgh, Scotland.
- Lange, R.T., Ivins, B., Pancholi, S., Iverson, G.I., & French, L.M. (February, 2012). *Factors Influencing Postconcussion Symptom Reporting Following Traumatic Brain Injury in the Military*.



- International Neuropsychological Society annual conference, Montreal, Quebec, Canada.
- Pancholi, S., Lange, R.T., Bhagwat, A., Brickell, T., & French, L.M. (February 2012). *Self-reported Cognitive Complaints and Neuropsychological Test Performance Following Traumatic Brain Injury in US Military Service Members*. International Neuropsychological Society annual conference, Montreal, Quebec, Canada.
- Lange, R.T., Ivins, B., Marshall, K., Schwab, K., Parkinson, G., Iverson, G.I., Bhagwat, A., & French, L.M. (November, 2011). *More Serious Bodily Injuries are Associated with Lower Risk for PTSD and Postconcussional Disorder in Military Service Members*. National Academy of Neuropsychology Annual Conference, Marco Island, Florida, USA.
- Brickell, T.A., Lange, R.T., & French, L.M. (November, 2011). *Self-reported Postconcussion Symptoms at Two months Post-injury are Poor Predictors of Symptom Expression in the First Four Years of Recovery from Mild TBI in Military Service Members*. National Academy of Neuropsychology Annual Conference, Marco Island, Florida, USA.
- Iverson, G.L., Lange, R.T., & French, L.M. (October, 2011). *Acute Stress Disorder in US Military Service Members Following Polytrauma and Mild-Moderate Traumatic Brain Injury*. American Congress of Rehabilitation Medicine annual conference, Atlanta, Georgia, USA.
- Anderson-Barnes, V., Lange, R.T., Pancholi, S., Brickell, T.A., Bhagwat, A., Iverson, G.I., & French, L.M. (2011, June). *Comparison of Neuropsychological Outcome from Uncomplicated Mild TBI, Complicated Mild TBI, and Moderate TBI in U.S. Military Personnel*. American Academy of Neuropsychology annual conference, Washington, DC, USA.
- Marden, T., Lange, R.T., Pancholi, S., Bhagwat, A., Iverson, G.I., & French, L.M. (2011, June). *Clinical Utility of the Conner's Continuous Performance Test-II to Detect Poor Effort in U.S. Military Personnel Following Traumatic Brain Injury*. American Academy of Neuropsychology annual conference, Washington, DC, USA.
- French, L.M., Lange, R.T., Iverson, G.L., Ivins, B., Marshall, K., & Schwab, K. (June, 2011). *Influence of Bodily Injuries on Symptom Reporting following Uncomplicated Mild Traumatic Brain Injury in U.S. Military Service Members*. Federal Interagency Conference on Traumatic Brain Injury, Washington DC, June 13-15.
- Lange, R.T., Brickell, T.A., Iverson, G.I., Parkinson, G., Bhagwat, A., French, L.M. (February, 2011). *12-month Outcome from Mild Traumatic Brain Injury and Polytrauma in U.S. Military Service Members*. NATO: Wounds of War III conference, Vienna, Austria.
- Lange, R.T., Pancholi, S., Bhagwat, A., Anderson-Barnes, V., & French, L. (February 2011). *Influence of Poor Effort on Neuropsychological Test Performance in Military Personnel following Mild Traumatic Brain Injury*. International Neuropsychological Society annual conference, Boston, Massachusetts, USA.
- Lange, R.T., Pancholi, S., Anderson-Barnes, V., Bhagwat, A., & French, L. (February 2011). *Neuropsychological Outcome from Blast versus Non-Blast Mild Traumatic Brain Injury*. International Neuropsychological Society annual conference, Boston, Massachusetts, USA.
- French, L.M., Lange, R.T., Brickell, T.A., Iverson, G.I., Parkinson, G., & Bhagwat, A. (February, 2011). *12-month Outcome from Mild Traumatic Brain Injury and Polytrauma in U.S. Military Service Members*. NATO: Wounds of War III conference, Vienna, Austria.
- Iverson, G.L., Lange, R.T., & French, L.M. (July 2010). *Poor Effort is Associated with Greater Post-Concussion Symptom Reporting in Military Personnel with Mild Traumatic Brain Injuries*. International Neuropsychological Society mid-year conference, Krakow, Poland.