

USAARL Report No. 2013-15

Proceedings of the Military Operational Medicine Research Program Return-to-Duty Research Working Group Meeting, 19-20 September 2012

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United States Army Aeromedical Research Laboratory
Warfighter Health Division

May 2013

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14. ABSTRACT A workshop, entitled "Return-to-Duty Assessment Methods and Standards: Developing a Research Agenda," was held at the Hilton Garden Inn, Frederick, MD, on 19-20 September 2012. Sponsored by the U.S. Army Medical Research and Materiel Command's (USAMRMC) Military Operational Medicine Research Program (MOMRP), the workshop objectives were 1) to ensure that MOMRP RTD research programs are targeting the most important gaps and current Department of Defense (DoD) needs, 2) to establish a dialog among the various key performers and stakeholders, and 3) to synchronize the efforts of various RTD and fitness-for-duty programs across the DoD. The underlying intent was to address the development of RTD standards and assessment tools focused on the most common injuries across DoD: neurosensory injury (e.g., concussion), musculoskeletal injury (e.g., training-related), and psychological injury (e.g., PTSD, depression). This report contains the workshop presentations, comment highlights, and break-out group notes.						
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Introduction

A workshop, entitled “Return-to-Duty Assessment Methods and Standards: Developing a Research Agenda,” was held at the Hilton Garden Inn, Frederick, MD, on 19-20 September 2012, and was sponsored by the US Army Medical Research and Materiel Command’s (USAMRMC) Military Operational Medicine Research Program (MOMRP). The MOMRP, directed by COL Carl A. Castro, includes three Task Areas (TA) with the goal of providing evidence-based criteria for standards to determine the level of operational competence and performance of a Soldier after injury. The need for return-to-duty (RTD) assessment criteria includes the spectrum of injury and disease experienced by U.S. Soldiers, Airmen, Sailors and Marines.

TA P1, managed by Dr. John S. Crowley, U.S. Army Aeromedical Research Laboratory (USAARL), focuses on injury effects on human neurosensory function, including those resulting from blast, blunt, and ballistic threats. Injuries of interest include those resulting from trauma to the neural, acoustic, vestibular, and visual systems. In developing these RTD standards, the research program determines the effect of injury on both general and specific Warfighter abilities.

TA P2, managed by Dr. Edward Zambraski, U.S. Army Research Institute of Environmental Medicine (USARIEM), focuses on injury effects on human neuro-muscular function. Musculoskeletal injuries during deployment can be the result of many factors. Combat related exposure to blast, physical impact and ballistic threats can cause severe musculoskeletal injuries. These causative factors are compounded by musculoskeletal injuries caused by the physical demands associated with locomotion, load carriage, lifting and the completion of many normal Soldier tasks.

TA WX, managed by COL Paul Bliese, Walter Reed Army Institute of Research (WRAIR), focuses on a wide spectrum of mental health issues and neuropsychological injuries. Mental health issues may include symptoms of Post-Traumatic Stress Disorder (PTSD), depression or anxiety, suicide attempts or ideation, and alcohol abuse and prescription drug use. Neuropsychological injuries include single or multiple concussive events along with other concomitant neurological effects associated with mental health interventions.

This report records the proceedings of the workshop in the form of descriptive text, edited spoken text or copies of projected slides, and makes recommendations about the direction of MOMRP’s RTD research programs. The conference agenda is presented in figure 1. The attendee list appears in the appendix.

Workshop Objectives

The workshop objectives were 1) to ensure that MOMRP RTD research programs are targeting the most important gaps and current Department of Defense (DoD) needs, 2) to establish a dialogue among the various key performers and stakeholders, and 3) to synchronize the efforts of various RTD and fitness-for-duty research programs across the DoD. The

underlying intent was to describe the development of RTD standards and assessment tools addressing the most common injuries across DoD: neurosensory injury (i.e., concussion), musculoskeletal injury (i.e., training-related), and psychological injury (i.e., PTSD, depression).

The two-day workshop was organized into three general sessions, each with specific aims and objectives. First, the morning of Day 1 introduced the workshop to the attendees with a series of progressively more detailed briefings, describing the three RTD research programs. Presentations from managers and researchers highlighted the common approach followed by the three programs, and presented the latest research findings.

The second session, on the afternoon of Day 1, addressed the perspectives of the users of RTD standards - practitioners in the clinical fields of physical medicine, physical and occupational therapy, psychology and psychiatry, as well as the administrators of the DoD RTD process. These presentations and the ensuing discussions captured experience with the current process and identified research gaps in need of further study.

The third session, commencing on the morning of Day 2, provided an opportunity for general discussion in plenary sessions, and then more focused discussions of each research task area in three breakout groups. These small group sessions addressed specific research gaps, strategies, and challenges of the various research programs comprising the MOMRP RTD research program.

Agenda
Return to Duty Research Working Group
19-20 September 2012
Hilton Garden Inn, Frederick, MD

Wednesday, 19 September (Day 1)

0730 - 0800 Registration

0800 - 0815 Welcome and Administrative Announcements – COL Castro, MOMRP/
Dr. Crowley, USAARL

0815 – 0830 Background and Overall Research Strategy – Dr. Zambraski, USARIEM

State of the Science and Current Research Efforts

0830 – 0930 RTD after NeuroSensory Injury

Task Overview and Current DoD Research (15 min) – Dr. J.S. Crowley, USAARL

Epidemiology of mTBI and NeuroSensory Injury (10 min) – Dr. B.D. Lawson, USAARL

Development and Validation of a Sensitive Marksmanship Task (10 min) – Ms C.M. Webb, USAARL

Assessment of Military Multitasking Performance (AMMP) (15 min) – Dr. M.M. Weightman, SKRC

Functional Hearing Test Development (10 min) – MAJ D.S. McIlwain, USAARL

0930 – 0945 Break

0945 – 1045 RTD after Musculoskeletal Injury

Task Overview and Current DoD Research (15 min) – Dr. E.J. Zambraski, USARIEM

Characterization of the RTD Musculoskeletal Problem (15 min) – MAJ O.T. Hill, USARIEM

Musculoskeletal injury trends in US Marines and Navy personnel from OEF/OIF: Relationship between RTD time and injury (15 min) – Dr. K.R. Kelly, NHRC

Measures of Soldiers Physical Task Performance in Relation to RTD Decisions (15 min) – Ms. M.A. Sharp, USARIEM

1045 – 1145 RTD after Psychological Injury

Task Overview and Current DoD Research (15 min) – COL P.D. Bliese, WRAIR

Prevalence of Psychological Injury (20 min) – LTC R.J. Whalen, WRAIR

Neuropsychological and Neuro-imaging tools as potential RTD decision tools (20 min) – Dr. S.P. Proctor, USARIEM, and CPT M.N. Dretsch, USAARL

1145 - 1200 Questions & Comments

Figure. Return to Duty Research Working Group agenda.

1200 - 1300 Lunch

State of the Science and Current Research Efforts (con't)

1300 – 1330 *Return to Duty Research at the Center for the Intrepid (30 min) – Dr. Rabago/Dr. Wilken*

Current Approach and Problems with Return to Duty Care – User Perspectives and Research Needs

1330 – 1430 Physical Medicine, Occupational Therapy, and Physical Therapy (1 hr)

Talk #1 (15 min) – LTC D. Teyhen, OTSG

Talk #2 (15 min) – Dr. J.L. Owens, WRRRC Fort Campbell, KY

Talk #3 (15 min) – Mrs. K.M. Helmick, RN DCoE TBI

Questions

1430 – 1445 Break

1445 – 1515 Clinical Psychology and Psychiatry (30 min)

Talk (20 min) – COL R.I. Porter, MEDCOM OTSG

Questions

*

1515 – 1545 The TRADOC Perspective—Practices and Problems in RTD (30 min)

Talk (20 min) – COL C.A. Tiffany, TRADOC

Questions

1545 - 1630 Day 1 Summary and Discussion

Task Area Managers (10 min each)

Day 1 Wrap-Up (15 min) – COL Castro

Figure (cont.). Return to Duty Research Working Group agenda.

* Note that LTC Edward Brusher, U.S. Army Medical Command, Office of the Surgeon General (MEDCOM OTSG), presented in place of COL Rebecca J. Porter.

Thursday, 20 September

0730 - 0800 Registration

0800 - 0830 Welcome and Instructions— COL Carl Castro

0830 - 1000 Break-Out Groups (Facilitator Led)

Groups

1. RTD following Neurosensory Injury
2. RTD following Musculoskeletal Injury
3. RTD following Psychological Injury

Objectives:

1. Review 6-step research approach as relevant to each Task
2. Identify data gaps or threats
3. Identify proposed research to address data gaps
4. Identify changes to existing research plans
5. Identify competencies, capabilities, funding required to address threats

1000 – 1015 Break

1015 – 1200 Break-Out Groups (Facilitator Led) – continued

1200 – 1300 Lunch

1300 – 1430 Break-Out Groups report back to Plenary Session

Task Area Research Plans—current state (30 min) – Task Area Managers

Discussion (30 min)

1500 Closing Comments and Adjourn – COL Castro

Figure (cont.). Return to Duty Research Working Group agenda.

Workshop Sessions – Day 1 Wednesday, 19 September 2012

0800 – 0815: Welcome and Administrative Announcements – Dr. John Crowley, USAARL, and
COL Carl Castro, MOMRP



**Welcome to the
Return-to-Duty Research
Working Group**

19-20 September 2012

  **Medical Research in Support
of the Army Warfighter**

Administrative Announcements

- Restrooms
- Breaks
 - Coffee service - free
 - Snacks – next to front desk, pay-as-you-go
- Lunch options – pay-as-you-go
 - Hotel
 - Nearby
 - One hour!
- Set cell phones to vibrate



**Medical Research in Support
of the Army Warfighter**

Administrative Announcements

- Please do not bring cellphones to podium
- Meeting is being recorded
 - Please indicate if you would like to make an off-the-record comment – that's fine
- Time keeper – Dr. Estrada
- Questions – state your name loudly and clearly
- Presentations will be provided; A report will be published



**Medical Research in Support
of the Army Warfighter**

Welcome

COL Carl Castro
Director, Military Operational Medicine
Research Program



**Medical Research in Support
of the Army Warfighter**

Agenda Overview

Day 1

- Welcome – COL Castro
- Overview – Dr. Zambraski
- Panel I – State of the Science/Current Research
 - Researchers
- Panel II - Current Approach and Problems
 - Users, Stakeholders



**Medical Research in Support
of the Army Warfighter**

Agenda Overview

Day 2

- Injury Break-Out Groups
 - Neurosensory
 - Musculoskeletal
 - Psychological
- Report back to Plenary
 - Gaps, Plans, Revisions



**Medical Research in Support
of the Army Warfighter**

Return-to-Duty Research Working Group

- Who: Key players concerned with safe return of Wounded Warriors to duty
 - Clinicians
 - Researchers
 - Senior leaders
 - Users
 - Policy makers
- What: Two day gathering sponsored by the US Army Medical Research and Materiel Command
- Why: Communicate, Identify, Integrate, Plan, Transition



**Medical Research in Support
of the Army Warfighter**

Comment highlights:

Dr. Crowley welcomed the attendees to the workshop. Dr. Zambraski and COL Bliese were identified as the co-hosts of the conference.

COL Castro, MOMRP Director, provided welcoming comments and thanked all attendees for their help in “grappling with RTD issues.” He noted that this was the first [MOMRP] RTD Workshop to be held. The goal, he continued, is to provide evidenced based criteria to the medical community for making RTD decisions. It is broad, and includes physical and psychological health, which overlap. There is co-morbidity. It is complex. This is the first attempt to do this systematically.

Kathy Helmick: How this effort related to LTC Chessley R. Atchison’s TECD [Technology Enabled Capability Demonstration Program - Brain in Combat: Resilience, Assessment and Intervention (7d)] work?

COL Castro: It does not directly synchronize with what COL Atchison does with the TECD. TECDs are not comprehensive. They have only a 2-year focus. This [effort] will be more than for far forward use. This will also be used in garrison. It will be prioritized and more comprehensive. It will include the concept of quick wins and longer running efforts as the good fruit is often what is up top rather than low hanging.

COL Paul Bliese: Please provide a lot of input on the topic. Keep it informal.

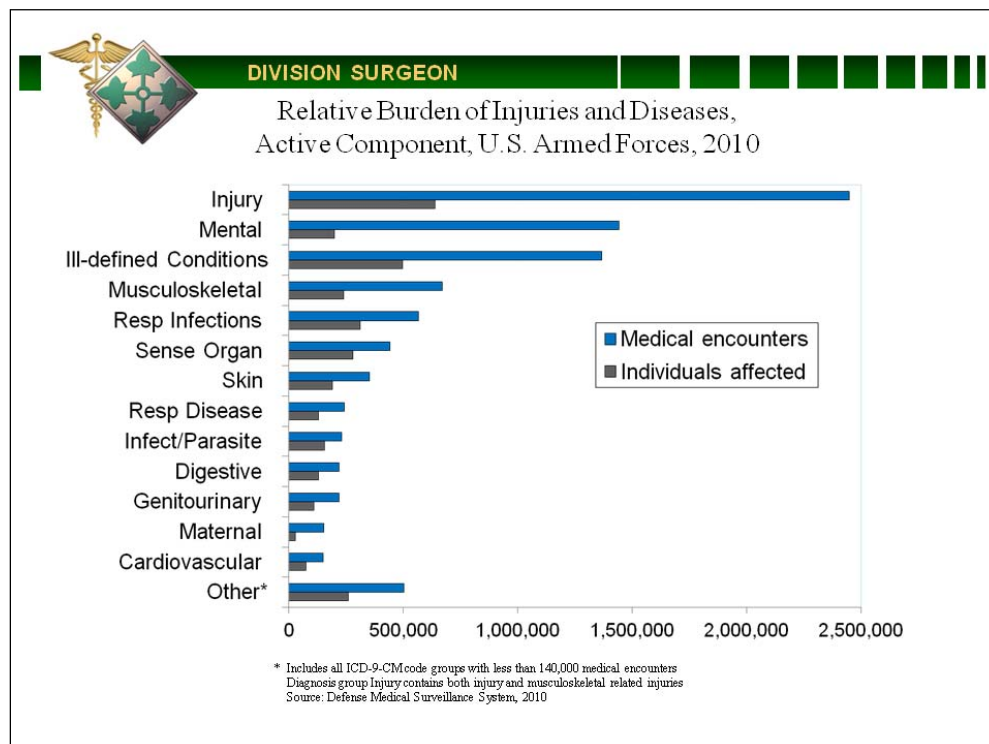
Dr. Crowley briefly reviewed the agenda and explained that other competing events have limited the number of attendees.

**ARMY MEDICINE**
Serving To Heal...Honored To Serve

Return to Duty Research Working Group

Background and Overall Research Strategy

Edward J. Zambraski, Ph.D.
Division Chief, Military Performance Division
U.S. Army Research Institute of Environmental Medicine
Natick, Massachusetts
edward.zambraski@us.army.mil





Threat of Musculoskeletal Injuries

What is known:

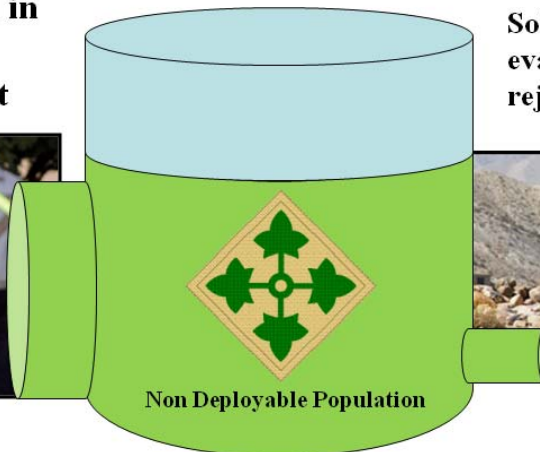
- 30 % males, 60 % females require medical attention during 8-9 weeks of BCT
- 80% of active duty Soldiers are on prescription NSAIDs (2011)
- Number of stress fractures in 2009
4,903 Army; 8,267 DoD wide
(increased femoral neck fractures)
- Majority (24 %) of medical evacuations from Iraq/Afghanistan (2004-2009, n=34,006) were due to non-combat musculoskeletal injuries



DIVISION SURGEON

Medically Not Ready

Soldiers injured in PT, training, or with deployment



Soldiers properly evaluated, ready to rejoin their units



Non Deployable Population

It is estimated that 17 % of our active duty Soldiers are “Medically Not Ready” for deployment (US Army Public Health Command)



Return to Duty Research Working Group

Military Operational Medicine Research Program (MOMRP)

Three “Task Areas” pertaining to RTD

“Return to Duty Standards and Strategies After...”



Neurosensory Injury (Task Area P1)

USAARL

Dr. John Crowley

Musculoskeletal Injury (Task Area P2)

USARIEM

Dr. Barry Spiering

Psychological Injury (Task Area WX)

WRAIR/USARIEM/USAARL

COL Paul Bliese



Complexities of RTD Research: Co-morbidities/poly-trauma

Contemporary War Casualties

- Current war casualties are driving changes in healthcare needs and therefore changes in R&D
- Specific types of casualties driving changes:
 - Traumatic Brain Injury (TBI)
 - Blast Injuries
 - Amputations
 - Sensory (Eye/Ear injuries)
 - Post Traumatic Stress Disorder (PTSD)
 - Musculoskeletal Injuries: acute & overuse



TBI Suffered in Iraq



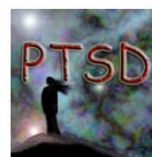
Trauma Team at Kirkuk Air Base in Iraq



Workshop at the Walter Reed Amputee Center

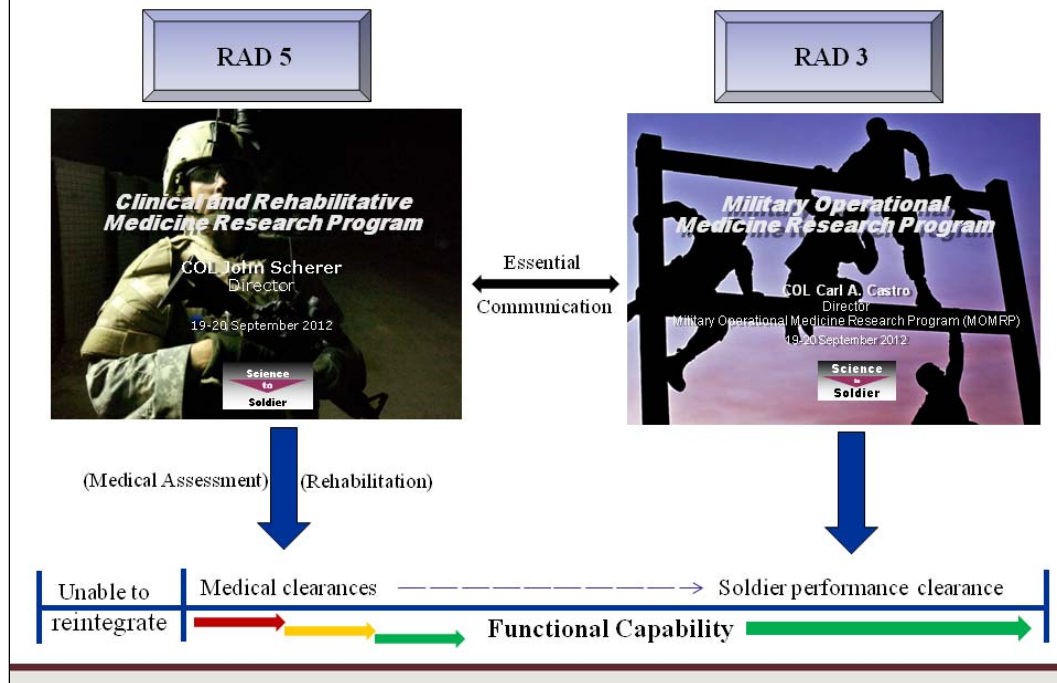


Blast Injury from Exploding Ordnance





Defining the “domains” for MPMC RTD research



Defining the line between return to civilian life vs return to active duty within a person's MOS





Return to Duty Decisions

Clinical Clearance (to perform basic functions)

Physical Evaluation

- Parameters Assessed
 - Strength, ROM, proprioception, fine motor skills
 - Absence of pain
- Well defined tests and norms

Psychological Evaluation

- Neurological Observations
 - identification of symptoms
 - self-report of symptoms
- Evaluation of prior testing
- “Mini-mental exam”
- RBANS
- Referral: MACE, ANAM



Return to Duty Decisions

Soldier Performance Requirements (physical, neurosensory and/or psychological)

To perform the functions that are required of every Soldier, regardless of their MOS, location (garrison/deployed) or circumstance.

To perform the specific functions as determined by their specialized training and Military Occupational Specialty (MOS)



Are these clearly defined?
What are the standards?
How are the standards tested?



Defining Soldier “Performance” Standards



Physical

Army Fitness Test (APFT): (2 mile run, push-ups, sit-ups)
Warrior Task and Battle Drills (total Army/every Soldier)
DA Pam 611-21 (MOS specific)



Psychological

Neurosensory

Warrior Task and Battle Drills (total Army/every Soldier)

DA Pam 611-21 (MOS specific)



Return to Duty Decisions

“Warrior Task and Battle Drills (WTBD)”

- Critical tasks or abilities are listed to: Shoot, move, communicate, survive, and adapt
- There are 15 Warrior Tasks and 6 Battle Drills
- These tasks and drills require physical, cognitive, sensory function, and intellectual capabilities.
- These WTBDs are skills that every Soldier is to possess.
- They were recently approved by GEN Odierno, May 2012

The critical issue/problem is to derive either physical, sensory or psychological tests that predict successful performance of WTBDs



Return to Duty Decisions

Department of the Army

Pamphlet 611-21

Personnel Selection and Classification

Military
Occupational
Classification
and Structure

Date of last approved: 2007



This Army PAM 611-21 defines the physical, and to a very limited extent, the cognitive “requirements” for every MOS.

It is task oriented. The physical/sensory/psychological requisites or attributes needed to complete the tasks successfully are NOT defined.



Return to Duty Decisions

DAPAM 611-21

Table 10-11B-1

Physical requirements for MOS 11B (Infantryman)

Skill level

Tasks

1. Frequently visually identifies vehicles, equipment, and individuals at long distances.
2. Frequently hears, gives, or echoes oral commands in outside area at distances up to 50 meters.
3. Frequently performs all other tasks while carrying a minimum of 111 pounds, evenly distributed over entire body.
4. Occasionally drags 299 pound person 15 meters.
5. Frequently digs, lifts, and shovels 21 pounds scoops of dirt in bent, stooped or kneeling position.



“Idealized” Research Approach to RTD Standards and Strategies for all three research areas

- I. Based on epidemiological data, define the top 5-7 conditions responsible for loss of duty time.
- II. Relevant metrics: amount of lost duty time, when they returned, issue of re-injury, those who never return, etc.
- III. The “clinical” approach: current practices, evidence of efficacy.
- IV. Development of Assessment Tools/Decision Aids
- V. Define “standards” for Soldier physical/sensory/cognitive performance
- VI. Application of Assessment Tools/Standards: Determine if metrics change (Are we decreasing the pool of “Medically Not Ready”?)



Realities/Qualifiers to this “Idealized” Research Approach

- I. What might be assumed to be known (Levels I-V) is really not.
 - e.g. capture of medical data
- II. State-of-the-art and/or progress for Levels I-VI may be different across the three MOMRP RTD Task Areas.
 - Complexity of the issues
 - Different pathologies
 - Definition of standards (may or may not exist)
 - Prior R&D that pertains to RTD issues
- III. We need to better integrate these efforts to deal with the issue of co-morbidities.



Goals for this RTD Working Group

- I. Within the 6-step research approach, define the important issues/concerns/research gaps.**
- II. Determine how to maximize the integration/coordination of research among the three RTD task areas.**
- III. To synchronize the efforts of various RTD and fitness-for-duty programs that may exist across the DoD.**
- IV. Increase the communication to better define the needs of the clinicians, who are making the RTD decisions, and the researchers.**
- V. Produce a research plan to address levels “I-VI.”**

Comment highlights:

Dr. Zambraski’s presentation noted that about 30% of the males and 60% of the females in the 8-9 weeks of Basic Combat Training require medical attention. Eighty percent of Active Component Soldiers are on prescription NSAIDs (nonsteroidal anti-inflammatory drugs).

COL Bliese: That seemed very high.

Dr. Zambraski: Eighty percent were prescribed an NSAID within the first year, with some receiving more than one prescription. Motrin is often counted twice, as a prescription and as over the counter [OTC] drug.

COL Dana Renta: Motrin is the first drug used in treatment.

MAJ Owen Hill: I often give Soldiers prescriptions (rather than as OTC) for Motrin while on the line.

In the context of Soldier performance requirements, COL Castro: It is appropriate not to include the word disability. The VA disability system definition does not mean the individual cannot perform. The person could be 100% disabled yet fully employed under the VA definition.

MAJ Hill: It was important to note that the outcome variable is loss of duty time. Clinicians have discrete outcomes; this is different. We need a metric to define what is meant as loss of duty time.

LTC Deydre Teyden: The RTD issue needs to include policies. As an example, 20-year old programs are being used, but RTD policies have changed and now can't capture that in the programs. They need to look at those policies that prevent good science from being institutionalized. There is a need to bridge that gap.

COL Bliese: When thinking psychological RTD, clinicians don't know what to do for certain psychological conditions. The trick is to identify the intersection of high prevalence and difficult decisions, like depression.

MAJ Hill: When time is a variable within the model, it becomes complicated.

Dr. Crowley: A test for balance problems is medical test. It may not affect duty performance depending on the Soldier's MOS [military occupational skill].

0830 – 0930: RTD after Neurosensory Injury

Task Overview and Current DoD Research – Dr. John Crowley, USAARL

Medical Research and Materiel Command
U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama

**State of the Science
Current Research**

Panels

- RTD after NeuroSensory Injury
John Crowley MD (USAARL)
- RTD after Musculoskeletal Injury
Ed Zambraski PhD (USARIEM)
- RTD after Psychological Injury
COL Paul Bliese PhD (WRAIR)

The slide features a header with the Medical Research and Materiel Command logo and text. The main title is 'State of the Science Current Research'. Below it is a section titled 'Panels' with a bulleted list of three topics: 'RTD after NeuroSensory Injury' by John Crowley MD (USAARL), 'RTD after Musculoskeletal Injury' by Ed Zambraski PhD (USARIEM), and 'RTD after Psychological Injury' by COL Paul Bliese PhD (WRAIR). The bottom of the slide has a horizontal strip of military-related images, including soldiers, helicopters, and a sunset, with a central circular logo.



RTD after NeuroSensory Injury

- Task Overview and Current DoD Research
 - John Crowley MD
- Epidemiology of mTBI and NeuroSensory Injury
 - Ben Lawson PhD
- Development and Validation of a Sensitive Marksmanship Task
 - Catherine Webb MS
- Assessment of Military Multi-Tasking Performance (AMMP)
 - Margaret Weightman PhD
- Functional Hearing Test Development
 - MAJ Scott McIlwain AuD



RTD Standards and Strategies After NeuroSensory Injury

Overview





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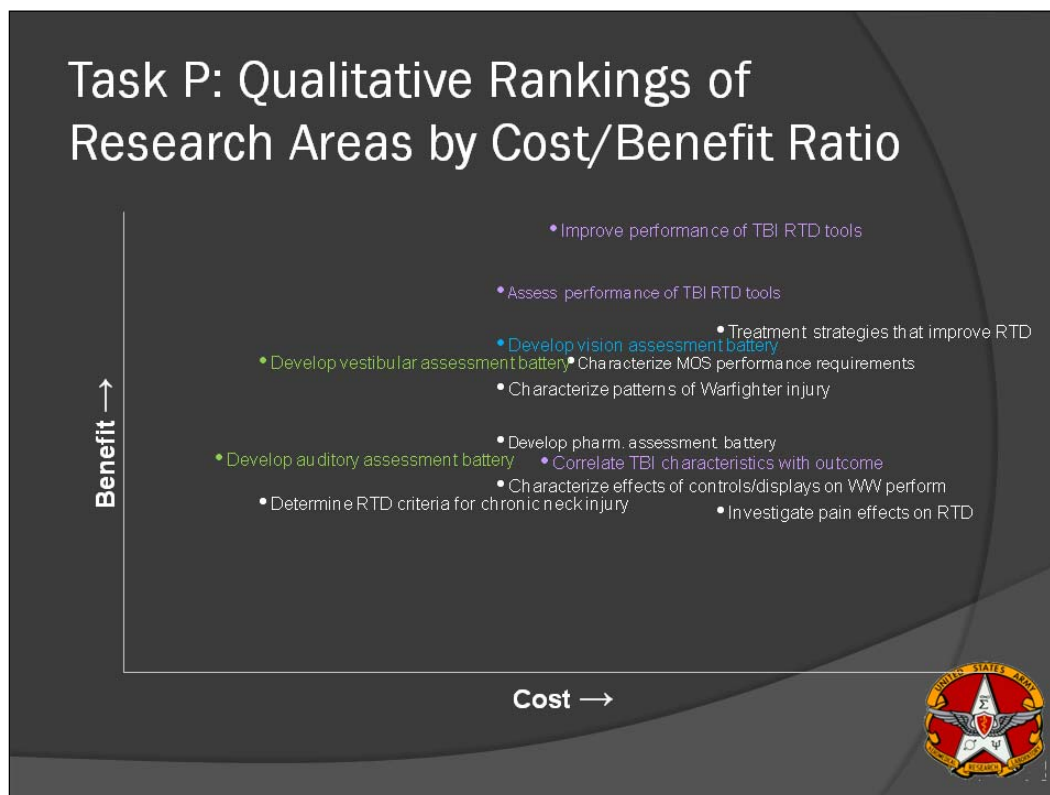


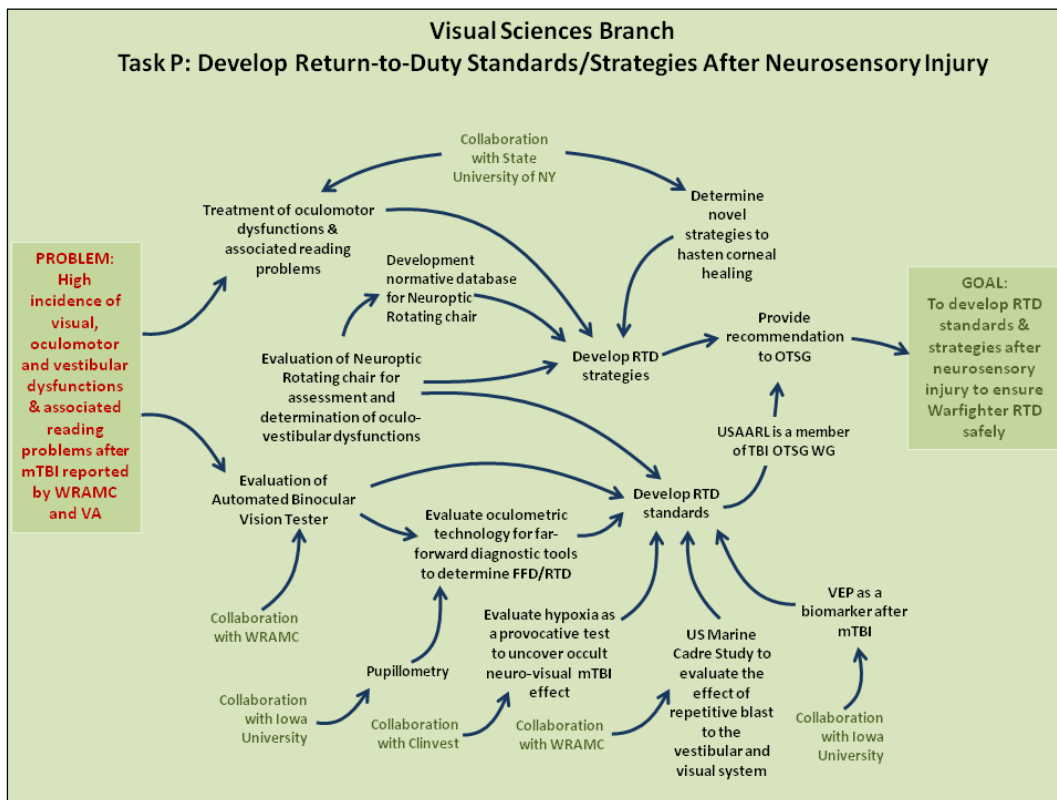
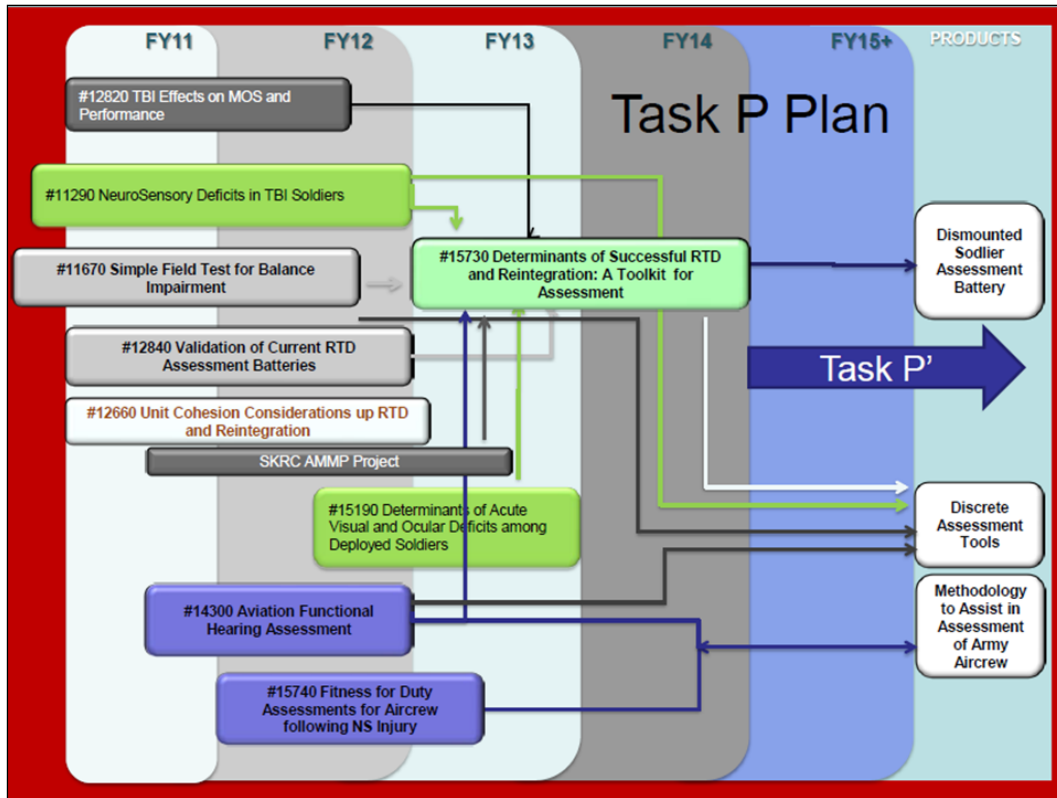
RTD Stds and Strategies After NeuroSensory Injury

- Started FY10
- NeuroSensory: CNS and sensory organs
- Goal: Develop evidence-based standards to determine the level of operational competence and Soldier performance following injury

“Valid, evidence-based, operationally specific”







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Idealized Research Approach for Task P

- 1. Identify drivers / epidemiology*
 - *Epidemiology of TBI/NeuroSensory Injury – Dr. Lawson*
- 2. Determine metrics*
 - *Domain-specific and generic metrics*
- 3. Clinical approach/current practices*
 - *Validation of current RTD approaches – Dr. Estrada*





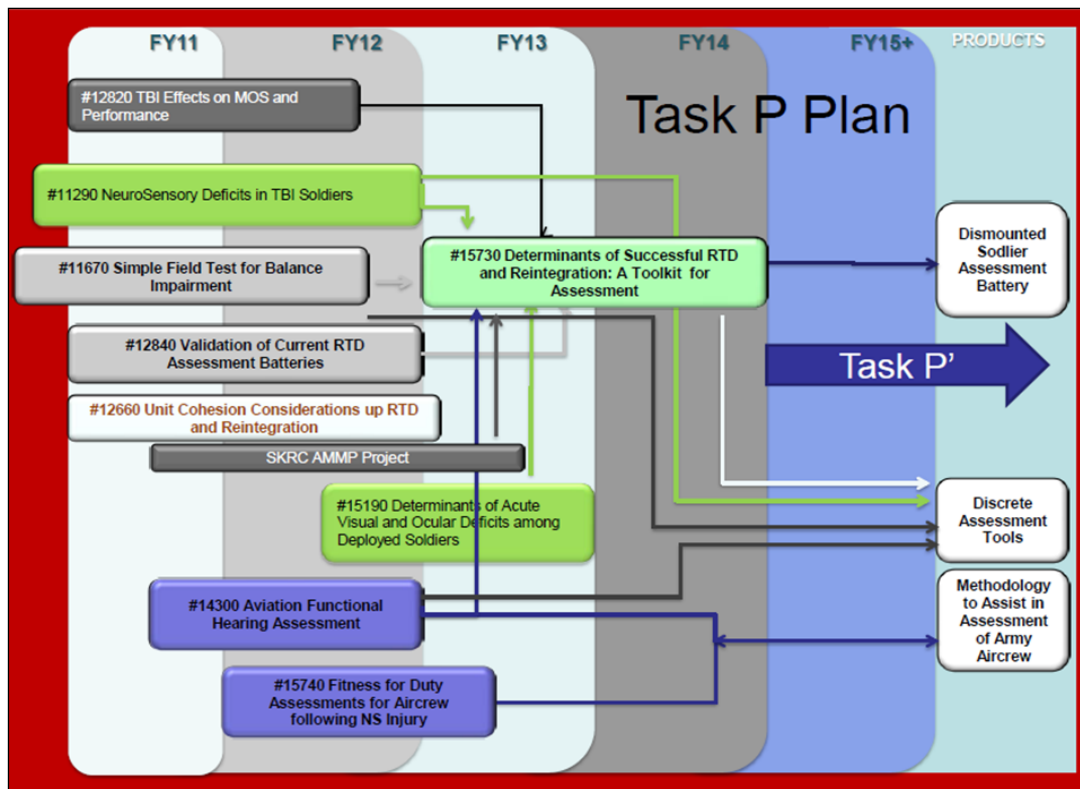
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Idealized Research Approach for Task P

- 4. Development of assessment tools/decision aids*
 - *Various vision, balance, hearing assessment tools*
- 5. Define standards for Soldier performance*
 - *Task dependent*
 - *Existing task – may have Soldier performance standards already defined*
 - *Novel task – short term criteria will depend on expert consensus*
 - *Medical / Clinical criteria – when obviously disqualifying no performance standard is needed*
- 6. Application of assessment tools/standards*
 - *Criteria / standards will evolve*





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Determinants of successful return-to-duty: A toolkit for assessment

Schedule & Funding

MILESTONES	FY13	FY14
Protocol development and collaboration with tx facilities	[Bar]	
Approval and experiment prep		[Bar]
Data collection		[Bar]
Analysis/Writing		[Bar]
Total Funding = \$400K	718K	718K

Problem

- Many Soldiers who complete physical, vestibular, and cognitive rehabilitation and treatment after traumatic brain injury return to active duty
- Factors which are predictive of success are unknown

Purpose

- Establish and refine a return-to-duty assessment battery employing newly-developed, military-specific assessments

Plan

- Focus group to determine definition of success
- Longitudinal study of "graduates" from rehabilitation center
- Data-driven outcomes will determine which newly-developed tasks will be included in "toolkit"
- Reliability and validity assessment of "toolkit"

Products/Payoff

- Toolkit of sensitive, predictive, valid, and efficient assessments

Progress

- Protocol in preparation

Program Area : Injury Prevention and Reduction
 Task Area P : Develop Return to Duty Standards and Strategies after Neurosensory, Musculoskeletal, or Thoracic Injury
 MOMRP # 115730
 Funding : MOMRP

UNCLASSIFIED

Principal Investigator: Amanda Kelley PhD
 Aeromedical Factors Branch
 Warfighter Health Division



Example of Task Evolution: Balance Problems p mTBI

1. *Identify drivers / epidemiology*

- *Epidemiology and PT/OT discussions indicated post-TBI balance problem with RTD implications*

2. *Determine metrics*

- *Gold standard studied, expert panel convened, recommendation made*

3. *Clinical approach/current practices*

- *Confirmed the need for an operationally relevant measure*
- *Suggested need for far-forward clinical screening tool*



Example of Task Evolution (con't)

4. *Development of assessment tools/decision aids*

- *Development of sensitive marksmanship task (Ms. Webb)*
- *Development of simple field test for balance (Dr. Rupert)*

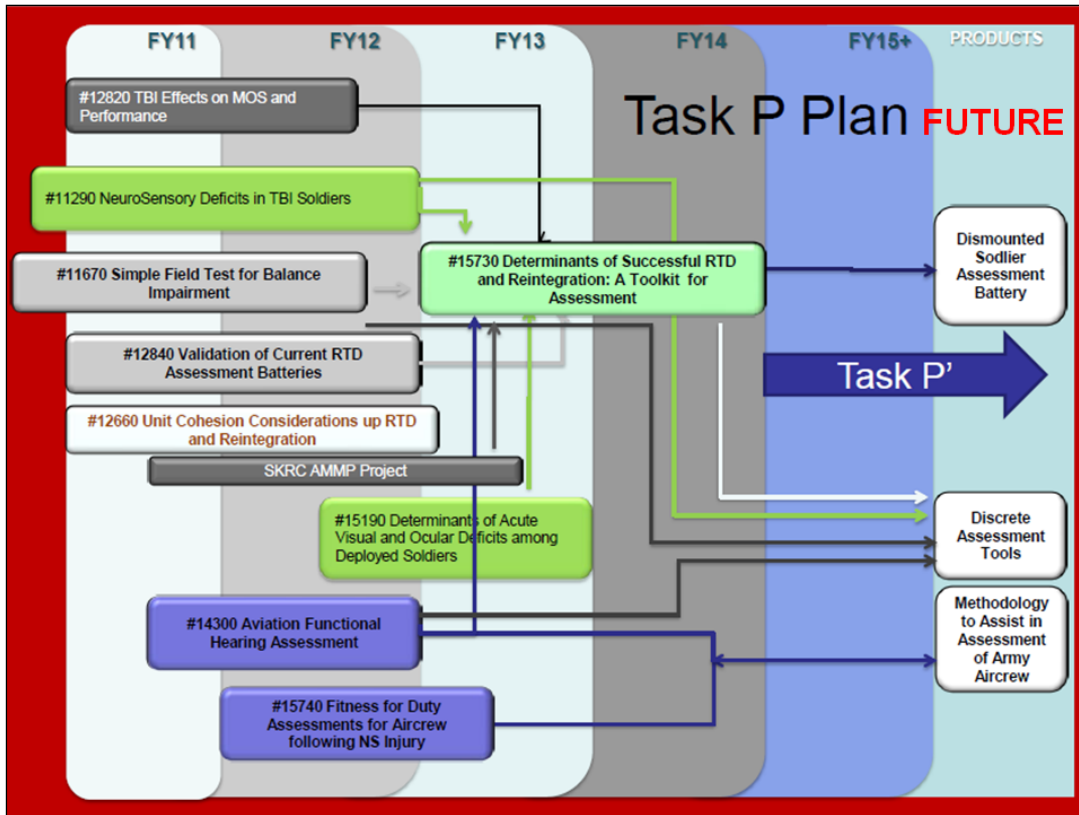
5. *Define standards for Soldier performance*

- *Leverage existing marksmanship standards*
- *Balance test primarily clinical screening tool*

6. *Application of assessment tools/standards*

- *NA*





Comment highlights:

Dr. Crowley: This task area is the oldest of the three task areas. It was started in FY10. The goal is to develop evidence based standards to determine the level of operational competence. In FY15, we'll be starting a new task area that will look at the long term effects of the injuries that are occurring now such as TBI [traumatic brain injury], hearing, and vision effects. We'll see how well our guidelines serve to predict performance.

COL Bliese: The criteria to evaluate the effectiveness of whatever strategy is developed is important. Think of other strategies to employ across all three areas. Perhaps employ the supervisor to rate the RTD person on a checklist for the different types of injuries after 3 months.

MAJ Hill: We'll need comparative baseline data. We'll need to do ubiquitous rating of all Soldiers in advance.

Dr. Art Estrada: The WRRC [Warrior Resiliency and Recovery Center] at Ft Campbell is developing a program to follow Soldiers after their "graduation" from their recovery program. Its Military Functional Assessment Program will follow Soldiers for 1 year following treatment requesting assessment from supervisors.

COL Bliese: Now we only have attrition as a metric. That could allow further dissection of the issues following RTD.

Dr. Estrada: We thought that perhaps the number of return visits to the mental health clinic could be a metric of trouble returning to duty; however, it could be that return visits are an indication of greater mental fitness and healthy self assessment.

Ms. Helmick: Regarding the continuum of care and looking at RTD, should all persons be considered for it? Might need discharge planning. Are [caregivers] to focus on period of time in recovery or the full assessment piece?

MAJ Matthew Scherer: The clinical model looks at body function. Evaluation metrics must look at function. The goal is return to performance level.

Dr. Crowley: In looking at effects of mTBI [mild TBI] on Soldiers, they frequently have balance effects. I encourage researchers to address low hanging fruit. Purpose here is the medical center RTD rather than far forward decision making.

COL Bliese: Yes, focus on medical center RTD decisions. There is flexibility in the program.

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Epidemiology of MTBI and Neurosensory Injury

Ben Lawson



Knowns

- Head injury is more common in the modern military



1914-1976



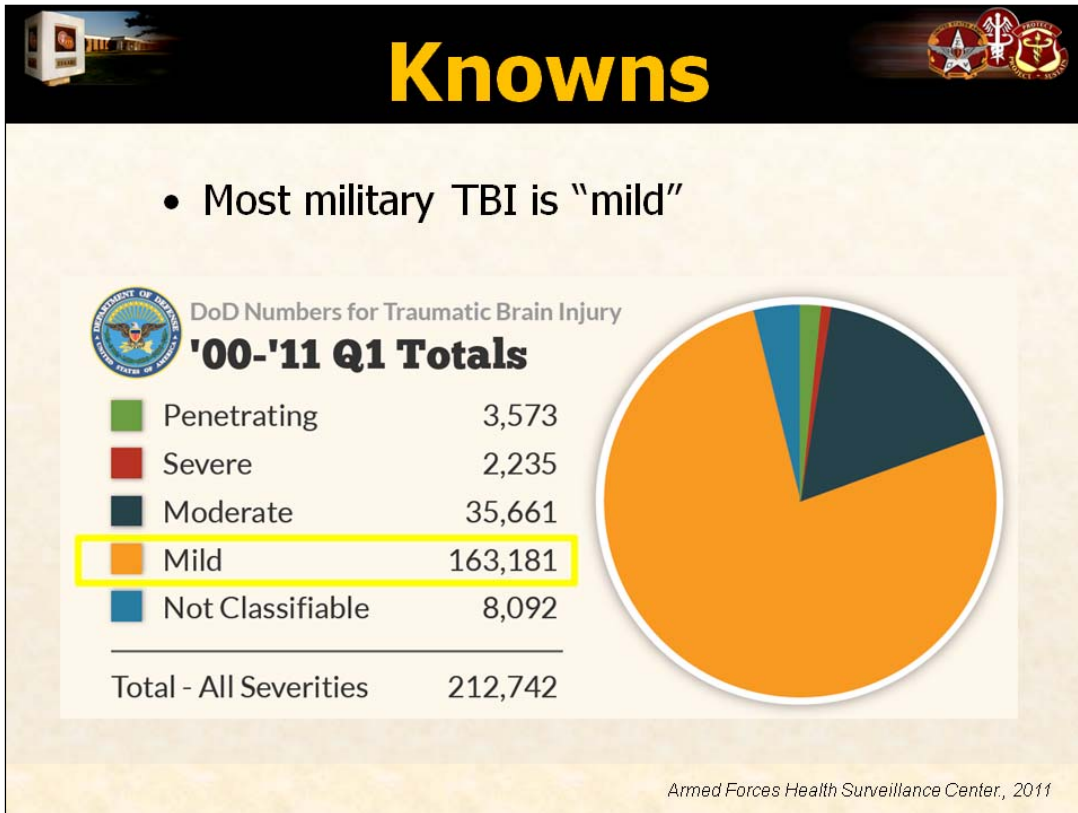
Head/Neck
Other

OIF c.2005



Head
Other

MacGregor et al., 2010





Unknowns



- Which jobs are most affected by MTBI?
- Which jobs would be ruled out?



- Associated sensory injury patterns

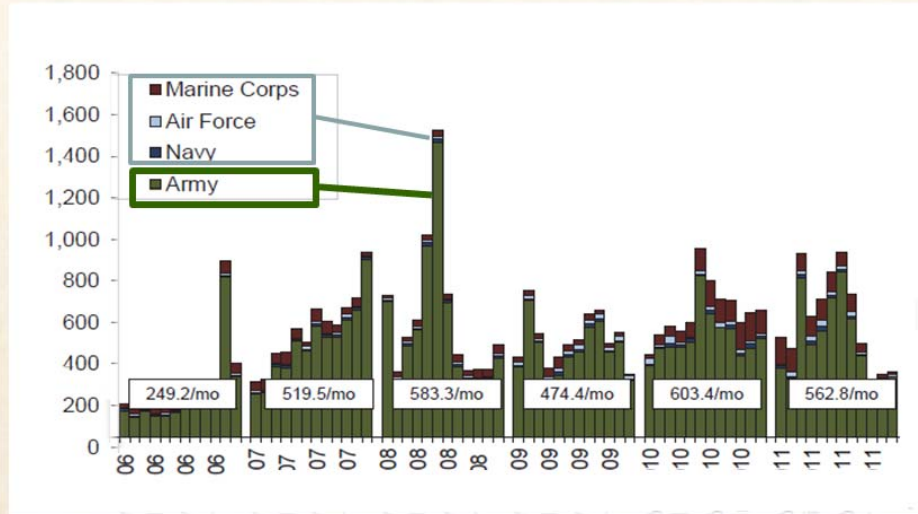




State of Research



- Past studies have broken down TBI by branch of service...



Armed Forces Health Surveillance Center, MSMR, 18(9), 2011



State of Research



...or TBI by source of injury...

Injury	Overall (115 patients)
mechanism	
IED	60 (52.2)
gunshot wound	10 (8.7)
mortar	9 (7.8)
blunt object NOS	6 (5.2)
motor vehicle crash	6 (5.2)
mine	5 (4.3)
blast/fragments NOS	5 (4.3)
rocket-propelled grenade	3 (2.6)
fall	2 (1.7)
crush	1 (0.9)
grenade	1 (0.9)
other/unknown	7 (6.1)



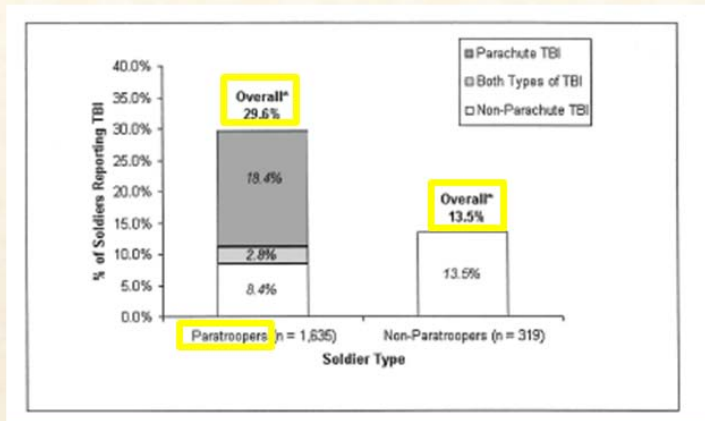
Galameau et al., 2008



State of Research



...or TBI for a specific job hazard...



Ivins et al., 2002

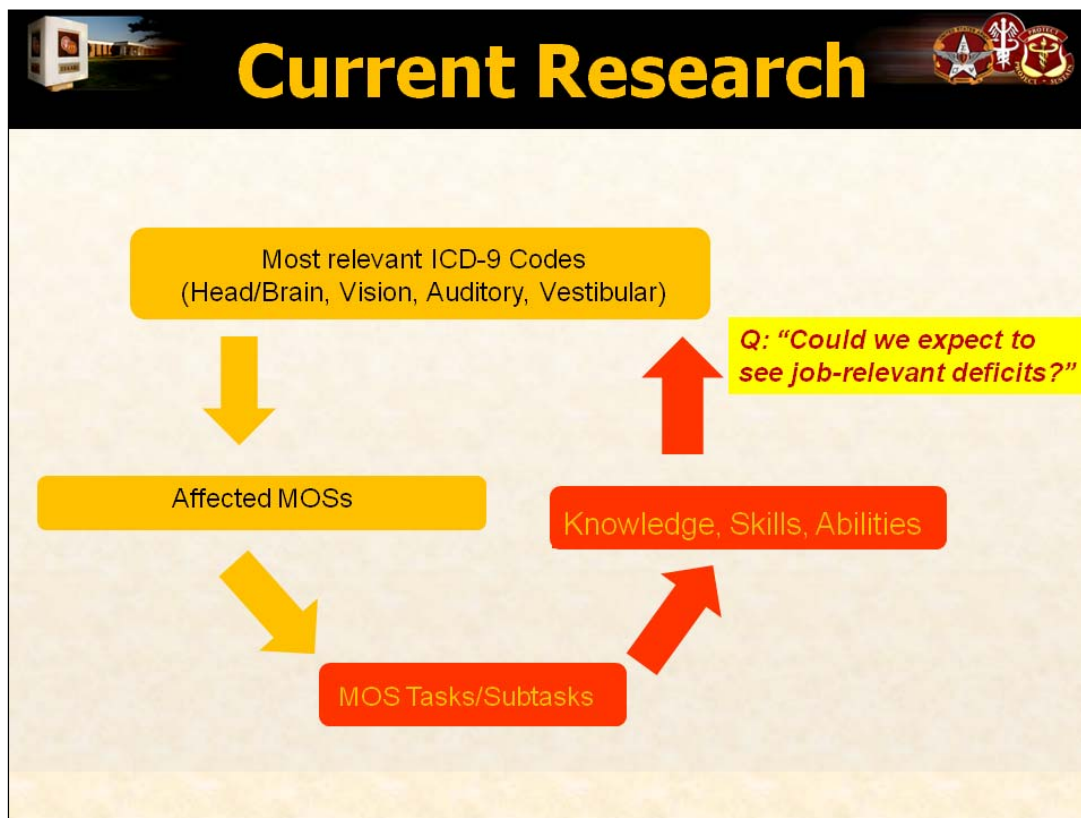
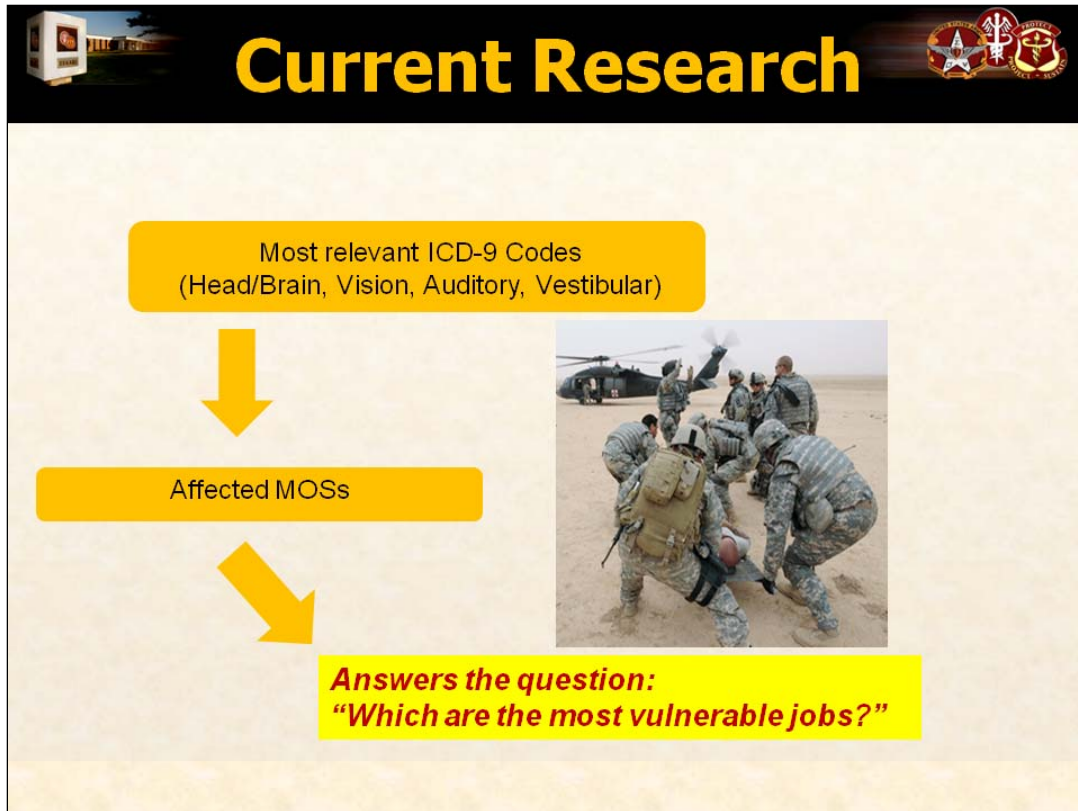


Current Research



- We studied MTBI (and sensory injury) among specific occupations







Key ICD Codes Identified

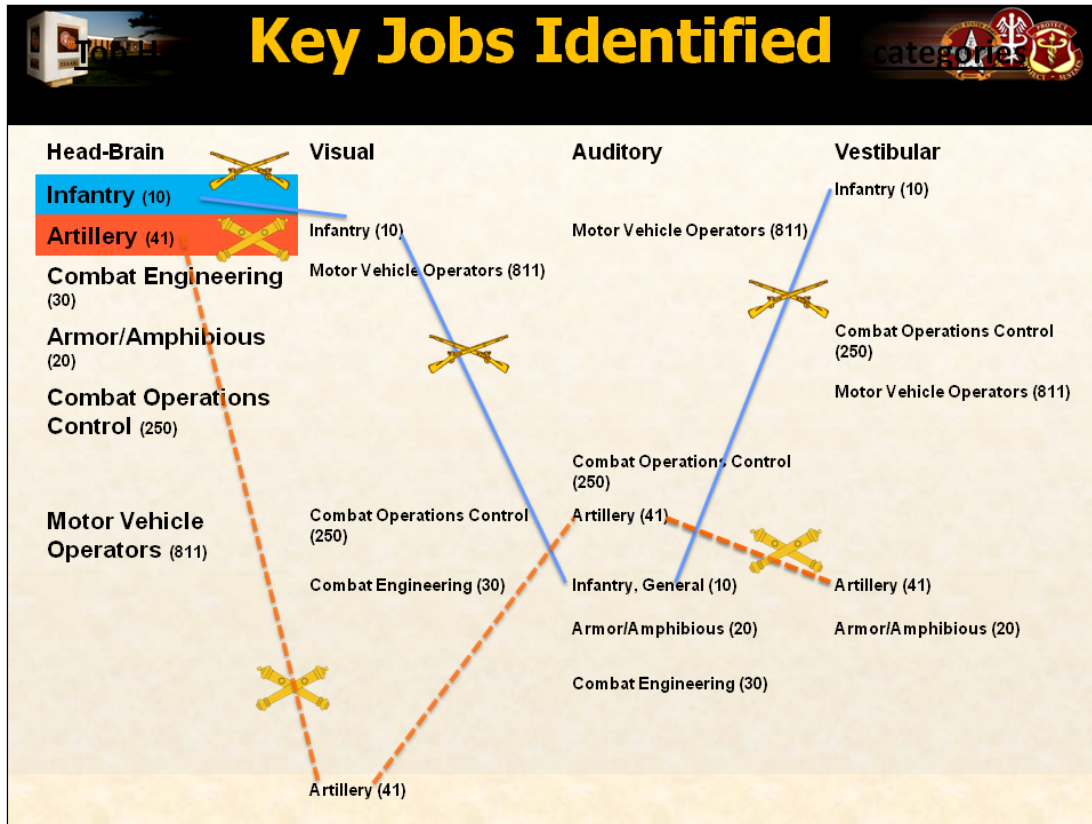


- Started with ~600 ICD codes from Family Practice ICD-9 and a few from the DOD ICD Coding Guidance for TBI



- Narrowed down list with two Ph.D. and two M.D. researchers
 - Cross-checked some items with one Aud.D. and one E.N.T. (M.D.)
 - Selected only consensus items deemed most critical
 - 25 final items

Key ICD Codes Identified			
Head/Brain	Visual	Auditory	Vestibular
310.2 Postconcussion syndrome	918.1 Corneal abrasion	384.21 Central perf tympanic membrane	386.2 Vertigo, central
959.01 Unspecified head injury	940.9 Eye burn, unspec.	388.31 Subjective tinnitus	388.11 Vertigo, benign paroxysmal positional
800 Closed fracture, vault of skull	930.9 Foreign body, eye, external, unspec.	389.03 Conductive hearing loss, middle ear	781.2 Gait disturbance
801 Closed fracture, base of skull	364.41 Hyphema – blood pooling in eye	389.10 Sensorineural hearing loss unspecified	993.0 Barotrauma, otitic
802 Closed fracture, nasal bones	361.01 Retinal detachment, partial, single defect		
803 Unspecified closed skull fracture			
804 Multiple closed fractures, skull/face			
850 Concussion			
851 Cerebral laceration/contusion			
852 Subarachnoid/ subdural/ extradural hemorrhage following injury			
853 Intracranial hemorrhage following injury			
854 Other intracranial injury			



Top Jobs Selected for Further Study

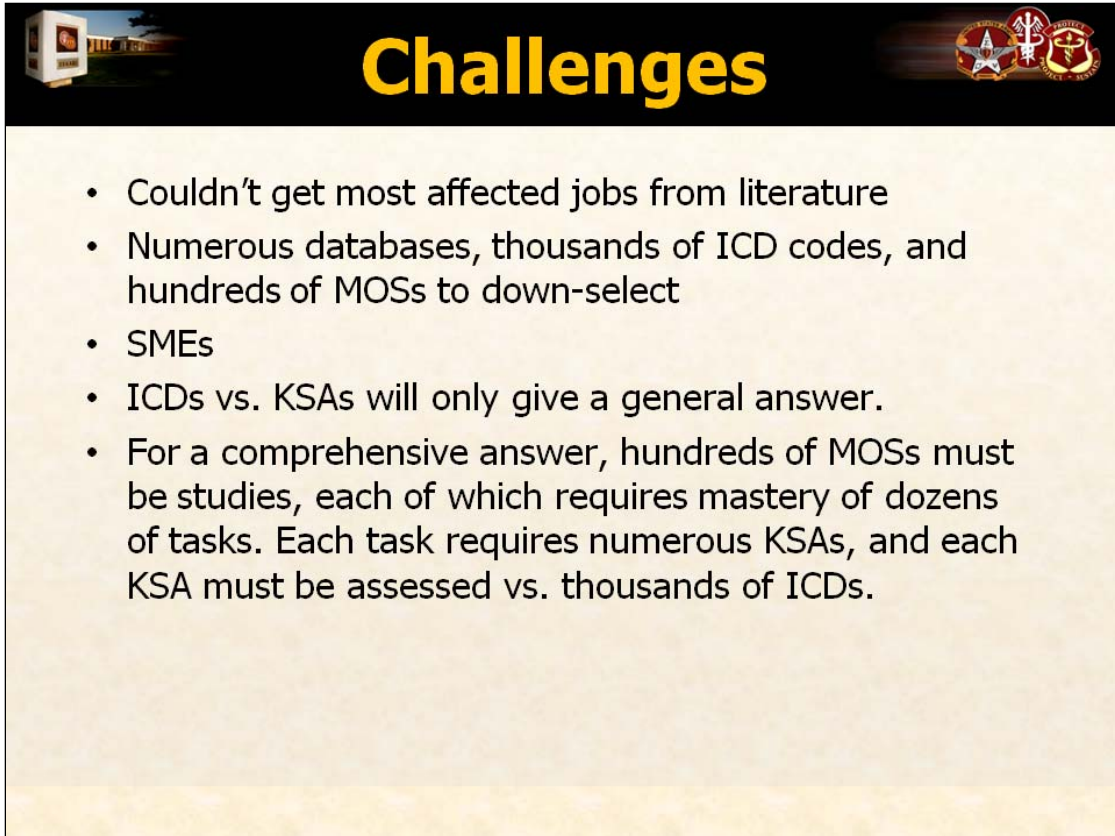
- Infantryman (11B), Artillery (Cannon Crewmember 13B), Cavalry Scout (19D):
Q: "Could we expect to see important job-relevant deficits from these injuries?"





 Job-Relevant Deficits? 						
ICD Categories	Lezak, 2004	Arnold et al, 2008	ORCA	Army-Portal.com	The Infantry Rifle Platoon and Squad, 2007	Soldier's Manual of Common Tasks Warrior Skills Level 1, 2009
Visual: 918.1 (Corneal abrasion) 940.9 (Eye burn, unspec.) 930.9 (Foreign body, eye, external, unspec.) 364.41 (Hyphema—blood pooling in eye) 361.01 (Retinal detachment, partial, single defect)	Sensory Visual		Vision	E-Eyes (2)	Shoot	Firearms Operation

 Job-Relevant Deficits? 			
Infantry Tasks (from Infantry Rifle Platoon & Squad, 2007)	Task Summary	Underlying knowledge, skills, & abilities needed to do tasks	ICD-9 codes associated with KSAs
5. Visual Signaling	Perform signals for: ... Combat formations; ... Battle drills; ... Movement	Social perceptiveness; Problem sensitivity; Judgment, thinking, decision-making; Memory; Near vision; Far vision; Depth perception; Seeing while moving; Finger/manual dexterity; Multilimb coordination; Arm hand steadiness; Closed/reproducible movement	Head-Brain 310.2, 800, 801, 802, 803, 804, 850, 851, 852, 853, 854, 959.01 Visual 361.01, 364.41, 918.1, 930.9, 940.9 A: "Yes" For this task of this job Auditory 384.21, 388.31, 389.03, 389.10 Vestibular 386.2, 386.11, 781.2, 993



Challenges

- Couldn't get most affected jobs from literature
- Numerous databases, thousands of ICD codes, and hundreds of MOSs to down-select
- SMEs
- ICDs vs. KSAs will only give a general answer.
- For a comprehensive answer, hundreds of MOSs must be studies, each of which requires mastery of dozens of tasks. Each task requires numerous KSAs, and each KSA must be assessed vs. thousands of ICDs.

Comment highlights:

Ms. Helmick: Did you do a re-look of the ICD-9 [International Classification of Diseases] codes in the following year, to find out if poor decisions were made about RTD?

Dr. Lawson: Good idea, but no, that was not done. Instead we created a 9-10 year database of primary diagnoses.

Ms. Helmick: Not sure there are data to suggest there really is a problem.

Dr. Lawson: If a job analysis is done, the focus can be on problem areas. Or we could try to find where to focus existing efforts, more globally. We could look at existing tests to find out which picked up critical cases.



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Development and Validation of a Sensitive Marksmanship Task

Catherine Webb
United States Army Aeromedical Research Laboratory
Warfighter Health Division





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U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama



Disclaimer

- The views, opinions, and/or findings in this presentation are those of the authors and should not be construed as official Department of the Army position, policy, or decision.
- Funding: Military Operational Medicine Research Program





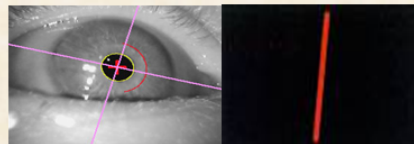
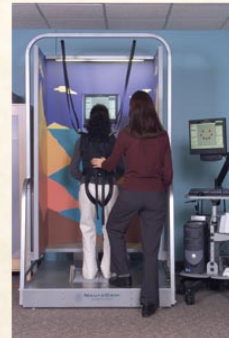
Introduction

- Balance problems and dizziness are common symptoms of mild traumatic brain injury (mTBI)
- Approximately 90% of acute mTBI patients and 80% of chronic mTBI patients exhibit vestibular disorders, including vertigo, dizziness, and disequilibrium (Balaban & Hoffer, 2009)
- No standardized approach for assessing or treating dizziness/balance following concussion/mTBI (Gottshall et al., 2003)



Introduction

- Current vestibular assessments germane to mTBI include:
 - Computerized Dynamic Posturography
Most successful and accepted approach to postural sway assessment (Lawson & Rupert, 2010)
 - Dynamic Visual Acuity
 - Vestibular Evoked Myogenic Potentials
 - Perceived Visual Vertical





Introduction

- Anecdotal reports from occupational and physical therapists indicate that Soldiers recovering from mTBI experience balance-related difficulties with weapons utilization
- Shooting accuracy is a critical task required of all military personnel
 - Good postural balance is a vital component of successful shooting performance; highly skilled rifle shooters have smaller body sway amplitudes than novice shooters (Era et al., 1996)



Marksmanship as Potential Operational Assessment?

- Current weapons qualification tasks are relatively static: prone supported, prone unsupported, kneeling
- A dynamic marksmanship battery that is sensitive to the effects of mTBI may provide more useful information for return to duty (RTD) determinations





Purpose/Aims

- Examine the vestibular and balance-related effects of mTBI on marksmanship abilities and weapons utilization tasks
- Demonstrate if a novel dynamic weapons utilization battery can supplement current RTD assessments



Methods

- A novel dynamic marksmanship battery was developed based on established clinical vestibular assessments
 - Functional Gait Assessment (Wrisley et al., 2004)
 - Berg Balance Scale (Berg et al., 1992; Berg et al., 1995)
- Phase 1
 - Examined reliability of the novel battery
 - Examined battery's sensitivity to induced vestibular disruption (20 second rotation via a Bárány chair)





Methods

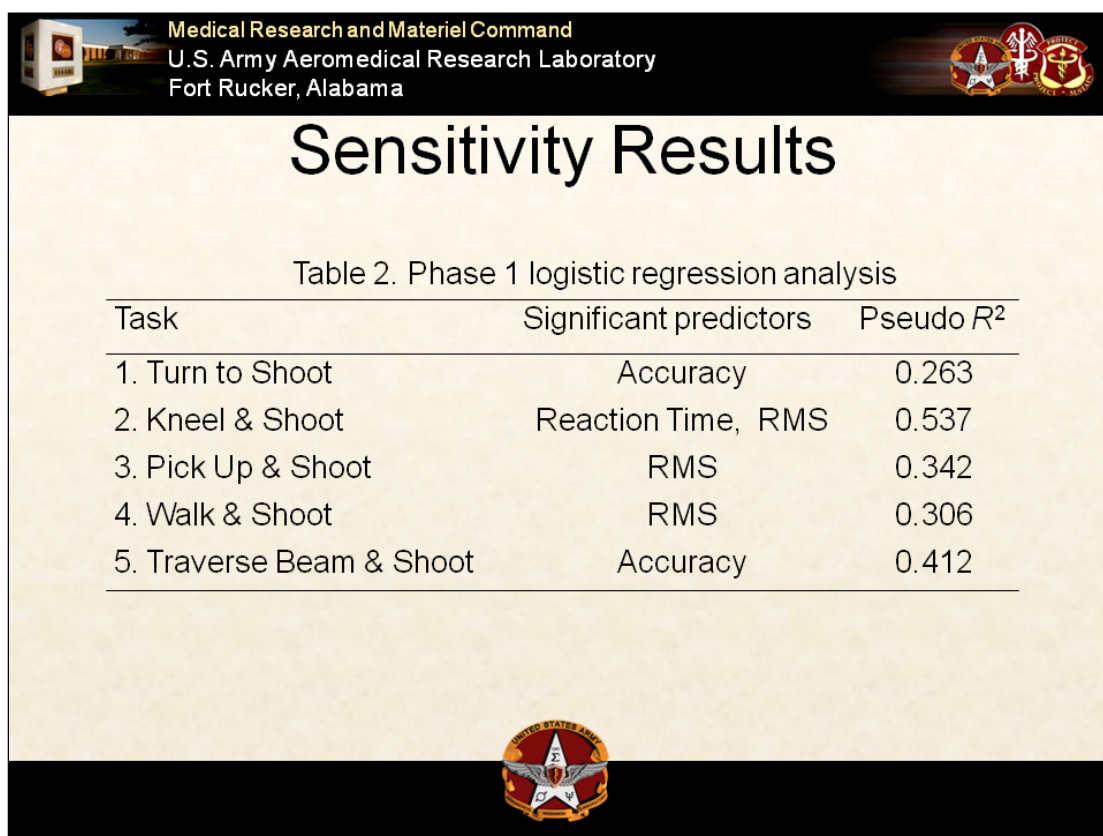
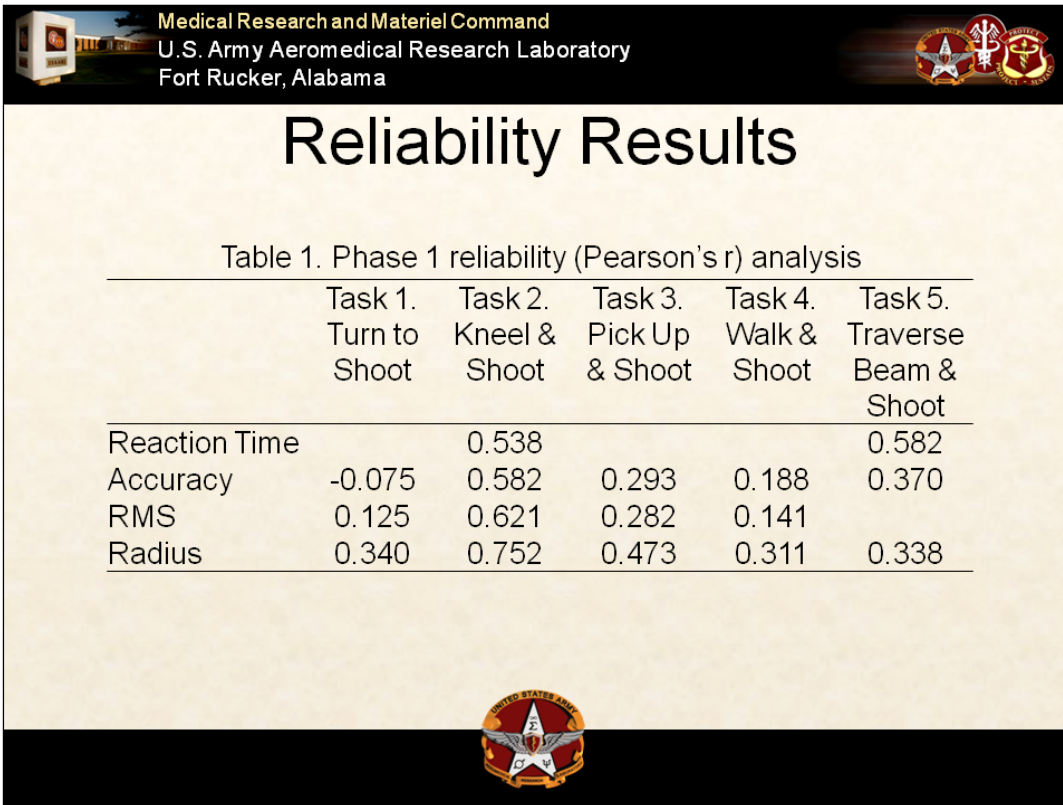
- Participants:
 - 60 U.S. Army Soldiers (Active Duty/National Guard/Reserve) aged 19-45 years with no history of brain injury
- Equipment:
 - Engagement Skills Trainer (EST) 2000 weapons simulator
 - Performance measures = accuracy, reaction time (msec), shot radius, and aiming drift (root mean square [RMS])
- Procedures:
 - Participants completed the new battery on three occasions: day 1, day 2, and again on day 2 after vestibular disruption



Data Analysis

- Reliability: Test-retest correlations were calculated between day 1 and day 2 performance without vestibular disruption
- Sensitivity: Binary logistic regressions were used to classify participants' shooting performance as either normal or after vestibular disruption







Discussion

- Task 2: Kneel & Shoot –most consistent performance
- Limitations of EST 2000
 - Which targets would collect data, dynamic tasks
- Future efforts
 - Phase 2 will examine the effects of mTBI on marksmanship abilities using those tasks that were found reliable and sensitive from the Phase 1 analysis
 - Findings will contribute tasks to be included in an assessment battery (clinical toolkit - Task P deliverable)



General Discussion

- There is a need for improved vestibular evaluation following IED exposure (Lawson & Rupert, 2010)
 - Need “easy-to-use tools which allow rapid and earlier (i.e., further-forward) testing to assist with decisions concerning return-to-duty” (Lawson, Rupert, & Legan, 2012)





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Balaban, C. D., & Hoffer, M. E. (2009). Mild traumatic brain injury: Vestibular consequences. Retrieved from <http://www.dcoe.health.mil/Content/Navigation/Documents/Balaban.pdf>.

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Wrisley, D. M., Marchetti, G. F., Kuharsky, D. K., Whitney, S. L. (2004). Reliability, internal consistency, and validity of data obtained with the functional gait assessment. *Physical Therapy*, 84, 906–918.



Comment Highlights:

Ms. Helmick: Will you add a cognitive task?

Ms. Webb: I can do a shoot/don't shoot task; I want to incorporate it.

Dr. Karen Kelly: I have incorporated a shoot/don't shoot task at NHRC [Naval Health Research Center] in San Diego.

Ms. Webb: Great idea.

COL Bliese: Consider if other populations also show deficits; they know those with depression also show reaction time deficits. This is a key task relevant to all services, to be able to shoot. If there are deficits across different injuries this would be convincing measurement.

Dr. Kelly: With the Marines, I did similar a test and had them run, then do the shooting test. I once got to 30% declined among lower ranking Marines compared to the NCOs [Non-commission officers]. It was a physically demanding task.

Dr. Lawson: Regarding Ms. Webb's shooting task, there are measures of aim trace. When posture is studied, you want to note it is more than sway. You can do it with a functional skill.

COL Bliese: I can see how someone with ankle or knee injuries would also be sensitive.

Dr. Crowley: If anyone is aware of others doing research in this area, let me know, to include them in this exchange. Also, Sister Kenny Research Center [SKRC] has been addressing some of these issues.

The Assessment of Military Multitasking Performance – Dr. Maggie Weightman, SKRC

THE ASSESSMENT OF MILITARY MULTITASKING PERFORMANCE (AMMP): VALIDATION OF A DUAL-TASK AND MULTITASK PROTOCOL

Maggie Weightman PT, Ph.D.
Sister Kenny Research Center



2

AMMP Team Members

USAMRMC: W81XWH-12-2-0070; 15Aug 2012

- Mary Vining Radomski PhD, OTR/L (Co-PI),
Sister Kenny Research Center
- Karen McCulloch, PT, PhD, NCS, University of
North Carolina 
- Leslie Davidson, PhD, OTR/L, Shenandoah
University 
- MAJ Matt Scherer PT, PhD, NCS, USARIEM

Background: SM with mTBI have cognitive, sensorimotor, musculoskeletal injuries that impact return to duty

- **Department of Defense Priority:** Objective assessment measures capable of predicting duty-readiness after concussion
 - **DTM 09-33** (Policy Guidance for Management of Concussion/Mild Traumatic Brain Injury in the Deployed Setting): Functional assessment for SM with multiple concussions
 - **Gray Team III** report to Chairman of Joint Chiefs (4-2011): Importance of standardized assessments and functional metrics for return to duty decisions
- There are no objective, standardized functional assessments that assist in predicting return to duty readiness.**
- Lack sensitivity to high-level functional declines (ceiling effects)
 - Not standardized on military population
 - Lack face validity to SM and decision-makers
 - Measure isolated impairments not integrated, multi-system function

Key Factors in AMMP Task Development

Clinicians use a variety of assessments and methods to inform return-to-duty decision-making; none validated for this purpose.

Decision-makers consider a number of factors when determining duty readiness after mTBI, including the SM's ability to dual task/multi-task, his/her social skills, and the SM's own appraisal of his/her readiness.

AMMP should challenge mTBI-related vulnerabilities that potentially interfere with duty-readiness: balance/vestibular function, cognition, and attention in the presence of distracters.

Key factors must be considered for AMMP to be adopted: test rigor; face validity to SM; practical logistics.



AMMP Concept Specification & Task Development



Hybrid Model – Dual Task and Multitasking

DUAL TASK PARADIGM

- Combined task performance (dual-task condition)
- Examine decrements in each task (dual task interference (or cost))
- Laboratory measures
- **Greater dual-task performance deficits following ABI & sports concussion**

MULTITASKING CONSTRUCT

- Complex task performance (overlapping tasks, interruptions, delayed intentions)
- Observational measures
- **Sensitive to high-level executive dysfunction in ABI**

Interim Development--AMMP Grant

**USARIEM RTT
June 2011**
Performance testing 10
Active Duty SM

**USAMRAA BAA
Submission
September 2011**
USAARL visit by AMMP
team
October 2011

**Collaboration with
USAARL scientists on
Radio Chatter, Functional
Reading Screen
USC psychologist on
SALTE videos
Spring/Summer 2012**

**Fort Bragg/WAMC
meetings on subject
availability, space, IRB,
research coordinator
Summer 2012**

**Collaboration with
USARIEM
neuropsychologist on
Neurocognitive tests for
correlation to AMMP
tasks
Summer 2012**

**Pilot testing individual
AMMP tasks
UNC-Chapel Hill
SKRC Mpls
Spring/Summer/Fall
2012**

AMMP Project Aims 15Aug 2012-14Aug 2014

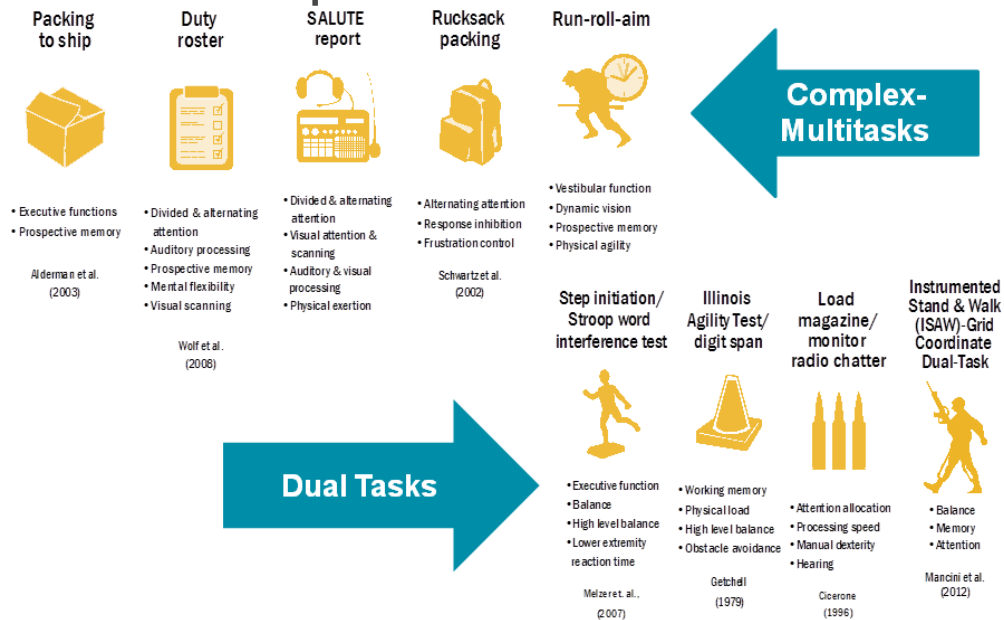
Aim 1: Specify set of dual & multitasks with test administration procedures

Aim 2: Evaluate inter-rater reliability for each task using healthy and SM with mTBI

Aim 3: Determine correlation between scores on neurobehavioral tests and scores on AMMP tasks in healthy control & SM with mTBI

Aim 4: Determine ability of AMMP tasks to discriminate between healthy control and SM with mTBI

Task Descriptions



Run-Roll-Aim Multitask

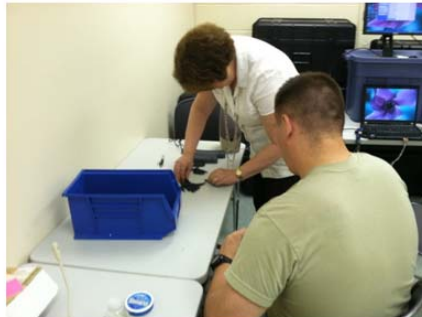


Avoid trip wire
3-5 second rush
Directional Stroop R or L
Combat Roll
Visual Aim
Target ID (odd/even)
Side shuttle
Back pedal

Metrics

Time to complete entire trial
Stroop effect
Errors in task execution
Errors in visual search
Inertial sensor data

Load Magazine-Radio Chatter Dual Task



Metrics

Dual-task cost in:
Rounds loaded/time
Cognitive error

Single and Dual Task Conditions:

- Load M16 Dummy Rounds
- Identify specified key words in Radio Chatter



Planned AMMP Data Collections

- **Sister Kenny Research Center—**

- Final task piloting
- Sept/Oct 2012



- **USARIEM—**

- Inter-rater reliability (IRR) in healthy controls,
- 25 HRV subjects,
- November 2012



- **Fort Bragg/Womack Army Medical Center--**

- Construct and Discriminate Validity, IRR in SM with mTBI
- 80 healthy control and 80 SM with mTBI,
- Estimated March 2013 through June 2014



AMMP Project Deliverables

- **Anticipate having a rich data set on 2 groups of 80 Soldiers**
 - (80 HC and 80 SM with mTBI symptom complex)
- **Preliminary psychometrics**
 - Inter-rater reliability—which task metrics can be reliably scored
 - Construct Validity—how the tasks correlate to underlying domains
 - Discriminate Validity—which tasks metrics distinguish the groups



Challenges and Opportunities in Functional Assessment

Challenges:

- Battery Validation Approaches-Identify successful RTD
 - I: Discrimination between known groups: Duty-Ready vs. Symptomatic
 - II: Input from military decision makers (Clinical and Commanders)
 - III: Longitudinal tracking using TAIHOD; Predictive modeling
- Scoring metrics
 - Individual test task performance vs. comprehensive score? Deficit profile?
 - Test task modularity based on patient presentation ?
- MOS Specificity vs. Broad Application

Challenges and Opportunities in Functional Assessment

Opportunities:

- Testing methods and technology to deliver an assessment battery with potential utility in **deployed** and **garrison** based practice environments.
- Responsiveness to intervention; show progress toward RTD

Acknowledgements

- Marsha Finkelstein MS, SKRC/John Hughes PhD, UMN
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- Kristin Heaton PhD, USARIEM
- Albert "Skip" Rizzo PhD, USC



W81XWH-09-2-0149; 21Aug 2009 *Combat Readiness Check*

- MAJ Sarah Goldman, PhD, OTR/L, CHT, (USARIEM)/R2D
- Kristin Heaton, PhD, USARIEM
- Erica Stern, PhD, OTR/L, University of Minnesota
- MAJ Tanya Roy, DPT, USARIEM
- Amanda Antczak, MS, USARIEM



THANK YOU

Questions?



Comment highlights:

COL Bliese: There is potential. Are there IRB [Institutional Review Board] issues?

Dr. Weightman: My colleagues have visited with BAMC [Blanchfield Army Medical Center]. We are working on IRB forms now.

MAJ Scherer: The challenge is getting onboard with BAMC. It would be helpful to have them as the referral source in order to meet projected sample size.

COL Bliese: There may be the ability to follow the 80 people and get attrition rates, supervisor reviews, and to get predictive validity.

Dr. Weightman: AMMP [Assessment of Military Multitasking Performance] scores are unlikely to do everything. A whole statistical approach is needed to determine the best predictors, including demographic data

Dr. Zambraski: It's a good model to pull expertise from many areas and coordinate the funding.

Dr. Estrada: Getting access to an mTBI population has been difficult. If Soldiers have mTBI and PTSD, they may be restricted from holding a weapon.

Ms. Webb: In her population, all had a blanket statement in their profiles to not allow access to weapons.

MAJ Scherer: Dr. Rábago, have you had any issues with your population?

Dr. Christopher Rábago: We went for a broad assessment battery. Not all were related to weapons handling. I skipped that portion of the battery for some individuals. Not all participants did all parts of the battery. I wanted to get a large sample size. I also got referrals through the WTU [Warrior Transition Unit].

Medical Research and Materiel Command
U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama

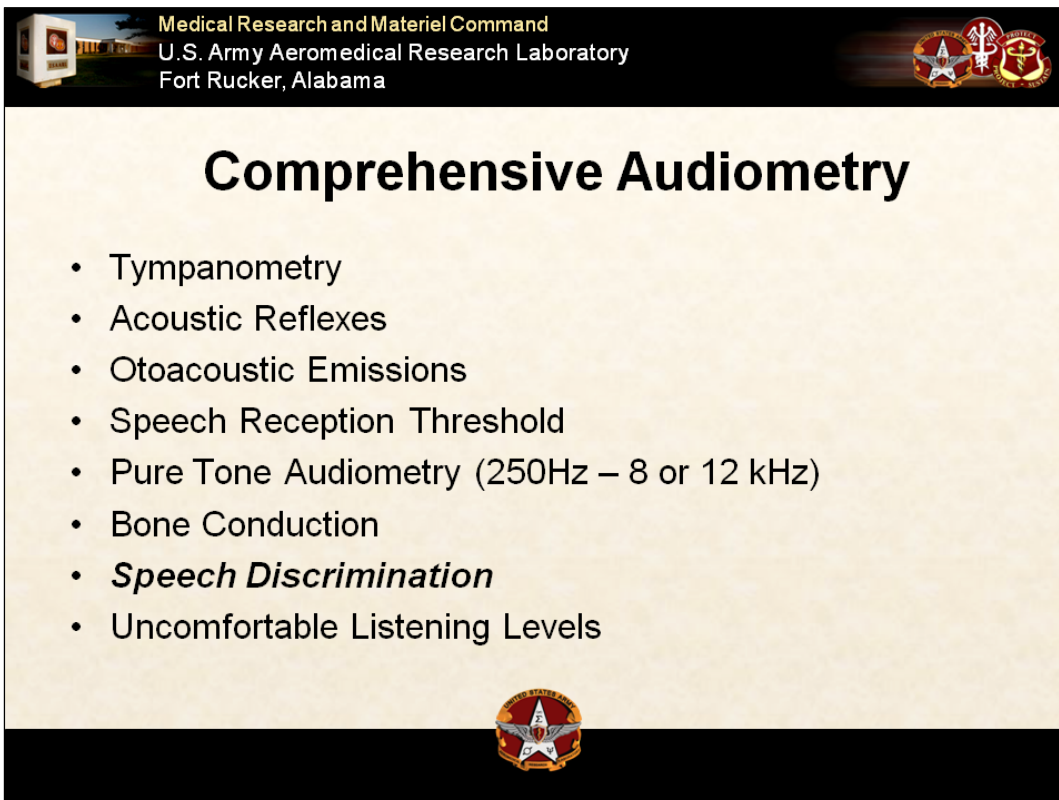


Functional Hearing Assessments

MAJ D. Scott McIlwain, Au.D.
Acoustics Research Branch



Medical Research and Materiel Command
U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama



Comprehensive Audiometry

- Tympanometry
- Acoustic Reflexes
- Otoacoustic Emissions
- Speech Reception Threshold
- Pure Tone Audiometry (250Hz – 8 or 12 kHz)
- Bone Conduction
- *Speech Discrimination*
- Uncomfortable Listening Levels





Early Attempts at Functional Hearing Assessment

- Speech Reception In Noise (SPRINT)
- Quick Speech In Noise (QuickSIN)
- Hearing In Noise (HINT)
- Speech Perception In Noise (SPIN)
- Words In Noise (WIN)



Definition

Functional Hearing – The ability or abilities to not only hear, but hear critical sounds, understand the sounds and complete whatever the assigned task is at an acceptable level.

Soli, S. 2003. Hearing and job performance. Human Communication Sciences and Devices. House Ear Institute, Los Angeles, California.





Influences on Auditory Performance

- Environmental Factors
- Biologic Factors
- Psychological Factors
- Stress Levels
- Complexity of Task
- Background Noise



Aviation Functional Hearing Assessment Objectives

- To determine the relationship between speech intelligibility in standard noise and speech intelligibility in operational noise
- To determine the relationship between clinical measures of SNR loss and flight performance
- To determine a speech in noise threshold (range) that correlates to unacceptable decreases in objective measures of flight performance





Current Protocol

- Relationship between clinical measures of SNR, hearing loss, and flight performance
- Predictor variables
 - QuickSIN
 - Commercially available
 - HINT
 - Commercially available
 - Modified with operational noise
 - Modified with operational noise and military sentences
- Gap detection test



NUH-60FS Simulator





Flight Workload - Visual

Visual Meteorological
Conditions (VMC)
No ceiling
6 SM visibility

Low visibility, fog
1.75 SM visibility

Instrument
Meteorological
Conditions (IMC)
0 SM visibility



Flight Workload - Psychomotor

Low workload	Straight and level flight followed by turns to various headings
Medium workload	Straight and level flight followed by turns to various headings combined with altitude changes
High workload	Straight and level flight followed by turns to various headings combined with altitude and airspeed changes





Flight Workload

Low workload	One-part radio command Ex. "Turn right heading 270°." Read-back task during maneuver
Medium workload	Two-part radio command Ex. "Turn right heading 290°, climb and maintain 2500'." Read-back task during maneuver
High workload	Three-part radio command Ex. "Turn right heading 270°, climb and maintain 2500' while decelerating to 100 knots." Read-back task during maneuver



Signal Quality

- Three levels
- Earphone output signal quality was manipulated and quantified with the Speech Intelligibility Index (SII) method of predicting speech intelligibility
- SII levels
 - 0.8 (good)
 - 0.6 (average)
 - 0.4 (poor)





Dependent/Response Variables

- **Flight performance**
 - Altitude deviation
 - Airspeed deviation
 - Heading deviation
 - ATC readback requests



Conclusion



Comment highlights:

MAJ McIlwain: In many functional hearing assessments, they don't take into account the pre-flight [phase]. Future tests might take that into account.

LTC Teyden: I have worked with pilots. It would be hard to get volunteers for this test.

MAJ McIlwain: I acquired this protocol following the PCS [permanent change of station] of LTC Kristy Casto. It was her protocol. There are trust issues among those with hearing loss.

Dr. Lawson: Do participants get flight hours?

MAJ McIlwain: Yes, they do for participating.

Dr. Estrada: What is the age range for participation?

MAJ McIlwain: It is active duty only.

Dr. Estrada: At Fort Rucker, there are ample retirees for studies, but they don't usually qualify.

MAJ Scherer: Is complexity of environment related to performance?

MAJ McIlwain: My thoughts are experience plays a role, but I lack any data. After 20 years, one can fly in one's sleep.

Dr. Crowley: This way of operationalizing a clinical test would apply to other occupations.

MAJ McIlwain: Other studies have worked with the armor community, but they didn't develop a functional hearing test. If we can prove that it works in one arena, it may catch hold.



ARMY MEDICINE
Serving To Heal...Honored To Serve

State of the Science and Current Research Efforts

“Musculoskeletal Injuries”

Edward J. Zambraski, Ph.D.
Division Chief, Military Performance Division
U.S. Army Research Institute of Environmental Medicine
Natick, Massachusetts
edward.zambraski@us.army.mil



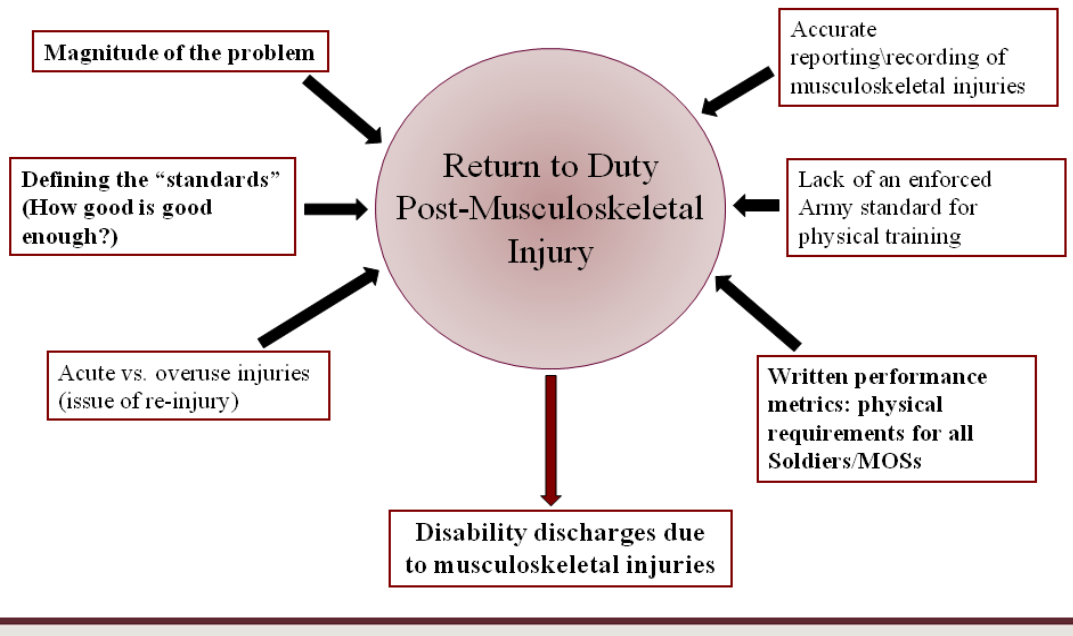
Return to Duty Standards and Strategies After Musculoskeletal Injury (MSI)
Task Area P2

Scope of this overview

- Where is the Task Area – musculoskeletal injuries concerning levels I-VI of the research approach?
- Unique challenges that exist with RTD musculoskeletal injuries.
- Advantages of this task area vs. “psychological and/or neurosensory”
- Disadvantages of this task area vs. “psychological and/or neurosensory”
- Research efforts of other services: Navy/Marines



Challenges of Assessing RTD Status and the Problems with Musculoskeletal Injuries

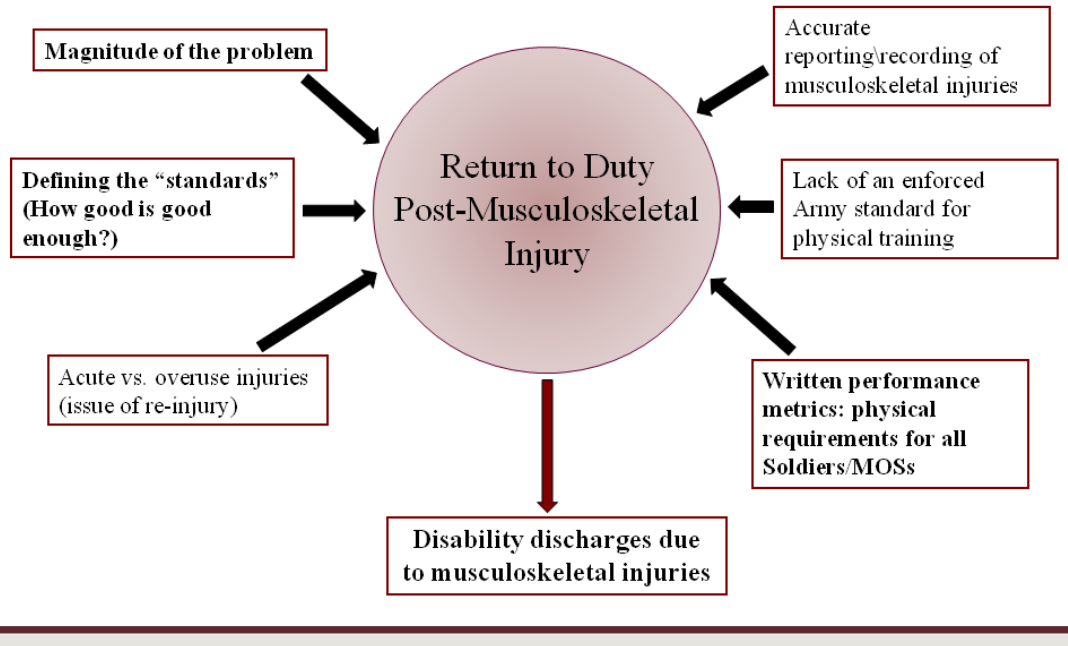


US Army Standards for Physical Training

- Physical requirements/demands of Basic Combat training are reasonably well defined and executed.
- Commanders have the authority and responsibility for physical training.
- **Despite the fact that a huge number of musculoskeletal injuries are incurred during physical training, running, and sports, there is no standard of what is being done (e.g. high intensity training programs).**
- This may be contributing to new injuries, re-occurring injuries and/or negatively affecting the rehabilitation process.



Challenges of Assessing RTD Status and the Problems with Musculoskeletal Injuries



Return to Duty Decisions

Department of the Army

Pamphlet 611-21

Personnel Selection and Classification

Military
Occupational
Classification
and Structure

Date of last approved: 2007



This Army PAM 611-21 defines the physical “requirements” for every MOS.

It is task oriented. Many of the tasks are not well defined (e.g. simply performing something vs. performing to a “standard”). The physical requisites or attributes needed to complete the tasks successfully are NOT defined.



Return to Duty Decisions

DA PAM 611-21

Table 10-11B-1

Physical requirements for MOS 11B (Infantrymen)

Skill level

Tasks

1. Frequently walks, runs, crawls, and climbs over varying terrain for a distance of up to 15 miles, during a 24 hour period, while carrying 153 pounds evenly distributed over entire body.
2. Must be able to repeatedly rise from a prone position and sprint for 3 to 5 seconds
3. Carrying a minimum of 111 pounds, evenly distributed over entire body, for a distance of no less than 100 meters.
4. Occasionally raises 299 pound person 3 feet as a member of a two man team.
5. Frequently lifts and lowers 45 pounds bags shoulder high.
6. Frequently throws 1 pound object 35 meters.
7. Frequently lifts 45 pounds waist high.



Musculoskeletal RTD Standards versus WTBD/DA 611-21 Standards for Accession/Retention

Warrior Task and Battle Drills
US Army PAM 611-21
Knowledge, Skills and other Attributes (KSAOs)

Advantages

- We have written stated physical requirements
- These requirements should be similar to RTD standards following musculoskeletal injury

Disadvantages

- They are not scientifically based and they may not be accurate
- While the “tasks are described, the actual physical requirements (e.g. strength, endurance, speed, mobility) are not defined
- “How good is good enough?

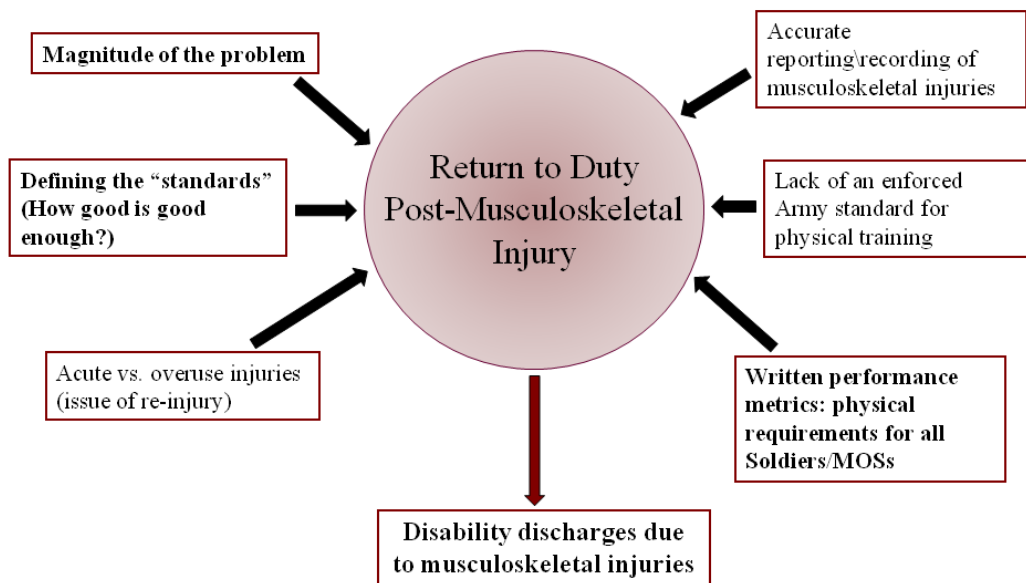


Physical RTD Standards versus Standards for Accession & Retention

- The only current Army-wide physical performance standard is the Army Physical Fitness Tests (APFT).
- The APFT does not measure “Soldier Task Performance.”
- Work at USARIEM to develop “Soldier Task Performance Tests” is well advanced.
- These assessment tools are applicable to RTD standards.



Challenges of Assessing RTD Status and the Problem with Musculoskeletal Injuries





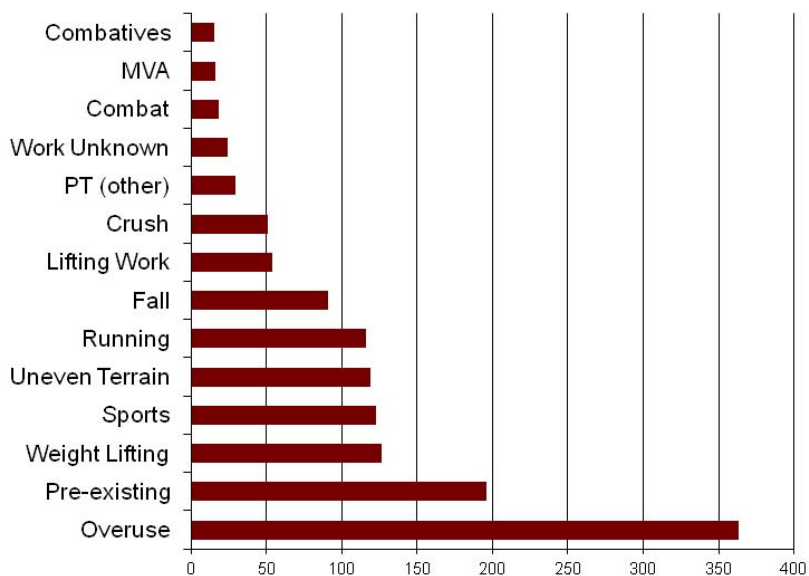
Musculoskeletal Injuries and Mechanisms of Injury in an IBCT (Afghanistan)

MAJ Tanja Roy (USARIEM)

- Patients treated by the 3rd Infantry Brigade Combat Team 10th Mountain Division Physical Therapist
- March 2006-May 2007
- 8 Forward Operating Bases
- 3066 Records
-1626 new evaluations

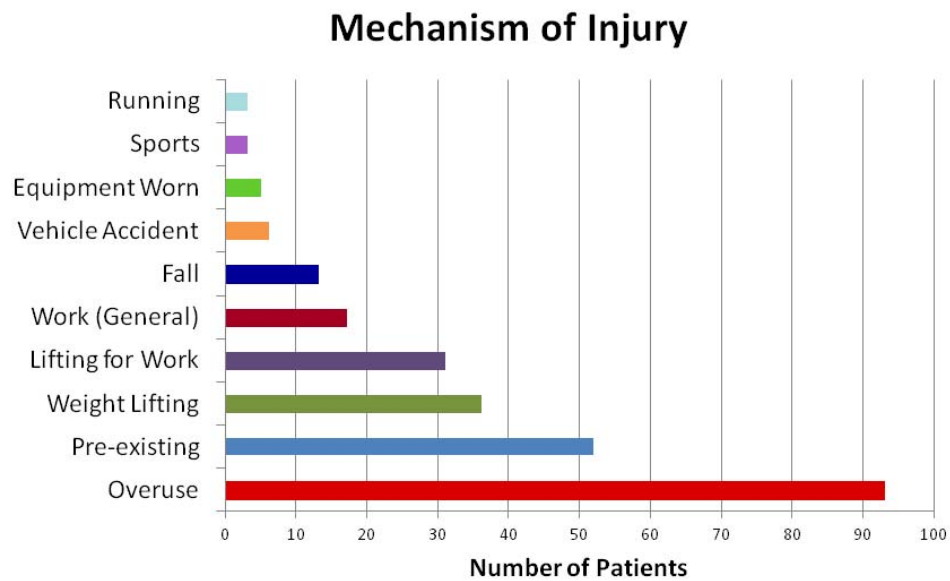


Mechanisms for all Musculoskeletal Injuries

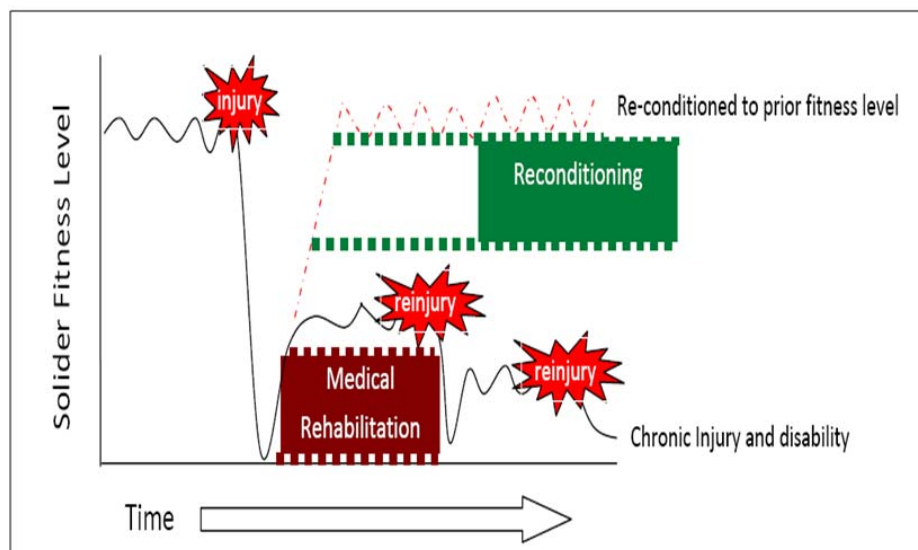




Mechanisms for Back Injuries



Musculoskeletal Injury/Re-injury Cycle





Overuse and Re-occurring Musculoskeletal Injuries

Overuse Injuries

Overuse injuries, versus an acute musculoskeletal injury, are far more complex, and difficult to treat.

They result from the cumulative effect of repetitive physical demands.

We are only beginning to characterize and quantitate the cumulative physical demands associated with deployment.

Re-occurring Injuries

One of the greatest predictors of the occurrence of a musculoskeletal injury is the history of site specific prior injury.

This may be due to incomplete healing or rehabilitation.

We need better clinical methodologies/technologies to assess musculoskeletal tissue status/function.



Research Approach to RTD Standards and Strategies for all three research areas

- I. Based on epidemiological data, define the top 5-7 conditions responsible for loss of duty time.
- II. Relevant metrics: amount of lost duty time, when they returned, issue of re-injury, those who never return, etc.
- III. The “clinical” approach: current practices, evidence of efficacy.
- IV. Development of Assessment Tools/Decision Aids
- V. Define “standards” for Soldier physical/cognitive performance
- VI. Application of Assessment Tools/Standards: Determine if metrics change.



Musculoskeletal Injuries & Return to Duty

Presentations

I. MAJ Owen Hill, USARIEM



Magnitude of problem (epi), metrics RTD issues, tools available, research effort (Levels I, II, and III)

II. Dr. Karen Kelly, Naval Health Research Center (NHRC)



Efforts outside of US Army/MRMC Navy/Marines (Level III)

III. Ms. Marilyn Sharp, USARIEM

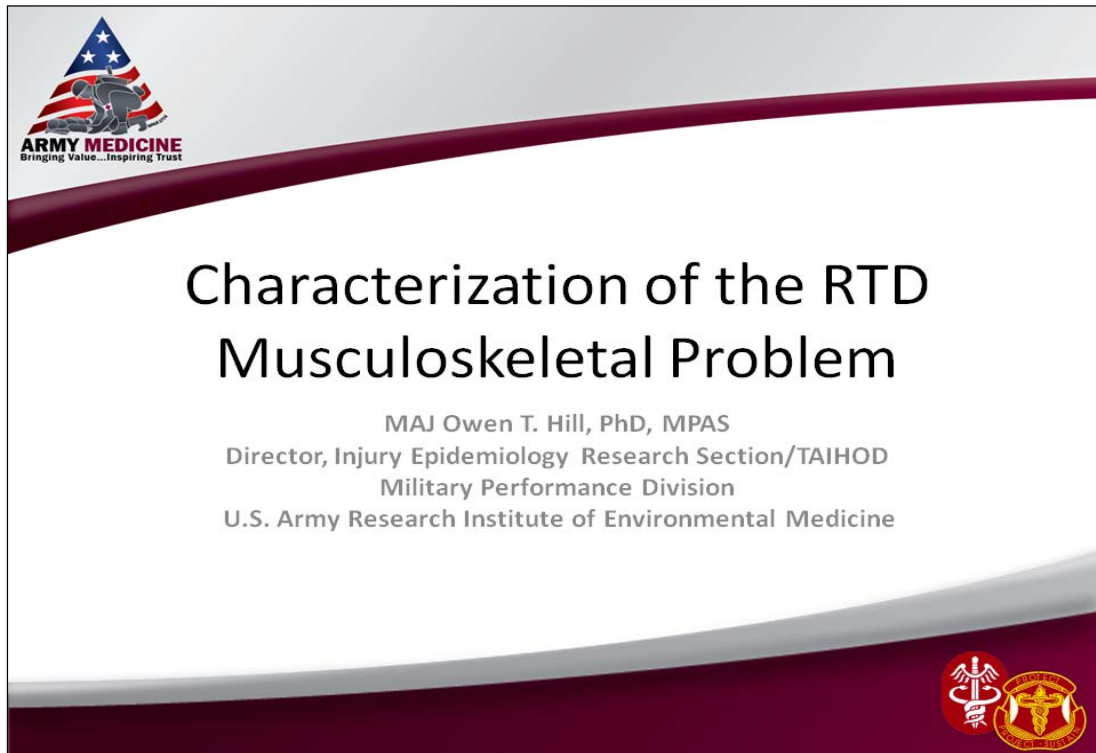


Measures of Soldier Task Performance (Levels IV, V)

Comment highlights:

Dr. Zambraski: There is a wide array of musculoskeletal injuries. Accurate reporting and/or recording of musculoskeletal injuries is a problem which is starting to be studied more. Over use is the most common cause of injury. Overuse injuries versus acute musculoskeletal injuries are far more complex and difficult to treat. We need better clinical research to assess whether the injury has healed.

MAJ Hill: Recently, a [military] base began a 5 day-a-week, 90 minute PT [physical training] program; the problem is not ubiquitous.



The 'Presentation Overview' slide has a similar layout to the title slide, with the Army Medicine logo in the top left and the USAMDCS and USARIEM logos in the top right. The title 'Presentation Overview' is centered. The content is organized into sections, each preceded by a purple diamond icon. The 'Problem' section states that Musculoskeletal Injuries (MSI) are a persistent detrimental health threat to the U.S. Army. The 'Epidemiology' section asks for the leading causes of MSI loss of duty time. The 'Data Considerations' section lists questions about data repositories, defining RTD outcomes, and data sharing. The 'Return to Duty (RTD) Predictive Model' section lists questions about essential variables, data sharing agreements, and stakeholders. The 'Assessment' section asks about existing clinical/surveillance tools. The slide has a white background with a maroon and grey wavy border at the top.

Problem: Musculoskeletal Injuries (MSI) are a persistent detrimental health threat to the U.S. Army that affects Soldiers, unit readiness, and mission accomplishment

◆ **Epidemiology:** What are the leading causes of MSI loss of duty time ?

◆ **Data Considerations**
Data:

- * Which systems/data repository can support RTD mission?
- * How best to define RTD outcome?

◆ **Return to Duty (RTD) Predictive Model**

- * Essential variables ?
- * Data sharing agreements ?
- * Stakeholders ?

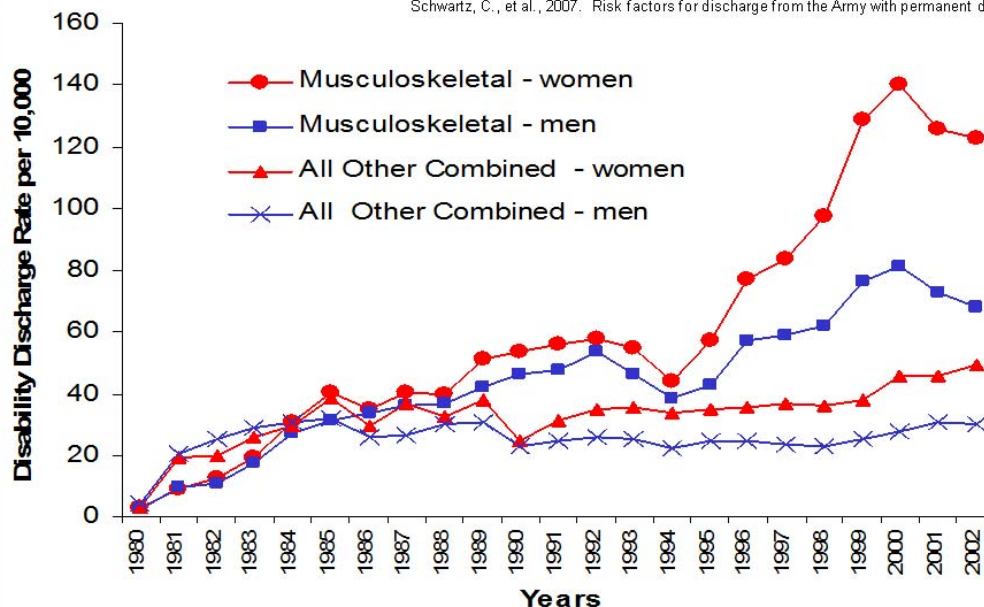
Assessment: What clinical/surveillance tools exist to support RTD mission?

*The above slide printed as presented

Musculoskeletal Disability



Schwartz, C., et al., 2007. Risk factors for discharge from the Army with permanent disability.



Musculoskeletal Injury



S66

Hasnet et al / Am J Prev Med 2010;34(13):S61-S70

Table 3. Injury-related musculoskeletal condition matrix for the active duty Air Force, Army, Marines, and Navy, 2006^{a,b}

Body region	Inflammation and pain (overuse)	Joint derangement	Joint derangement with neurological involvement	Stress fracture	Spmin/strain/rupture	Dislocation	Total	Total %
Vertebral column								
Cervical	36,932	5,390	7,972	0	0	0	50,294	6.8
Thoracic/dorsal	0	751	15,244	0	0	0	15,995	2.2
Lumbar	114,562	18,078	12,684	0	0	0	145,324	19.5
Sacrum, coccyx	4,720	0	0	0	0	0	4,720	0.6
Spine, back unspecified	72,755	7,283	2,831	283	0	0	83,152	11.2
EXTREMITIES								
Upper								
Shoulder	54,460	7,014	0	0	2644	2,368	66,486	8.9
Upper arm, elbow	7,392	313	0	18	0	33	7,756	1.0
Forearm, wrist	18,037	691	0	37	0	28	18,793	2.5
Hand	11,146	320	0	0	657	50	12,173	1.6
Lower								
Pelvis, hip, thigh	26,509	394	0	179	229	23	27,334	3.7
Knee, lower leg	140,161	17,490	0	6,800	1335	535	166,321	22.4
Ankle, foot	89,598	6,498	0	0	371	229	96,696	13.0
UNCLASSIFIED BY SITE								
Others and unspecified								
Other specified/multiple	5,882	273	0	404	114	16	6,689	0.9
Unspecified site	29,690	365	5,048	6,261	430	20	41,814	5.6
Total	611,844	64,860	43,779	13,982	5780	3,302	743,547	—
Total %	82.3	8.7	5.9	1.9	0.8	0.4	—	100

^aIncludes injury-related musculoskeletal conditions from outpatient visits and hospitalizations; primary and nonprimary diagnoses were included.

^bMedical encounters (outpatient visits or hospitalizations) for the same injury-related musculoskeletal condition diagnosis (ICD-9-CM) within 60 days of the first hospitalization or outpatient visit were excluded to minimize duplicate counts of the same injury.

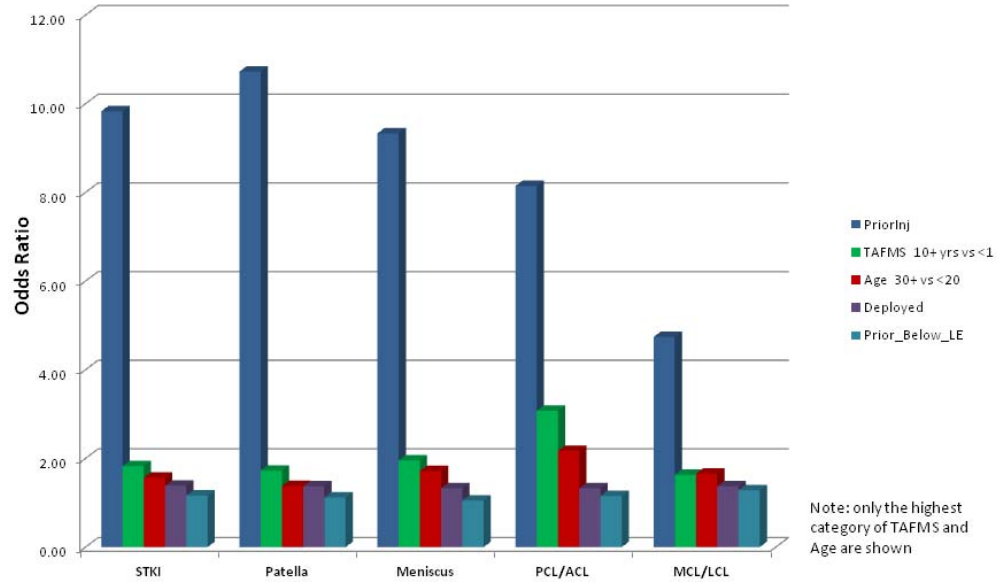


Soft Tissue Knee Injuries



Top five Risk Factors for Soft Tissue Knee Injury

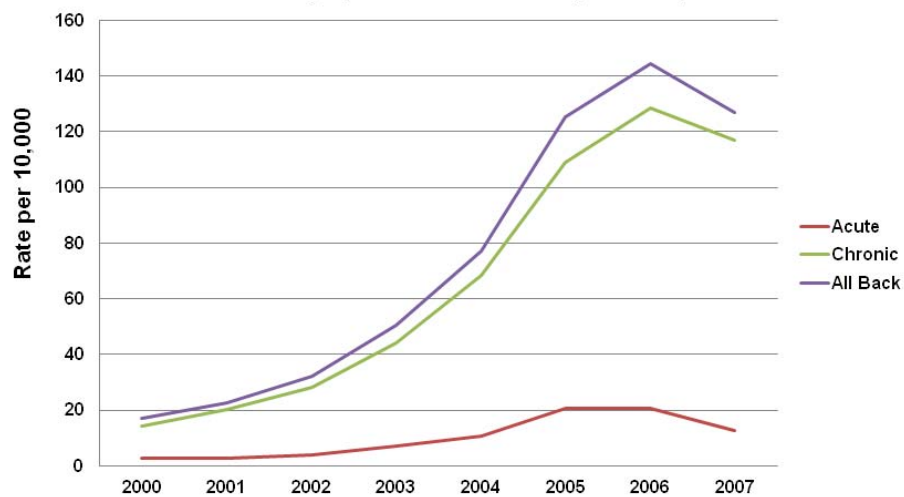
Results derived from 2012 TAIHOD knee injury data.



Lumbar Spine MSI



Back Injury Rates in Active Duty US Army



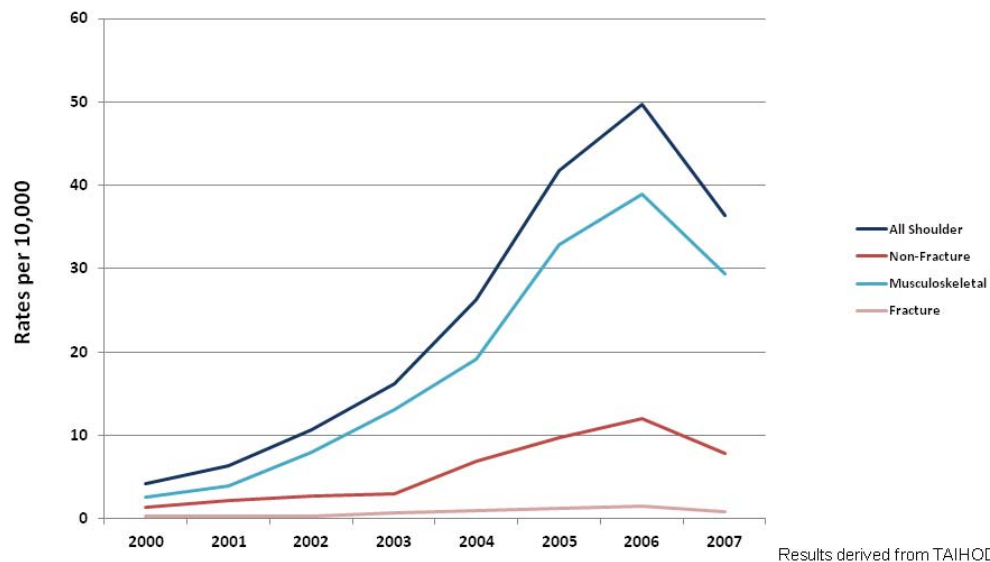
Results derived TAIHOD back injury data.



Shoulder MSI



Shoulder Rates



Data Considerations



Data: First steps

- ⊕ Criterion variable (RTD)
 - ⊕ Expend methodological effort ascertaining reliable indicators for RTD
 - ⊕ RTD is not an official status in the Army; rather it is an informal phrase indicating a Soldier's resumption of 'normal duties' after a period of 'lower than normal activity'
 - ⊕ Need to quantify markers of RTD following MSI:
 - ⊕ Expiration of temporary/permanent profile in eProfile
 - ⊕ improvement of Soldier health profiles (PULHES)
 - ⊕ Soldier is deployable after not being deployable for physical health reasons
 - ⊕ Soldier not entering the Army disability system after MSI
 - ⊕ Soldier not leaving a regular unit for a Warrior Transition Unit after MSI



Data Considerations



Predictor variable

- ✦ Selection of essential data elements
 - ✦ Known risk factors for delayed RTD
 - ✦ Demographic data
 - ✦ Clinical encounter data
 - ✦ Occupational data
 - ✦ Profile data/Disability discharge data
- ✦ Stakeholders
 - ✦ within MRMCM, USARIEM, greater Army, funders, DoD, outside contractors/universities
- ✦ Many more customers will emerge – priorities?
- ✦ Many more datasets will become available – priorities?
- ✦ Essential to inform/support existing RTD research data stewards



Data Considerations



- ✦ Data Repository
 - ✦ What DoD systems contain the essential RTD data elements?
 - ✦ eProfile, TAIHOD, DMDC, MDR
 - ✦ Which data repository/system can house RTD data and support the RTD mission?
 - ✦ Who should be responsible for stewarding data?
 - ✦ Relationships between datasets
 - ✦ Which databases can talk with one another?
 - ✦ Leveraging this communication is paramount



Data Considerations - eProfile



- ✦ e-Profile
 - ✦ a relatively new (2011) software application within the MODS suite
 - ✦ allows global tracking of temporary and permanent medical conditions that may render Soldiers medically not ready to deploy
 - ✦ All unit level providers and MTFs are using this system
- ✦ Components of eProfile include:
 - ✦ Automated Profile Form using the Artificial Intelligence Process
 - ✦ MOS Medical Retention Board (MAR2) Status Tracking
 - ✦ Medical Evaluation Board (MEB) Status Tracking
 - ✦ Physical Evaluation Board (PEB) Status Tracking
 - ✦ Statistical Reporting of all Components of the e-Profile Application
 - ✦ Captures Medical Specialty Referral for Soldiers
 - ✦ e-Profile Contains PHI and is Required to be HIPAA Compliant
- ✦ Can we tap into eProfile and link with TAIHOD for comprehensive analysis?



Future Direction



Developing a Clinical Tool for Return to Duty Guidelines





Background



Reed Group, Ltd. of Westminster, CO provides a commercial database known as MDGuidelines (<http://www.mdguidelines.com>) to which the US Dept. of Defense (DoD) has an active global enterprise license.

MDGuidelines, built upon over 4.5 million records, contains a predictive model that isolates independent variables contributing to disability duration and calculates a likely outcome at the onset of a work absence episode.

Utilizing the DoD active global enterprise license, USARIEM and the Reed Group will work in unison on this proposed project.



Purpose



To develop and validate a clinical tool, similar to MDGuidelines, which will yield a standardized range of expected RTD time intervals adjusted for a Soldier's demographics, occupation, co-morbidities, and actual injury.





Methodology



This study will use data from the Total Army Injury and Health Outcomes Database (TAIHOD), which is an epidemiologic data repository for the ADA and contains data from existing DoD administrative and medical systems.

To begin:

A retrospective cohort study will be conducted from records of Soldiers entering the Army 2000 through 2010 ($N > 1$ million).

From these records, a subpopulation of Soldiers with a MSI will be identified.

Multivariate statistical models will be used to calculate RTD intervals.

Data will focus on four core characteristics known to impact RTD from MSI:

- ⊕ Demographic
- ⊕ Occupational
- ⊕ Behavioral
- ⊕ Medical

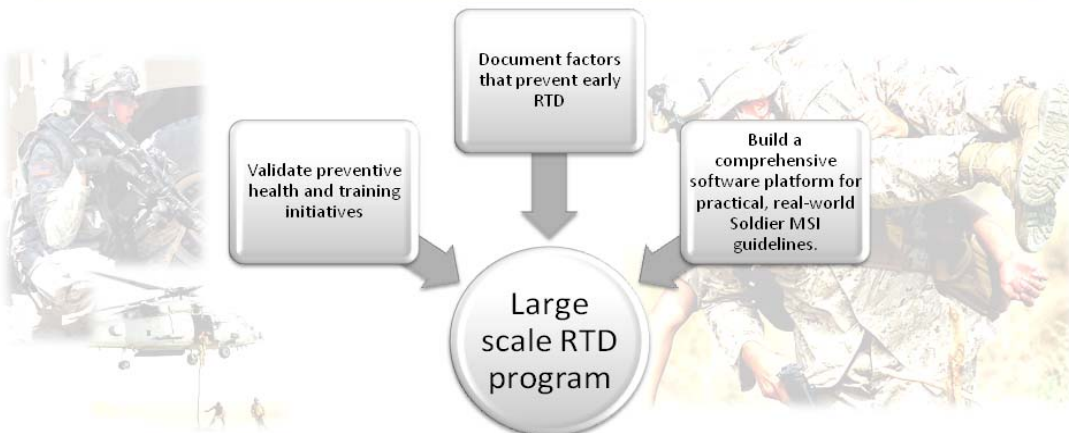


Implications/Applications



We will detail the RTD time intervals for each type of MSI, derived from actual ADA data, after controlling for demographic, occupational, behavioral, and co-morbid factors.

Utilizing this tool will enable Army clinicians to easily standardize temporary and permanent profiles across the service.



Comment highlights:

MAJ Hill: I manage the TAIHOD [Total Army Injury and Health Outcomes Database] database. It has data on over 5 million Soldiers. Musculoskeletal injuries are known to be detrimental. Knee, ankle/foot; lumbar/spine, and shoulder are most prevalent sites of injuries. At some point we need to draw the line and begin to analyze the data. Considerations include what DoD systems contain the essential RTD data elements: eProfile, TAIHOD, DMDC [Defense Manpower Data Center], or MDR [Master Data Record]? Who should store and steward the RTD data? Which databases can talk to each other?

Dr. Estrada: Many researchers can't get access to databases.

MAJ Hill: Yes; it is a challenge.

Dr. Susan Proctor: eProfile is not set up for research access.

MAJ Hill: That is true. I look for ways to access it because of its granularity.

Dr. Weightman: Regarding Medical Evaluation Board decisions, if her [clinical] tests show that the Soldier is not progressing, how does she know if the Soldier ended up being successful in civilian life; or if he/she could have stayed in the military? Should I be following them in civilian life?

MAJ Hill: Yes. We could develop a VA [Veterans Affairs] relationship to look at that. I capture what occurs throughout the career of those in the military.

Dr. Kelly: I have a 9-week rehabilitation program. I will be doing a follow-up survey up to one year after the rehab to determine if tools were effective in their everyday lives, especially after they separate from the military.

Dr. Weightman: Is the idea of VA follow-up reasonable?

Dr. Rábago: There is a mandate to do DoD-VA translation research.

LTC Deydre Teyhen: That is significant; historically funds were divided.

Dr. Estrada: If [MAJ Hill] could de-identify the data, I could provide research assistants to do the analyses.

MAJ Hill: Those datasets aren't comprehensive enough to do everything. In TAIHOD, we end up with de-identified data. It captures occupational and demographic data, skill sets, vaccinations, etc.

Musculoskeletal Injury Return to Duty



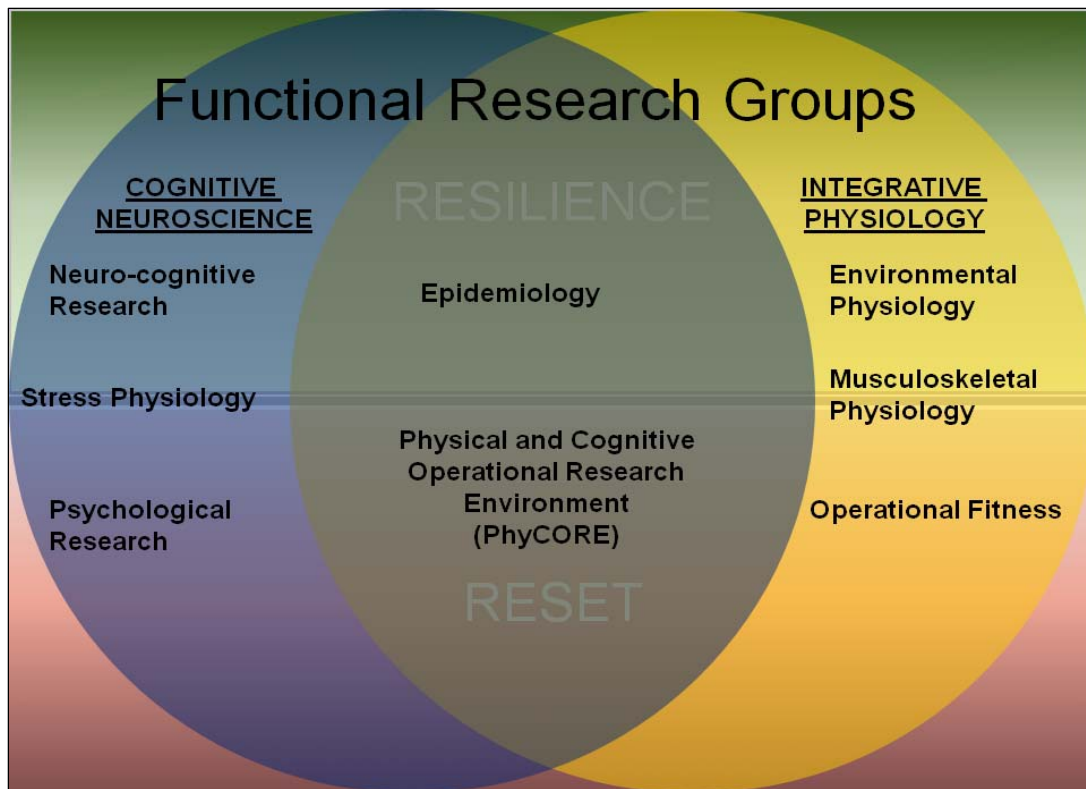
Karen R Kelly, PhD

DEPT 162 WARFIGHTER PERFORMANCE

MISSION

Leverage science and technology with operational know-how to improve the mission-specific performance of the Warfighter, now and in the future.





Emergency Medical Evacuation Database



- Comprehensive Tri-service database of all battle and non-battle injuries from 2001- present
 - Data is most accurate from 2007- present
- Linked to medical records
- Identify injuries based on ICD-9 codes

Combat Injury Trends



All battle injuries:

Total = 294,893
 Army = 251,137
 Marine = 12,383

Total musculoskeletal injuries:

Total = 142,253
 Army = 123,137
 Marine = 4,876

Rank	ICD9 code	Definition
1	724.2	lumbago
2,3	719.46	joint pain, lower extremity
3	845	ankle sprain
4	724.5, 847.2	back-ache, lumbar spine sprain
5	719.41	shoulder joint pain

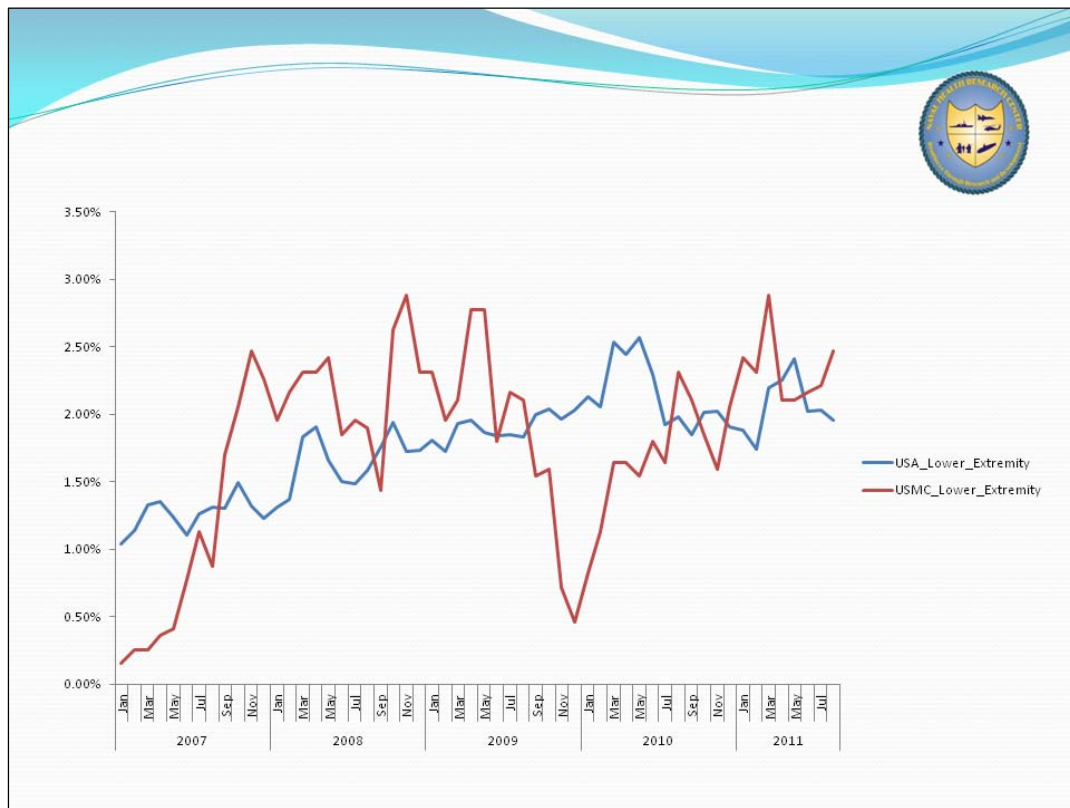
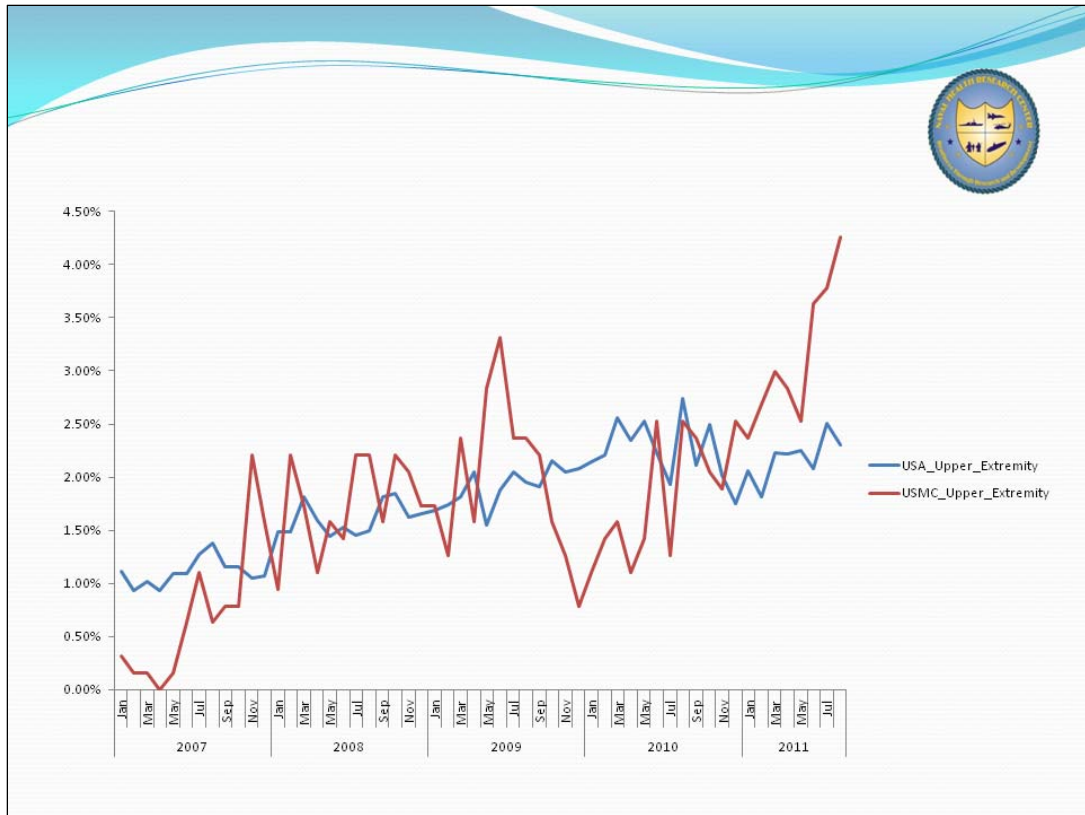
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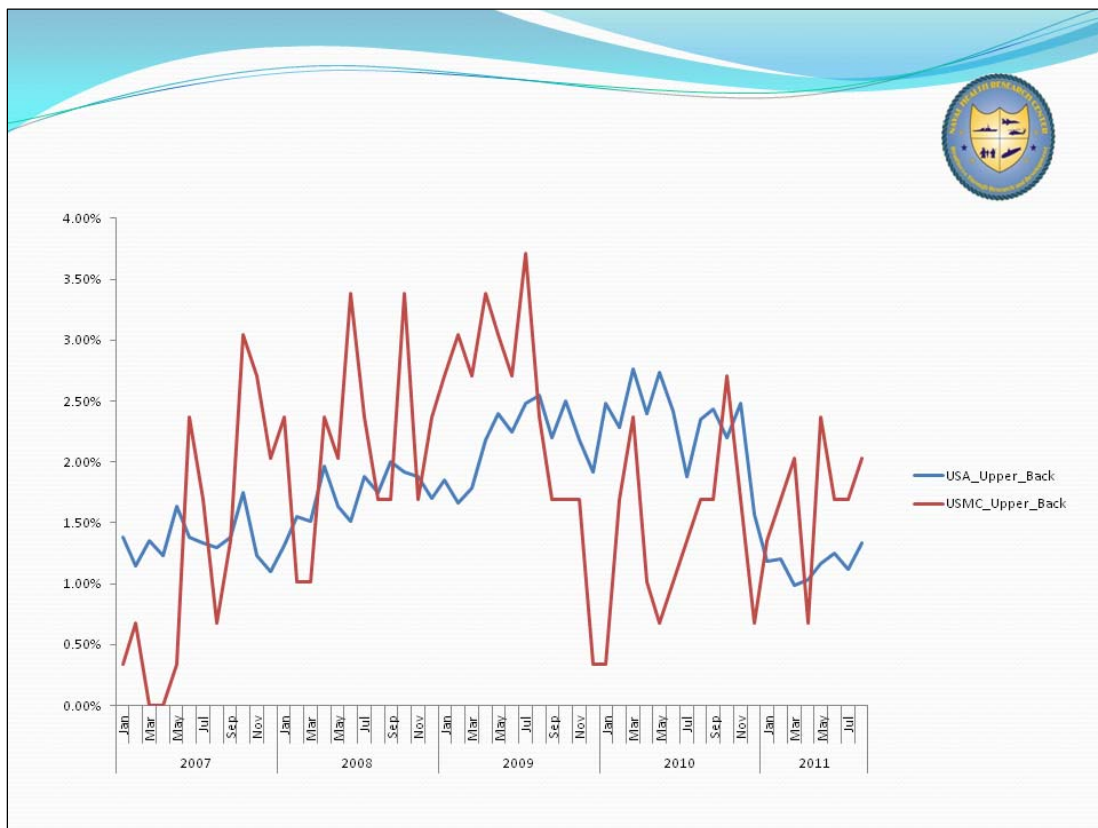
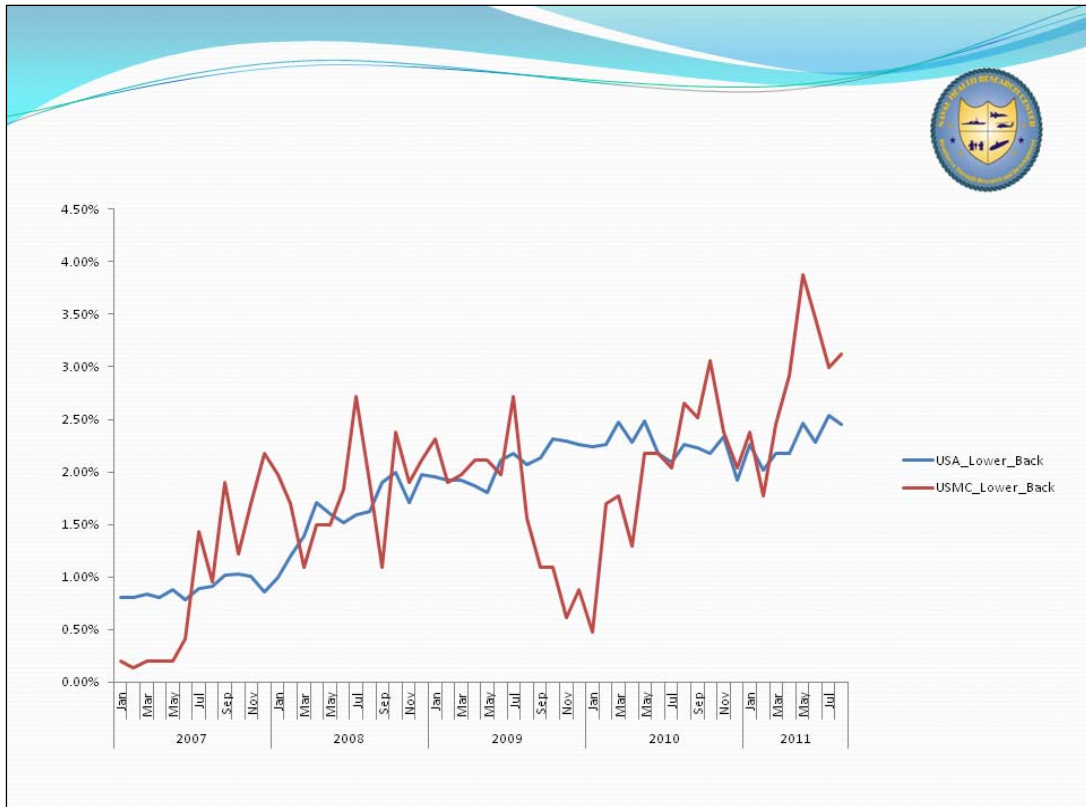
Total = 48%
 Army = 49%
 Marine = 39%

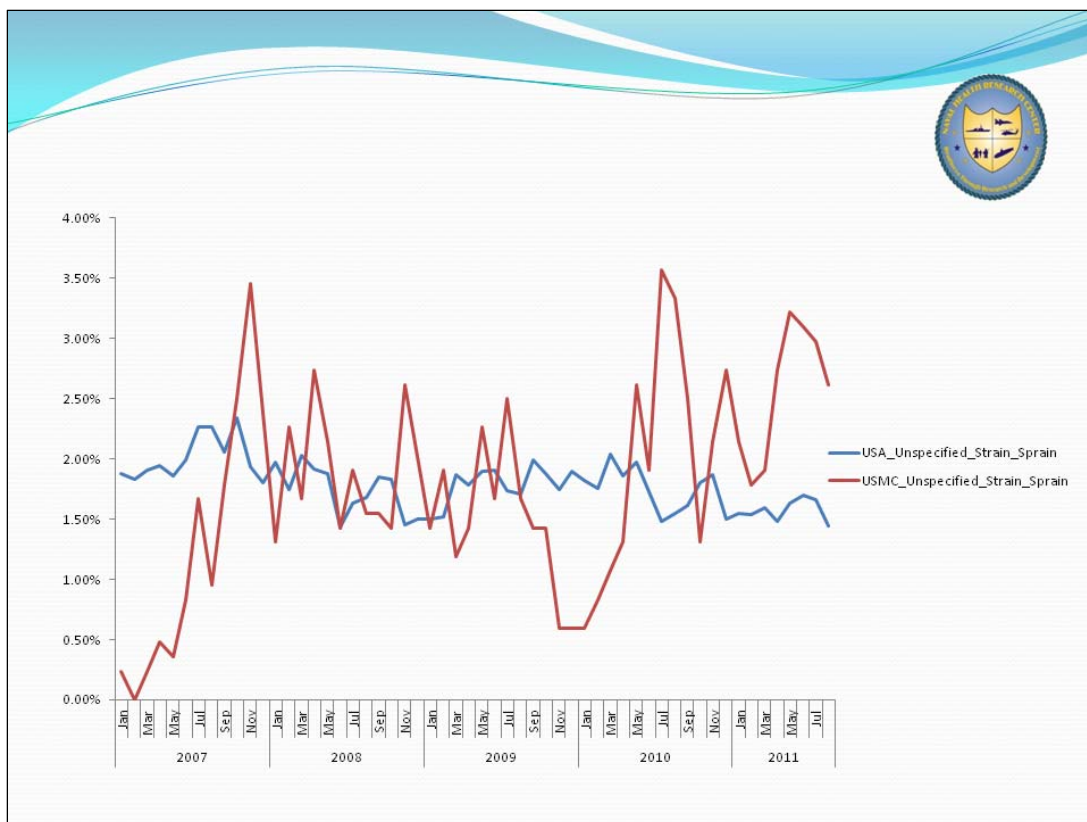
Emergency Medical Evacuation Database
 Data provided by Dept 161, Mike Galameau



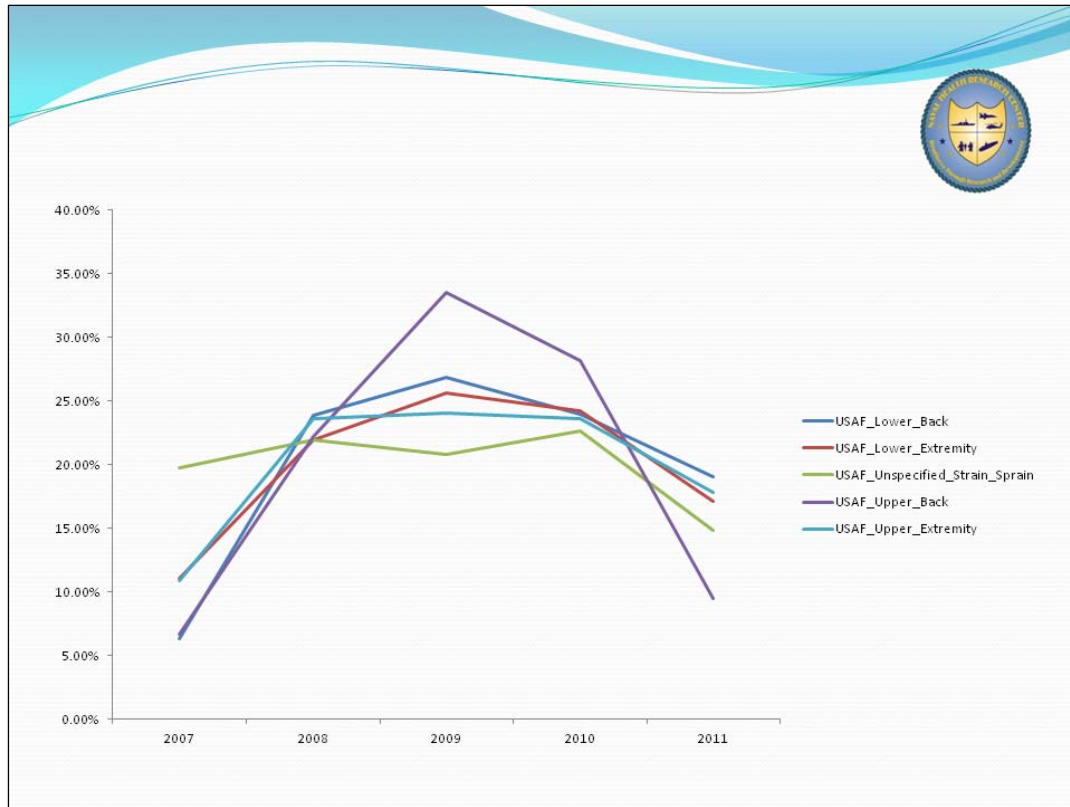
	USA_Lower_Back	USMC_Lower_Back	USA_Lower_Extremity	USMC_Lower_Extremity	USA_Upper_Extremity	USMC_Upper_Extremity	USA_Upper_Back	USMC_Upper_Back
2007	10.63%	10.74%	15.12%	12.71%	13.29%	8.52%	16.21%	15.20%
2008	19.21%	21.69%	19.82%	26.13%	19.24%	20.98%	20.60%	25.34%
2009	24.83%	20.33%	22.84%	22.33%	22.91%	23.66%	25.93%	29.05%
2010	26.95%	24.27%	25.73%	20.16%	27.08%	21.77%	27.97%	16.89%
2011	18.37%	22.98%	16.50%	18.67%	17.48%	25.08%	9.29%	13.51%







MOS	5 & 10K			15K			20K		
	Pack Wt (lbs)	Total Load Wt (lbs)	Load % of BW	Pack Wt (lbs)	Total Load Wt (lbs)	Load % of BW	Pack Wt (lbs)	Total Load Wt (lbs)	Load % of BW
311	65.1	75.3	42.2	67.2	77.4	43.9	62.5	72.6	41.7
321	69.1	79.3	44.6	62.4	73.4	41.1	56.9	67.1	38.0
331	64.2	74.3	39.8	63.1	105.9	57.6	60.3	120.7	66.6
341	60.9	70.9	40.2	63.4	99.4	55.5	61.6	102.9	58.5
351	60.3	70.3	38.0	61.5	90.5	50.2	60.3	92.7	51.8
352	66.5	76.7	41.3	60.6	84.1	45.4	65.0	129.3	70.3
Total Average	64.0	74.1	41.2	65.1	84.8	47.5	62.0	86.6	49.1

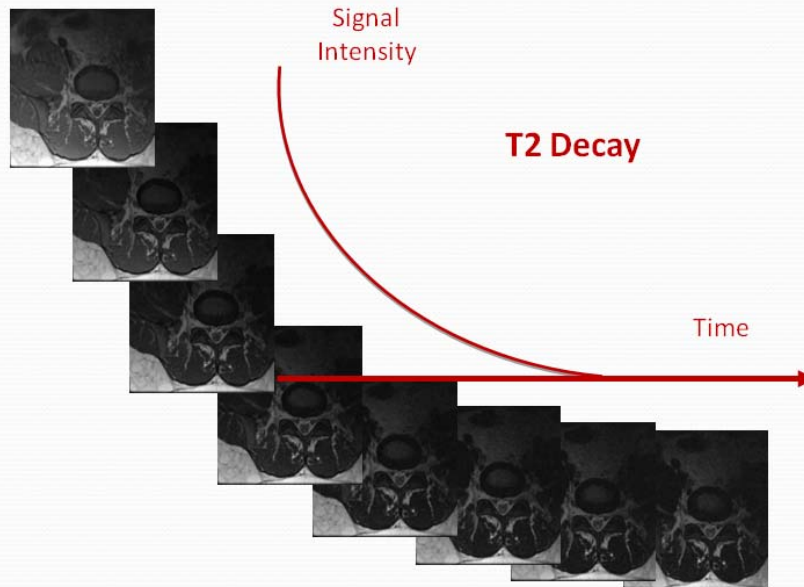
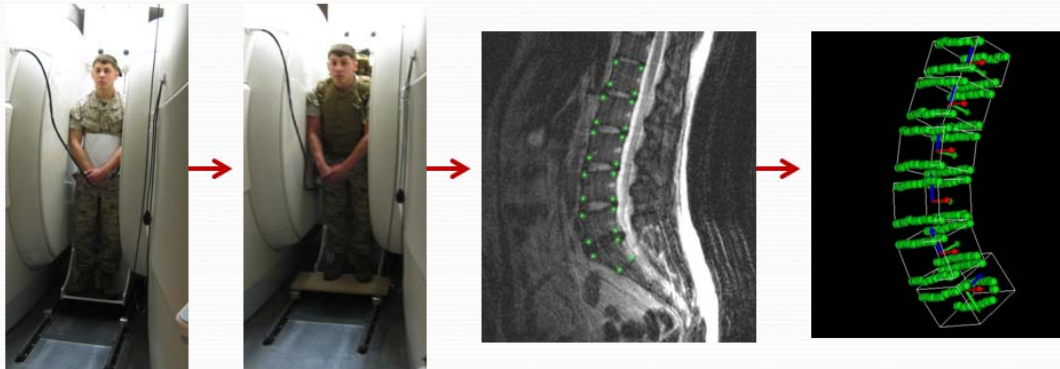


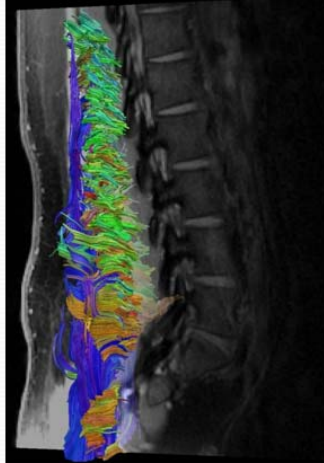
Integrative Physiology

Prevention and protection against future injuries through research that merges science with Warfighter operational needs:

- Effects of Load Carriage on Spine Kinematics
- Nutrition and Over training injuries
- Load Carriage on GCE and marksmanship
- Injury trends in combat
- Exercise therapy for PTSD in residential treatment facility

Load Carriage





Exercise RX-PTSD



- 9 week in patient program- OASIS (San Diego)
- Wounded Warriors
- Goal to RTD, improve quality of life
- Combination of therapies
- Re-structuring exercise program
 - Physiological changes
 - Improvements in sleep
 - Overall improvements in mood

PhyCORE Lab



Physical and Cognitive Operational Research Environment

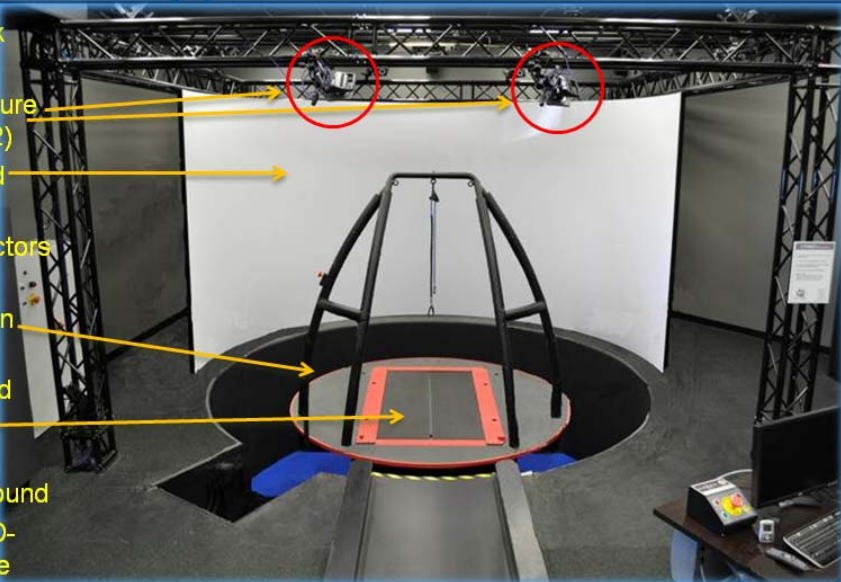
Utilize immersive technology for operational relevance, specifically to define the capabilities and limits of today's Warfighter



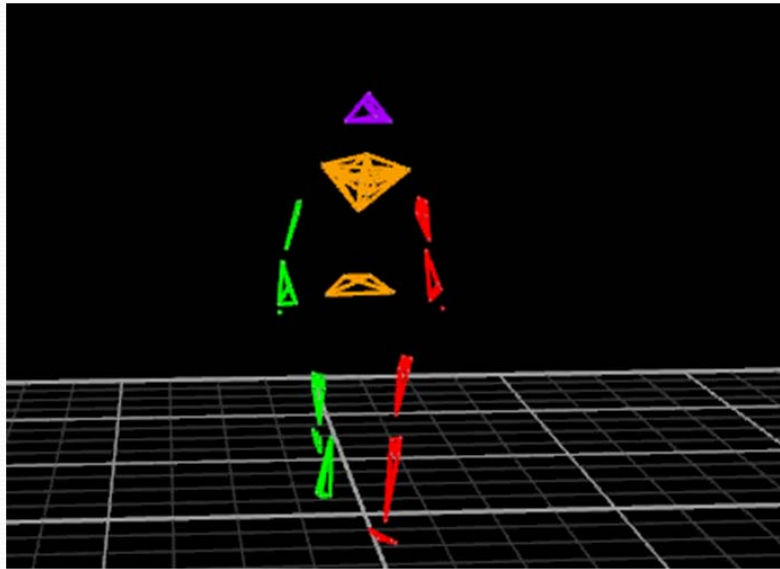
Technology Overview

CAREN (Motek Medical)

- Motion Capture cameras (12)
 - 180° Curved Screen
 - Video Projectors (3)
 - 6DOF Motion Platform
 - Instrumented Split Belt Treadmill
 - Surround Sound
 - Integrative D-flow software
- Additions: wireless controllers, EMG, EKG, airsoft weapons, scent system



Biomechanical Data Collected



Current Projects



1. Able-bodied CAREN database (gait)
 - Walking with and without visual flow
 - More than 50 active duty participants
2. Amputee database (gait)
3. Sensorimotor learning in an immersive environment (boat study)
4. The use of self-paced walking function in the CAREN
5. Use of the CAREN for treatment of TBI patients with vestibular disorders
6. Rapid rehabilitation of lower limb amputees to decrease falls

Vestibular PT Rehabilitation vs. Traditional PT



- **Purpose:** to determine the effectiveness of different treatment methods for persons having problems with balance.
 - Use the CAREN to test the agility of subjects in a variety of reproducible conditions.
 - Compare with those using traditional (TVPT) methods at NMCS

CAREN Treatment



- At each session, subjects performed 4 different virtual activities that required different physical tasks to challenge the subject's balance:
 1. Walking on road with cognitive tests
 2. Hill path with target hitting
 3. Afghanistan mountain walk
 4. Boat racing
- Difficulty of application increased as performance improved

Road with cognitive tasks:



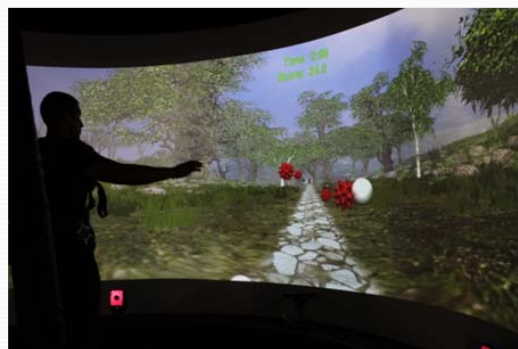
- Self selected walking speed
- Cognitive tasks
- Perturbations



Hill path and hitting targets:



- Walking over small hills with platform matching the terrain.
- Swatting at moving targets.



Afghanistan mountain walk:



- Walking through Afghanistan mountains with platform matching terrain
- Target identification



Boat Race:



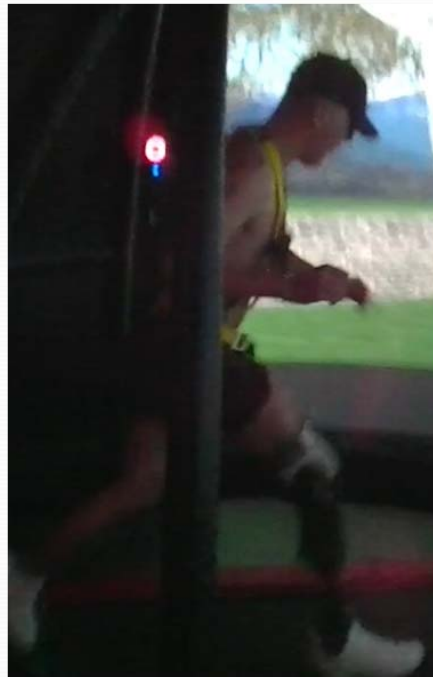
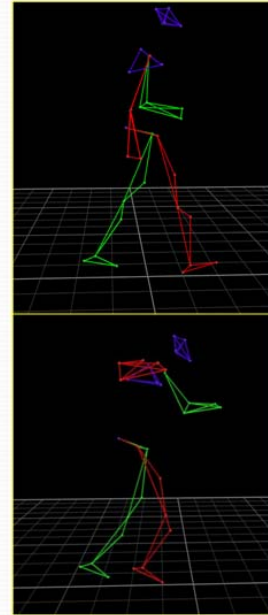
- Controlling boat direction and speed by shifting body.
 - Maneuvered boat around buoys to finish line
- Platform perturbations imitate boat moving through waves on the water.



Rapid Rehabilitation of Amputees to Decrease Falls

- **Purpose:**

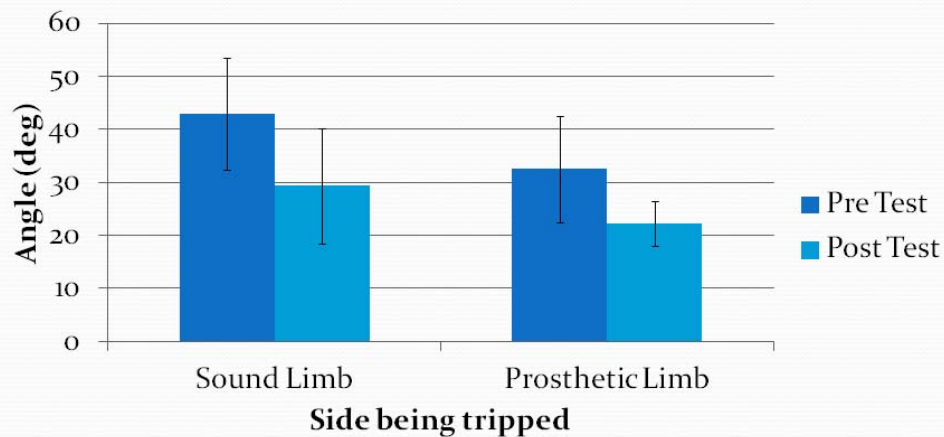
- To develop a technique for assessing falls in persons with lower extremity amputation
- To assess the ability of a rapid rehabilitation training program to improve ability to recover from falls for lower limb amputees





Rapid rehab results

Max trunk flexion angle



Restoration

Post-Traumatic Stress Disorder (PTSD)

Mood disorders



Flashbacks



Difficulty concentrating



Nightmares



Sleep Disturbances



Hyper-Vigilance

EEG biofeedback



- ✓ PTSD is a major reason for **adjustment disorders** in returning warfighters
- ✓ Learning more about underlying **brain dynamics** may help with **diagnosis** and/or **treatment** strategy
- ✓ **EEG biofeedback** therapy may **accelerate recovery** from PTSD



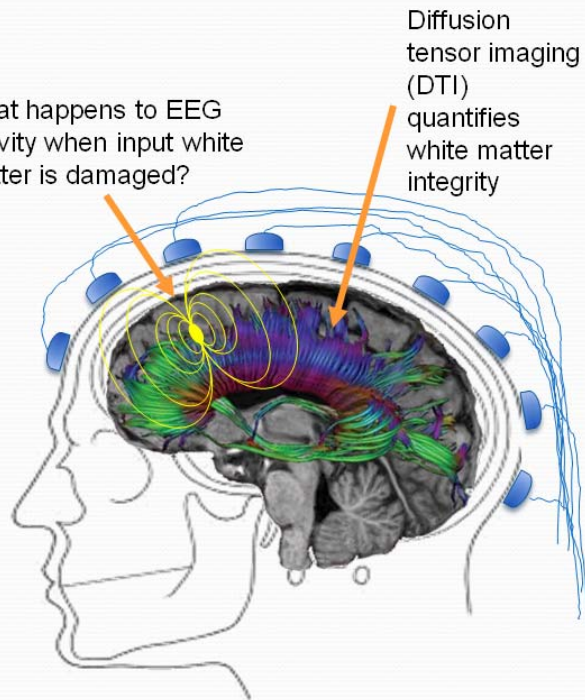
Restoration

Traumatic Brain Injury (TBI)



- ✓ TBI from blast or blunt force injury causes a variety of symptoms such as **headaches**, **memory** deficits, **emotion** regulation and **equilibrium** problems
- ✓ Finding **brain dynamics** associated with white matter damage may improve **diagnosis** and **treatment** strategy

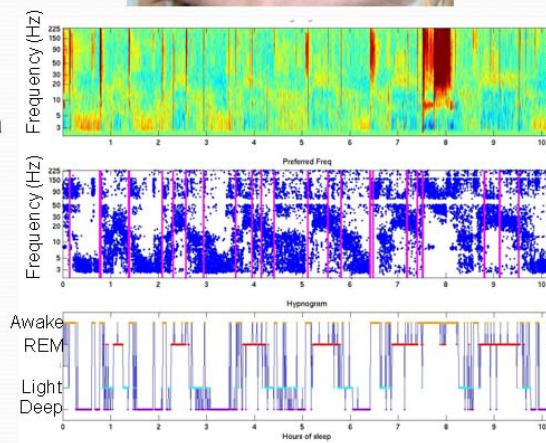
What happens to EEG activity when input white matter is damaged?



Restoration

Sleep monitoring

- ✓ EEG recordings during sleep reveal useful details about sleep architecture
- ✓ Sleep analysis can quantify sleep quality, medication efficacy and medication's influence on sleep architecture
- ✓ New electrode technology provides a low profile device to monitor sleep EEG



Summary



- Documentation of combat injuries
- Protocols target specific injuries but not necessarily designed as metrics for return to duty
- Focus is on prevention, protection and mitigation of injuries through prospective research
- RTD is at the discretion of the clinician
 - Currently no set of standards, physical fitness tests etc.

Acknowledgements

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Kathrine Service
Julie Onton, PhD

LCDR Justin Cambell
Mike Galarneau
Gerry Larson



UCSD

Samuel R. Ward, PT, PhD
Larry Frank, PhD
Ana Rodriguez-Soto, PhD candidate

SDSU-graduate student interns

Jarrott Mayfield
Ric Martinez



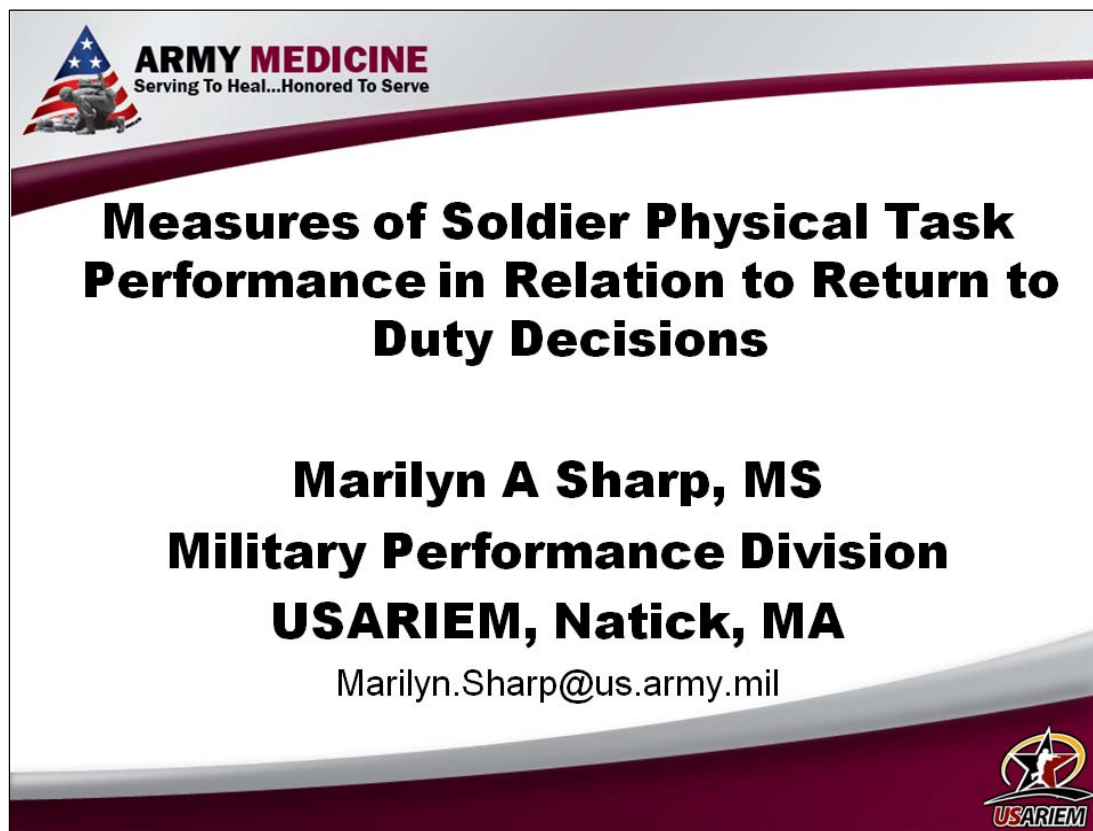
Comment highlights:

Dr. Kelly: Thirty percent of those entering the USMC [United States Marine Corps] Image Study already have pre-existing injuries. Yet the majority is unaware of injury(ies) and reports no pain. [The Navy] is considering doing an MRI [magnetic resonance imaging] in advance of SEAL [Sea, Air, and Land] training to identify those with injuries. It may be useful in separating malingerers from those with actual injuries. For those with PTSD or depression, [we] are studying the value of daily exercise to make physiological changes, and improve sleep and mood. The protocols are not designed [with] RTD metrics but could be modified to address it.

Dr. Estrada: As you describe CAREN [Computer Assisted Rehabilitation Environment], I can see the applications to measure progress in treatment. Is there an effort to collect normative data to use as assessment?

Dr. Kelly: Yes, I do collect normative data. There's not much published on it so far. It's hard to measure in the field.

Measures of Soldier Physical Task Performance in Relation to Return to Duty Decisions – Marilyn A. Sharp, USARIEM





Background

- The U.S. Army lacks a valid physical employment test
 - Accession and retention into the military
 - Return-to-duty standards following musculoskeletal injury
 - APFT does not predict MOS performance



≠



GOAL

To develop and validate tests to assess a Soldier's readiness to perform physically demanding warrior tasks and battle drills (WTBDs) common to all Soldiers.



Slide 3 of



Previous Physical Employment Standards (PES) Research

1980: Vogel, et al. USARIEM TR5/80 & Sharp, D.S. et al USARIEM TR 8/80,
Measured strength and stamina requirements of MOS physically demanding tasks
Clustered common tasks and set standards for each MOS cluster

Using field expedient tests, developed equations to predict MOS performance

1984/85: Myers, et al USARIBSS TR 610, 1984 and Teves et al, USARIEM TR 13/85, 1985.

Selected test of lifting strength predictive of common soldiering tasks.

Validated on large sample of trainees on completion of AIT

Test implemented as 'MEPSCAT' for job counseling only.

1997: Patton et al.

Designed a study to create a two tiered system to match the physical capacity of soldiers to the PD of MOS.

2008: Niebuhr, et al. Military Med.

Validated pre-enlistment physical screening tests (PU & step test) to predict injury and attrition during recruits first 180 days.

Slide 4 of



AUSTRALIAN APPROACH

Trade Specific PES

-Trade specific assessments: work simulations, represent job requirements, have face and content validity. Extended testing time and equipment are not obstacles.

Generic Military
(Common Task) PES

All Corps Soldier
PES

Common Combat
Arms PES

-Generic Military PES
Assessments should be simple and not equipment intensive, but should be conducted in combat body armor.

Slide 5 of



CANADIAN APPROACH

- Universal Soldier Service Requirements (minimal level of PF)
- Operational Exercise Prescription administered by training NCO or individually via website.
- Determination of and testing for performance on common soldiering tasks.
- Website to assist Medical Officers with return to duty decisions

Slide 6 of 6

Canadian Approach
RACLE

ATIS TECH
AVN TECH
AVS TECH
AWS TECH
DE TECH

Click to see requirements for selected occupation

Occupational Specifications Career Manager Page Recruitment Page Additional Information

Input candidate limitations

MEMBER INFORMATION

Serial Number: A11 111 111
Name: DOE
Surname: JOHN
Sex: Male
Date of birth: 01/01/1981
Photo ID: 



RACLE

Navigation








Evaluation progress






Personal Informations

Physical Categories

Psychological Categories

Environmental Categories

Medical Categories

Evaluation Status

CANDIDATE

OCCUPATION

EVALUATOR

Date of Evaluation: 01/12/2010
Body Weight (Kg): 80
Age (Years): 29

Component: Regular
Environment: Air force
Occupation: AWS TECH
Rank: Cpl
MOC: 101
Unit and UIC: 000

Reason of evaluation: Back pain
Location of evaluation: Comox
Name of evaluator: Dr. Smith
Telephone of evaluator: (000)-000-0000
Comments: increases during training

Record: 1 of 2

No Filter

Search

Previous Evaluations

Date of evalus	Serial Number	Body Weight	Component
01/12/2010	A11 111 111	80	Regular
06/04/2011	A11 111 111	81	Regular

MEMBER INFORMATION

Serial Number: A11 111 111
Name: DOE
Surname: JOHN
Sex: Male
Date of birth: 01/01/1981
Photo ID: 



RACLE

Navigation








Evaluation progress






Personal Informations

Physical Categories

Psychological Categories

Environmental Categories

Medical Categories

Date of evaluation: 01/12/2010

Material handling

Locomotion

Posture

Fine motor

GBM

M1: no limitation
M2: <70kg SP or <55kg IP
M3: <55kg SP or <40 IP
M4: <40kg SP or <25 IP
M5: <25kg SP or <10kg IP
M6: <10kg SP or <5kg IP

L1: N/A
L2: no limitation
L3: vertical SP or Horizontal IP
L4: inclined/uneven SP Horizontal even IP
L5: horizontal SP only
L6: no locomotion

P1: N/A
P2: type 1,2,3 no limitation
P3: type 3, short period 1,2 no limitation
P4: type 1,2 no limitation
P5: type 1, no limitation type 2 short period
P6: type 1 short period, cannot perform type 2

F1: N/A
F2: no limitation for precision, duration, repetition
F3: precision for short Period, no repetition
F4: general FM, no repetition
F5:
F6: no FM

G1: N/A
G2: high and low impact Ballistics at IP
G3: high impact SP and low impact IP
G4: no high impact, low Impact at IP
G5: low impact at IP
G6: no ballistic mvts

SP: Self Paced; IP: Imposed Pace; FM: Fine Motor; GBM: Gross Ballistic Motor

102



OCCUPATION DETAILED RESULTS

Serial Number:

A11-111-111

Name:

DOE

Surname:

JOHN

Sex:

Male

Date of evaluation:

01/12/2010

Med Category results

Specific results

CriticalEssentialTasks

- Assemble/disassemble/maintain Precision Guided Munitions (PGM)
-
- Recover, render safe and dispose of Improvised Explosive Devices (IED)
- Load and unload live missiles on aircraft
-
- components.
- Convoy/coordinate explosives/weapons
- Supervise / conducts scheduled and unscheduled maintenance inspections off aircraft armament components.
- Instruct, monitor and assess air weapons break out and assembly (BOA) crew training and tasks in accordance with Technical Orders and Airworthiness publications
- Instruct, monitor and assess air weapons load crew training and tasks in accordance with Technical Orders and Airworthiness publications
- Oversee/coordinate aircraft weapons load on multiple aircraft
- Perform functional check on aircraft fire suppression system
- Develops and verifies aircraft weapons loading checklists, break out and assembly checklist, SOP's
- Inspect air weapons range/explosive destruction area

10



Fitness for other Occupations in the CF

Serial Number:

A11-111-111

Name:

DOE

Surname:

JOHN

Sex:

Male

Date of evaluation:

01/12/2010

NAVY

ID	Occupation_Abv	Status
1	MARS	
2	MS ENG	
3	MUSC	
4	NAV ENG	
5	NCS ENG	

Record: 1 of 26

ARMY

ID	Occupation_Abv	Status
35	ARTYMN FD	
36	CBT ENGR	
37	CRMN	
38	EO TECH (L)	
39	INFMN	

Record: 1 of 16

AIR FORCE

ID	Occupation_Abv	Status
51	ACS TECH	
52	AES OP	
53	AM SUP	
54	AVN TECH	
55	AVS TECH	

Record: 2 of 18

COMMUNICATION AND SERVICES

ID	Occupation_Abv	Status
73	FIRE FTR	
74	GEO TECH	
75	IMAGE TECH	
76	INT OP	
77	LCIS TECH	

Record: 2 of 23

SUPPORT

ID	Occupation_Abv	Status
100	AMMO TECH	
101	BE TECH	
102	COOK	
103	CRT RPTR	
104	DENT TECH	

Record: 1 of 29

11



Elements of Best Practices in Physical Employment Standards Research

1. Detailed job analysis and description of physically demanding tasks.
2. Develop simple simulations of MOS tasks.
3. SME agreement on minimal acceptable performance of tasks.
4. Measure physiological capacities needed to perform tasks at minimally acceptable level.
5. Measure large population of soldier performing simulations and field expedient tests.
6. Develop equations to predict go/no go task performance from field expedient tests of physical fitness or use task simulations.
7. Validate the equations on a large sample of the target population.
8. Implement predictive tests and check for effectiveness/fairness.

Slide 12 of



Soldier Task Test Development

- Reviewed Warrior Tasks and Battle Drills
- Examined additional documentation to define the task parameters (load, distance, lift height, etc)
- Tested ~40 Soldiers to examine the test-retest reliability of the measures using ICC
- Product: Identified reliable common Soldiering task simulations, presented at scientific meetings and manuscript published in peer-reviewed journal

(Spiering et al, JSCR, 2012)



USARIEM Soldiering Task Tests

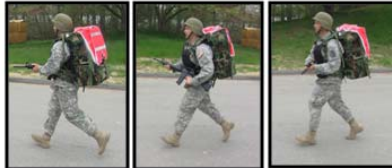
Maximal Lifting Capacity



Repetitive Lifting and Carrying



Ruck March



Victim Rescue



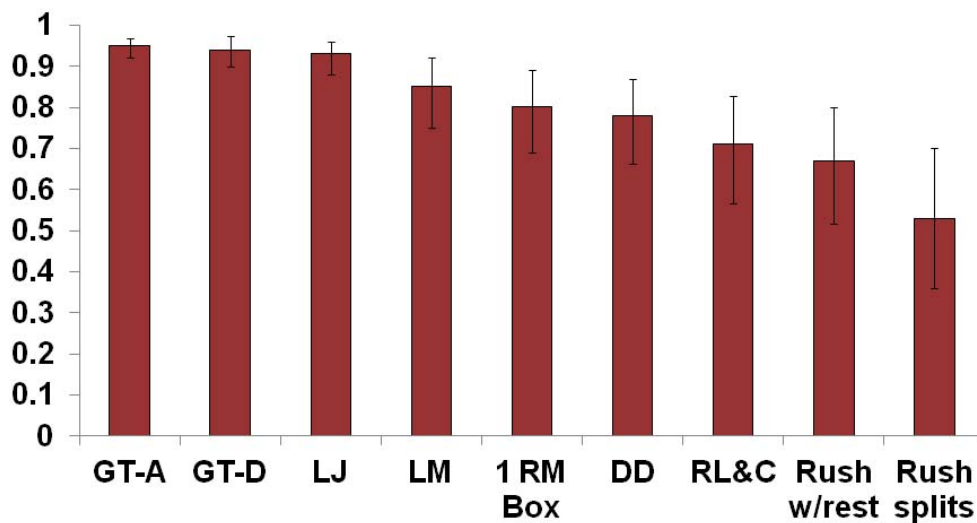
Combat Rushes



Obstacle Clearance



ICC for Soldier Tasks





Setting RTD Standards

- Establish normative values for each soldiering task test
- Establish acceptable performance standards for each soldiering task test.
- Determine correlations among soldiering task tests and field-expedient tests
- Determine the validity of using the field-expedient tests to predict pass/fail standards for soldiering task tests



Challenges/Limitations

Accepting the current WTBD definitions w/o conducting detailed task analysis.

Determining the minimum acceptable level of performance.

Potential methods to set PES standards:

- SME determination (focus groups, films)
- Specific percentile of normative data for task simulations
- Measure task performance parameters of soldiers successfully performing tasks during an FTX
- Post-deployment surveys to quantify necessary level of task performance



Future Efforts

- Conduct study to obtain normative data for soldier task tests and field expedient tests of physical fitness
- Consult with SMEs to determine acceptable level of soldier task tests
- Collaborate with Canadian and Australian Forces to benefit from lessons learned and improve methods for minimal standards determination

Comment highlights:

Ms. Sharp: APFT [Army Physical Fitness Test] is the only universal Army test. Goal is to develop and validate tests to assess a Soldier's readiness to perform physically demanding warrior tasks. The focus is on general warrior skills. Future efforts will address whether Soldiers are meeting minimum standards.

Dr. Lawson: Can you elaborate on combat rush 30 meter test?

Ms. Sharp: You start by lying down with a load on. Then you jump up and rush to another location; do it 5 times. It's a timed test and it's realistic.

Dr. Kelly: My combative fitness test is similar; including the load. It made a difference.

Ms. Sharp: Yes. You could argue what load to wear and whether to go down to their knee. The Canadians interviewed subject matter experts and forced them to create a scenario for the evaluations.

Dr. Kelly: Also noticed in scoring of tests there was a point system. I took those in highest percentile of their class and yet of 65% of the high scorers missed their grenade targets. Many of those coming in don't know the biomechanics of throwing a grenade.

Psychological Return to Duty Workshop

COL PAUL BLIESE



The opinions expressed in this presentation are personal and are not to be construed as official position of the U.S. Department of the Army or Department of Defense



Task Area Purpose

- Develop and validate a portfolio of simple, easily administered tools providers (and leaders?) can use to augment judgment when making psychological RTD decisions
 - Evaluate user acceptance
 - Ensure products are aligned and complement MEDCOM (and other) Decision Support Tools

Workshop Goals

- Define the problem and present a preliminary research plan to key stakeholders.
- Refine research plan with stakeholder feedback.
 - Identify specific area(s) to target initial efforts

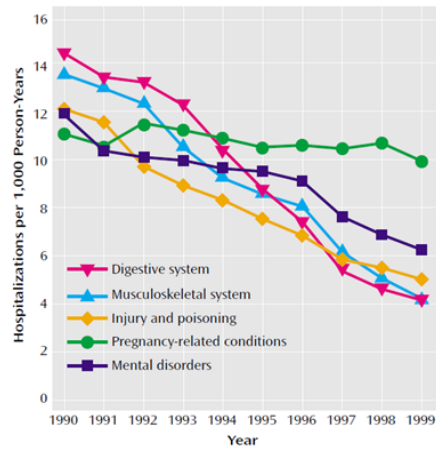
Outline

- I. Define top 5-7 conditions responsible for loss of duty time
- II. Relevant metrics: amount of lost duty time, when they returned, issue of re-injury, those who never return, etc.
- III. The “clinical” approach: current practices, evidence of efficacy
- IV. Development of Assessment Tools/Decision Aids
- V. Define “standards” for performance
- VI. Application of Assessment Tools/Standards

Prevalence (Hoge et al., 2002)



FIGURE 1. Rate of Hospitalization for the Five Leading Primary ICD-9 Diagnostic Categories Among All Active-Duty Military Personnel, 1990–1999^a



^a Same-day episodes excluded. Pregnancy-related conditions included normal deliveries.

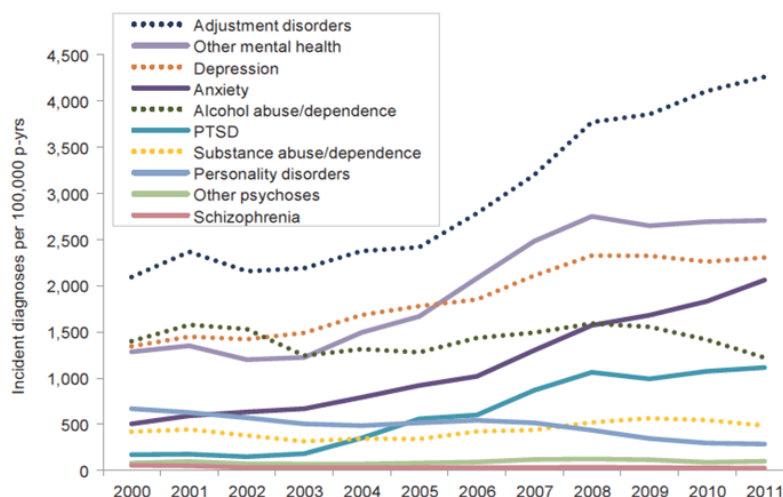
Prevalence and Attrition (Hoge et al., 2002)



Variable	Personnel With First Hospitalization for Mental Disorder ^b		Personnel With First Hospitalization for Illness Other Than Mental Disorder	
	N	%	N	%
All personnel	7,902	100	59,969	100
Personnel who left military service, by time period after hospitalization ^d				
3 months	2,630	33	3,639	6
6 months	3,746	47	7,035	12
1 year	4,849	61	13,083	22
2 years	5,865	74	22,626	38
Personnel who remained in military service more than 2 years	2,037	26	37,343	62

Prevalence Rates

FIGURE 1. Incidence rates of mental disorder diagnoses, by category, active component, U.S. Armed Forces, 2000-2011



Psychological RTD from OIF/OEF Evacs

	Did not return to duty (n=2707)	Returned to duty (n=271)
Traumatic brain injury (n=218)	187 (86%)	31 (14%)
Substance abuse (n=98)	85 (87%)	13 (13%)
Stress reactions (n=803)	731 (91%)	72 (9%)
Depression or bipolar disorder (n=1045)	978 (94%)	67 (6%)
Other (n=814)	726 (89%)	88 (11%)

Data are number (% of individuals who had each diagnosis), and include individuals who were evacuated but were not service members. $p=0.0003$ for individuals who did not vs those who did return to duty.

Table 8: Proportion of individuals with psychiatric diagnoses who were medically evacuated and did or did not return to duty (n=2978)

Diagnoses and factors associated with medical evacuation and return to duty for service members participating in Operation Iraqi Freedom or Operation Enduring Freedom: a prospective cohort study

Steven P. Cohen, Charles Brown, Connie Kurhara, Anthony Plunkett, Connor Nguyen, Scott A. Strassels

Summary

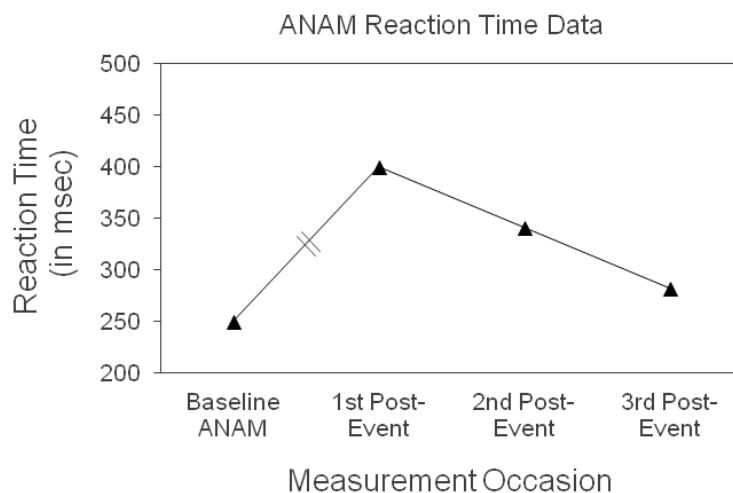
Background: Anticipation of the types of injuries that occur in modern warfare is essential to plan operations and maintain a healthy military. We aimed to identify the diagnoses that result in most medical evacuations, and ascertain which demographic and clinical variables were associated with return to duty.

Lenox 2010; 375: 301-09
See Editorial page 253
See Comment page 257

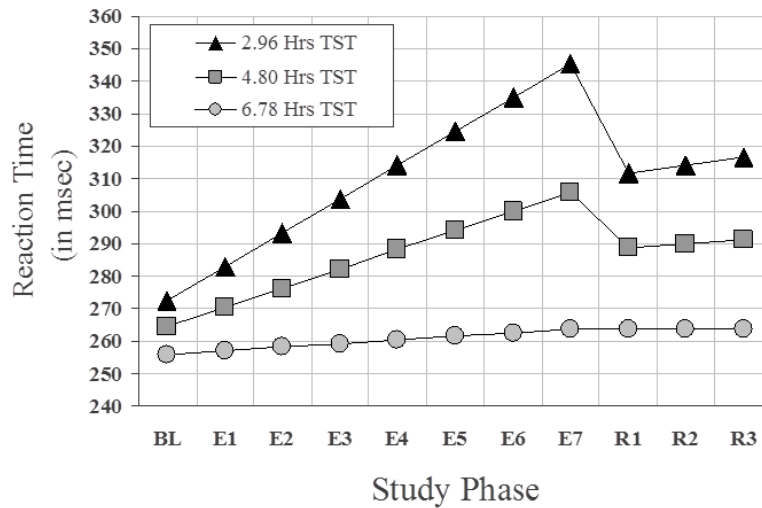
RTD perspectives from OIF/OEF (Evidence of Efficacy?)

- Common for deployed providers to complain that most of the Behavioral Health cases had a history of Behavioral Health problems and should have never deployed
 - Reflects the fact that prior injury is a risk factor
 - Not clear if this reflects a RTD issue...
- CENTCOM has well-established policies for Mental Health waivers

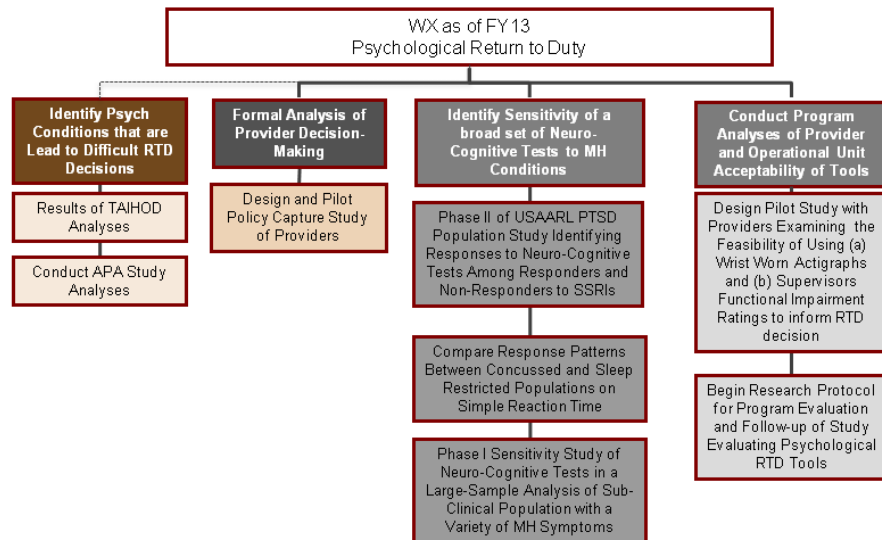
Development of Assessment Tools



Development of Assessment Tools



Tentative Plan



Tentative Plan

- The Task Area plan will leverage other initiatives in complementary Task Areas
 - Mental Health Advisory Teams (MHAT) with Medical BDE
 - American Psychiatric Association (APA) study of providers

Point of Contact

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Silver Spring, MD 20910
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paul.bliese@us.army.mil

<http://wrair-www.army.mil/>



Comment highlights:

COL Bliese: The Psychological RTD Program only began 6 months ago. I hope to establish a group to look at the program put in place and make modifications to it. We'll always rely on clinical judgment, but we need tools to help assist the user. This Workshop's goal is to define the problem and present a preliminary research plan to the stakeholders, and then refine the research plan with the stakeholders' feedback. In 1990, mental health disorders were the second most likely to hospitalize after pregnancy.

Unidentified: Adjustment disorder. It is caused by multiple disorders.

MAJ Scherer: Adjustment disorder is not a code. The Army petitioned to have it added in the future.

LTC Teyhen: There is research that has to be done to list what the criteria are for expediting a person out of the service.

COL Bliese: Great point. The system lacks the means to get a person out. NIH [National Institute of Health] has a standard battery of tests.

LTC Teyhen: The line might value expediting out as much as returning them to duty.

COL Bliese: Of those evacuated due to TBI, 86% did not return. For those evacuated for depression or bipolar disease, 94% did not return.

Dr. Kelly: What percent of those coming in are depressed? Are they pre-screened? What about preemptive measures?

COL Bliese: The bottom line is difficult. Tests of prior histories are sensitive, but would exclude too many who would end up doing just fine. The present common theme reflects the fact that prior injury is a risk factor. Tomorrow's goal will be to get stakeholder input and modify the task area plan as needed.

State of the Practice: RTD Decision-Making in a Deployed Environment



LTC RONALD WHALEN



The opinions expressed in this presentation are personal and are not to be construed as official position of the U.S. Department of the Army or Department of Defense



Outline

- Brief OIF Deployment History
- Unique Aspects of OEF Deployment
- Difficult RTD Decisions
- Conflict with Operational Leadership

Brief OIF Deployment History

- Two OIF deployments as organic, Brigade BHO with 3ID
- OIF 2003:
 - Extremely austere; limited connectivity with fellow providers across AO
 - Eventually located at Olympic stadium, Baghdad, with access to CSC unit
 - 3-man Reserve CSC team with Psychiatrist augmentation for 1.5 months
 - No AHLTA-T
- OIF 2005:
 - 1st & 3rd Brigade, 3ID, OPCON to 42ID (vic. Tikrit)—DIV Psychiatrist on 90 day rotations
 - Replaced CSC team at FOB Brassfield-Mora (vic. Sammara)—DIV Main Effort—following command perceptions of over-evacuation
 - No AHLTA-T; email/telephone connectivity much improved over 2003
 - Use of PHQ-9 and PCL when indicated for assessment and monitoring

Unique Aspects of OEF Deployment (1 of 2)

- PROFIS to 528th CSC on 12 mo deployment
- Deployed off-cycle to operational units
- Replaced 2-man, non-organic CSC team at FOB Andar
- Supported unit (BN+) OPCON to Polish Task Force (vic. Ghazni)
- U.S. Forward Surgical Team co-located with Polish TF HQ
- Regional TBI clinic at FOB Sharana
- PROFIS BN SURGs on ~6 mo deployment
- PROFIS 528th CSC Psychiatrists on 6 mo deployment

Unique Aspects of OEF Deployment (2 of 2)

- BN SURG of initially supported unit requested CSC team following KIA incident in Feb
- CSC team co-located with primary care providers
- Primary care providers wrote majority of Rx's for psychotropic and/or sleep meds
- Med consults with 528th CSC psychiatrist by exception
- AHLTA-T and MEDPROS access
- Routine use of RESPECT-MIL screen for depression and PTSD
- Co-investigator of study examining use of evidence-based treatment for PTSD in a deployed environment
- Battalion Commander requested Unit Behavioral Health Survey—greatly aided CSC planning and intro to supported unit

Difficult RTD Decisions



- Chronic sleep problems among senior NCOs with PTSD
- Misconduct and/or questions of professional competency among senior NCOs with PTSD/anxiety/anger issues known to command
- Failure to disclose pre-service mental health history (e.g., bipolar disorder with previous hospitalization for suicide attempt)
- Cases involving mTBI (esp. when FST Team over-evacuated to Bagram) and co-morbid combat stress reactions
- Generally, all soldiers were motivated to serve and felt personal and/or social pressure to RTD

Conflict with Operational Leadership



- General support for CSC mission, but suspicious of behavioral health providers
- Non-organic providers generally make MEDEVAC determinations—Us vs. Them
- Unit command climate, CSC planning, and related recommendations from anonymous surveys (i.e., Unit Behavioral Health Survey)
- Critical role of senior NCOs in shaping unit stigma/barriers-to-care climate

Point of Contact

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<http://wrair-www.army.mil/>



Comment highlights:

COL Bliese: I asked LTC Whalen to recount experiences as a deployed provider in theatre, in terms of RTD.

Dr. Estrada: In your experience, was there an active duty and National Guard difference in command climate among those who were deployed?

LTC Whalen: Yes, I did notice a difference anecdotally. In 2003 I worked with a National Guard Battalion with a variety of issues. That Commander got OPCON [operational control] help for them through his own efforts. He wanted his guys involved in the fight. The sense among his Soldiers was the Commander was more ambitious than was healthy for the unit.

Dr. Estrada: Was the command more sympathetic toward mental health issues?

LTC Whalen: Yes, but it could be due to natural variation. There was more sympathy in the National Guard unit. The longevity was better in that unit.

COL Bliese: Would your [LTC Whalen's] job been easier if had more tools to use in communicating with his leadership, e.g. actigraph readings in association with cognitive tests?

LTC Whalen: Yes. I wanted to discuss issues related to patient health information confidentiality and occupational health impairment information being provided to the Command.

Dr. Estrada: LTC Whalen is one deep with the service members. That has impacts.

State of the Science & Current Research Efforts Pertaining to RTD and Psychological Health:
Neuropsychological and Neuroimaging Tools as Potential RTD Decision Tools – Dr. Susan P.
Proctor, USARIEM



ARMY MEDICINE
Serving To Heal...Honored To Serve

State of the Science & Current Research Efforts Pertaining to RTD and Psychological Health:

Neuropsychological and Neuroimaging tools as potential RTD decision tools

Susan P. Proctor, DSc (MPD, USARIEM)
RTD Research Working Group meeting
19 Sep 2012

Talk Overview

- ❖ Current data/information available
- ❖ Potential approach-RTD decision tools
- ❖ Research Gaps

The views expressed are those of the presenter and do not reflect the official policy or position of DoD/ Dept of the Army.



Results* from Current TAIHOD Study (MOMRP #14580)

Prevalence of Mental Health Disorder Diagnoses -by Category	
Mood Disorders (includes Major Depression@3.1%)	15.5%
Adjustment Disorders	11.9%
Anxiety Disorders (includes PTSD@2.5%)	9.1%
Substance-related Disorders	1.4%
Psychotic Disorders	0.6%
Somatoform/Dissociative/Factitious/Conversion Disorders	0.5%
Other Mental Disorders	2.2%
All other (not included in above categories)	24.7%

* **Data Source:** in- and out-patient medical record systems (TAIHOD)
Population (n=962,238): Active Duty Army military personnel, 2002-2007
Descriptive Characteristics:

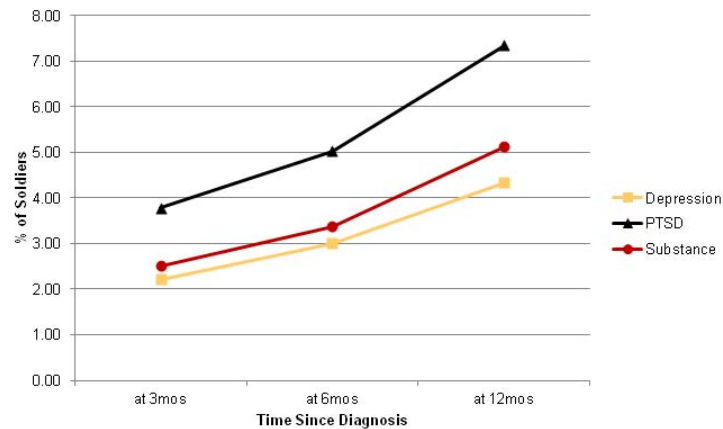
- Mean age=27 years; 16% female; 88% Enlisted
- 62% deployed to OIF/OEF

Proctor: MCMR-EMP / (508) 233-4465 (DSN 256-4465) / Susan.Proctor@us.army.mil

Slide 2 of 9 19 September 2012



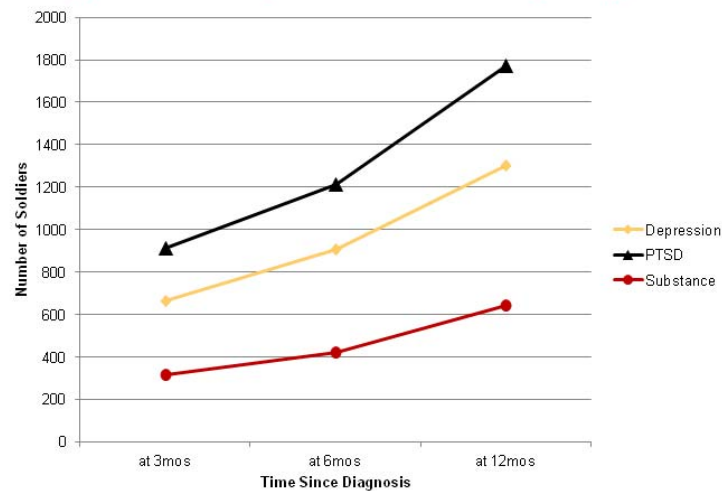
% of Soldiers No Longer in Military Service Following Diagnosis



(MOMRP #14580)



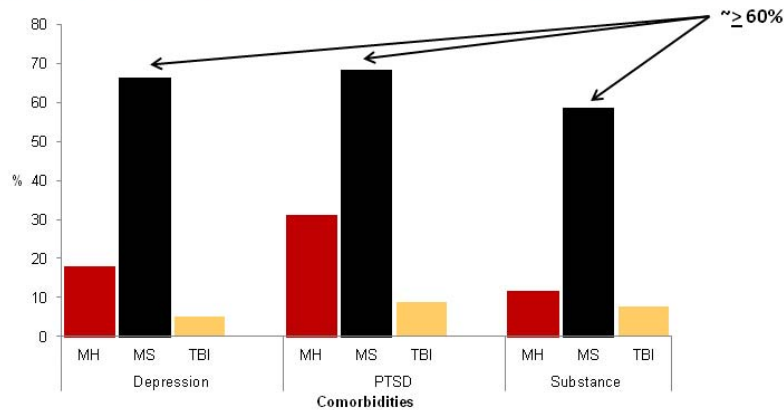
of Soldiers No Longer in Military Service Following Diagnosis



(MOMRP #14580)



Comorbidities with Major Depression/PTSD/Substance-Related Disorders



■ MH = Any Other Mental Health Disorders
■ MS = Any Musculoskeletal Disorder
■ TBI = Any Traumatic Brain Injury

(MOMRP #14580)

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Slide 5 of 9 19September2012



Neuropsychological task performance patterns as potential RTD decision tools

Population (n=760): Active Duty Army military personnel, 2003-2005, from NDHS, BJP 2012

■ Mean age 25 years; 8% female; 98% enlisted

Data Collection: Conducted in-person, pre- and post deployment

+Of the TBI+ persons in this study:

17% PTSD+ and 31% Depression+

Psych The Science of Human
Cognition and Performance

Neuropsychological outcomes of mild traumatic
brain injury, post-traumatic stress disorder and
depression in Iraq-deployed US Army soldiers
Jennifer L. Vasterling, Wade S. Kessler, Susan D. Proctor, Robert K. Kane, Timothy A. Keane,
and Molly Frantz

Results: Neuropsychological task performance patterns observed

	Study Diagnosis Criteria Used+	Functional Domain Patterns
TBI+	any LOC; assessed via interview [8.9% TBI+ at post-deployment]	--
PTSD+	based on >50 and DSMR-IV criteria from PCL-C [11% PTSD+ at post-deployment]	visual/verbal learning and memory(+), psychomotor speed, cognitive efficiency
Depression+	based on defined criteria, from CES-D [18% Depression+ at postdeployment]	psychomotor speed, cognitive efficiency

NOTE: Participant group only includes those Soldiers currently with their unit/battalion post-deployment

Proctor/MCMR-EMP/ (508) 233-4465 (DSH 256-4465) / Susan.Proctor@us.army.mil

Slide 6 of 9 19September2012



Neuropsychological (Neurobehavioral) task performance patterns as potential RTD decision tools



Functional Domain Approach

Step 1 Identify those functional domain(s) affected by disorder(s) of interest, from clinical practice & research literature

Functional Domain Categories	Example Tasks/ Subtasks
<i>Executive function, cognitive flexibility</i>	Trail-Making Task, B-A performance
<i>Learning (visual/verbal)</i>	-Verbal Paired Associates, learning -Visual Reproductions, % retention
<i>Memory (short/long-term; visual/verbal)</i>	-Verbal Paired Associates, % retention -Visual Reproductions, % retention
<i>Attention (simple/ sustained)</i>	-Trail-Making Task, time to complete -Continuous Performance Test, response time, errors
<i>Psychomotor abilities</i>	-Simple Reaction Test -Finger Tapping
<i>Behavior (Current mood, motivation, general functional level)</i>	-Profile of Mood States -Test of Memory Malingering -SF-36V



Neuropsychological task performance patterns as potential RTD decision tools



Functional Domain Approach (continued)

Step 2 Design neurobehavioral task battery to be inclusive of tasks that assess appropriate functional domain performances for RTD decisions



Step 3 Determine appropriate benchmark or threshold performance required (i.e., sensitivity/specificity needed) for RTD decisions



Step 4 Interpret results/patterns of individual/group results for RTD decisions (ideally compared to baseline, pre-morbid levels)



IDENTIFIED RESEARCH GAPS

- Lack of standardized RTD metrics (and/or algorithms) available in medical or Command-level data systems to permit tracking of RTD trajectories/time courses
- Limited knowledge basis for requirements (i.e., sensitivity/specificity thresholds) for military group-level screening initiatives or individual Soldier-level tracking of functional performance for RTD decisions
- Little understanding of the influence that co-morbid diagnoses may play on Mental Health RTD trajectories and/or decisions



Comment highlights:

LTC Teyhen: There is an article coming out in a journal in November that demonstrated that when pain improves, it impacts the other co-morbidities.

COL Bliese: The key is to have thought about ANAM (Automated Neuropsychological Assessment Metrics) as related to concussion and TBI. But what [Dr. Proctor] is showing may be more sensitive to changes in depression and PTSD symptoms.

LTC Teyhen: Her battery includes more than ANAM. PTSD and depression have their own set of changes.

Ms. Helmick: Is there science to look at expectations regarding treatment?

COL Bliese: Good point. In a study, a provider showed patients how they were improving compared to where they were when they arrived.

LTC Edward Brusher: There is an IT system that has screening measures for depression and PTSD. It will become standard across MEDCOM. It's a clinical tool to show patient where they are over time.

LTC Teyhen: It may go across other domains. In Australia, they used an expectation model regarding back pain. I did a similar effort in Fort Sam Houston. Those that got the announcement had a rate decrease in pain.

Ms. Helmick: The strongest mTBI evidence is from Australia. It is worth a look in all 3 areas as to how to incorporate expectations for recovery.

CPT Michael Dretsch: We know that cognitive performance is affected by affect. Something to consider when seeing any cognitive impairments; work to regulate anxiety and depression symptoms.

Neurobehavioral, Brain Imaging, Proteomic, and Lipidomic Biomarkers of TBI and PTSD:
Metrics for Making RTD Decisions for the U.S. Warfighter – CPT Michael N. Dretsch,
USAARL

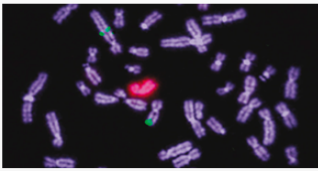


Medical Research and Materiel Command
U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama



Neurobehavioral, Brain Imaging, Proteomic, and Lipidomic Biomarkers of TBI and PTSD:

Metrics for making RTD decisions for the U.S. Warfighter



CPT Michael N. Dretsch, Ph.D.
Chief of Neurocognitive Sciences
USAARL



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Medical Research and Materiel Command
U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama



Disclaimer

The opinions, interpretations, conclusions, and recommendations are those of the presenter and are not necessarily endorsed by the U.S. Army and/or the U.S. Department of Defense.



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Background

•High incidence of mild traumatic brain injury (mTBI) and posttraumatic stress disorder (PTSD) in deployed U.S. Soldiers (Terrio et al., 2009; Hoge et al., 2008). High co-morbidity between mTBI and psychological health conditions such as PTSD, depression, etc (Tanielian & Jaycox, 2008). Neurocognitive testing and symptom reporting the most common for TBI & PTSD assessment, but **lack sensitivity and specificity**

Brain and Behavior

Open Access

Mood symptoms contribute to working memory decrement in active-duty soldiers being treated for posttraumatic stress disorder

Michael N. Dretsch¹, Kenneth J. Thiel¹, Jeremy R. Athy¹, Clinton R. Irvin¹, Bess Sirmon-Fjorndbak² & Anthony Salvatore³

¹U.S. Army Aeromedical Research Laboratory, Fort Rucker, Alabama 36362-0577
²University of Texas at El Paso, El Paso, TX, USA

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Archives
of
CLINICAL
NEUROPSYCHOLOGY

Assessment of Acute Concussion in the Combat Environment

Mark P. Kelly^{1,2,5}, Rodney L. Coldren^{2,6}, Robert V. Parish^{1,7}, Michael N. Dretsch¹, Michael L. Russell^{4,8}

¹Department of Psychology, Walter Reed Army Medical Center, Washington, DC, USA
²Directorate of Epidemiology and Disease Surveillance, United States Army Public Health Command, Aberdeen Proving Ground, MD, USA
³Warfighter and Health Division, United States Army Aeromedical Research Laboratory, Fort Rucker, AL, USA

Mild Traumatic Brain Injury (Concussion), Posttraumatic Stress Disorder, and Depression in U.S. Soldiers Involved in Combat Deployments: Association With Postdeployment Symptoms

JOSHUA E. WILK, PhD, RICHARD K. HERBELL, PhD, GARY H. WYNN, MD, LYNDON A. RIVIERE, PhD, AND CHARLES W. HOGE, MD

Psychosomatic Medicine 74:249-257 (2012)
0033-3174/12/7403-0249



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Development and validation of objective RTD measures

- Currently no objective measures of PTSD
- Non-traditional tasks need to be validated

Posttraumatic Stress Disorder in the U.S. Warfighter: Sensitivity to Punishment and Antidepressant Use Contribute to Decision-Making Performance

Michael N. Dretsch¹, Kenneth J. Thiel¹, Jeremy R. Athy¹, Sandra Born¹, and Kathy Prue-Owens²

Traumatology
2000;1-8
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sagepub.com/journalsPermissions.nav
DOI: 10.1177/1534765812455228
http://trauma.sagepub.com

SAGE

•Dretsch and colleagues (2012) revealed potential sensitivity of emotion-based tasks to PTSD and treatment efficacy

•Needs validation. Proposal submitted by Temple University to BAA for funding for MRI study.



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Medical Research and Materiel Command

U.S. Army Aeromedical Research Laboratory

Fort Rucker, Alabama

- Need for objective measures for assessing recovery from mTBI and PTSD
- Strong interest and potential with blood-based biomarkers of TBI and PTSD

Received 4 June; accepted 25 July; published online 26 August 2012; corrected online 5 September 2012 (details online); doi:10.1038/nm.3195

NATURE NEUROSCIENCE ADVANCE ONLINE PUBLICATION

Lipidomics identifies cardiolipin oxidation as a mitochondrial target for redox therapy of brain injury

Jing Ji¹⁻⁴, Anthony E Kline⁴⁻⁶, Andrew Amoscato^{2,3}, Alejandro K Samhan-Arias^{2,3}, Louis J Sparvero^{2,3}, Vladimir A Tyurin^{2,3}, Yulia Y Tyurina^{2,3}, Bruno Fink⁷, Mioara D Manole^{4,8}, Ava M Puccio⁹, David O Okonkwo⁹, Jeffrey P Cheng^{4,5}, Henry Alexander^{1,4}, Robert S B Clark^{1,4,5}, Patrick M Kochanek^{1,4,5}, Peter Wipf¹⁰, Valerian E Kagan^{2,3} & Hülya Bayir^{1-4,5}

JOURNAL OF NEUROTRAUMA 29:246-260 (January 20, 2012)
© Mary Ann Liebert, Inc.
DOI: 10.1089/neu.2011.1789

Identification of Plasma Biomarkers of TBI Outcome Using Proteomic Approaches in an APOE Mouse Model

Fiona Crawford^{1,2}, Gogce Crynen¹, Jon Reed^{1,2}, Benoit Mouzon^{1,2}, Alex Bishop¹, Benjamin Katz¹, Scott Ferguson^{1,2}, John Phillips¹, Vani Ganapathi¹, Venkatarajan Mathura^{1,2}, Allen Roses² and Michael Mullari^{1,2}

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Medical Research and Materiel Command

U.S. Army Aeromedical Research Laboratory

Fort Rucker, Alabama

Genetic, injury, and neurobehavioral correlates of neurocognitive testing in deployed Soldiers

Prospective (pre- and post-deployment testing)

Progress:
N = 470 at pre-deployment from two BCTs
n = 209 of 300+ post-deployment

- Neurocognitive Testing (CNS-Vital Signs)
 - Verbal Memory (VM)
 - Symbol Digit Coding (SDC)
 - Stroop Test (ST)
 - Shifting Attention Test (SAT)
 - Continuous Performance Test (CPT)
 - Digit Span (forward and backward)
- Genotyping, proteomics, lipidomics

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PRELIMINARY RESULTS

- Sample ($n = 92$) of post-deployment data from Soldiers returned from Iraq and Afghanistan ($n = 209$ as of 14 Sept 202)
- 98% Male

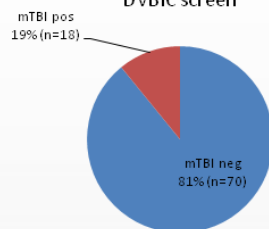
Total Deployments		
	Frequency	Percent
None	62	67.4
1	19	20.7
2	9	9.8
3	2	2.2
Total	92	100.0



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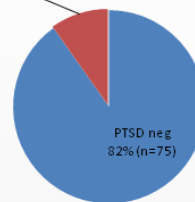


Post-deployment mTBI Screening DVBIC screen



Post-deployment PTSD Screening

PTSD pos
18% (n=16)



PCL-M score of 35



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Deployment-Related Symptom and Behavioral Changes

	Pre-deployment		Post-deployment	
PCL-M*	21.6	8.2	26.6	9.9
ZungDep	36.7	8.6	37.8	8.7
ZungAnx	33.3	7.7	34.5	7.4
AUDIT	5.7	5.7	6.3	5.6
Neurobehavioral Symptoms*	12.0	14.3	15.9	14.8
Pitt Sleep*	6.6	4.3	8.1	4.1

*Significant at level .05 (2-tailed)



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Deployment-Related Neurocognitive Changes

	Pre-deployment		Post-deployment	
Working Memory	5.4	1.5	5.5	1.6
Reaction Time	94.6	15.2	93.5	19.2
Complex Attention	52.2	87.6	33.7	133.8
Processing Speed	91.4	13.6	94.5	19.8
Cognitive Flexibility *	85.3	27.7	93.2	27.8
Executive Function *	88.6	24.6	95.4	25.7
Verbal Memory	92.4	18.6	90.1	21.8

*Significant at level .05 (2-tailed)



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Proteomic and Lipidomic Assays and Results

TBI and PTSD-targeted therapeutics

Diagnostic and prognostic markers

Development of a Point of Care diagnostic device

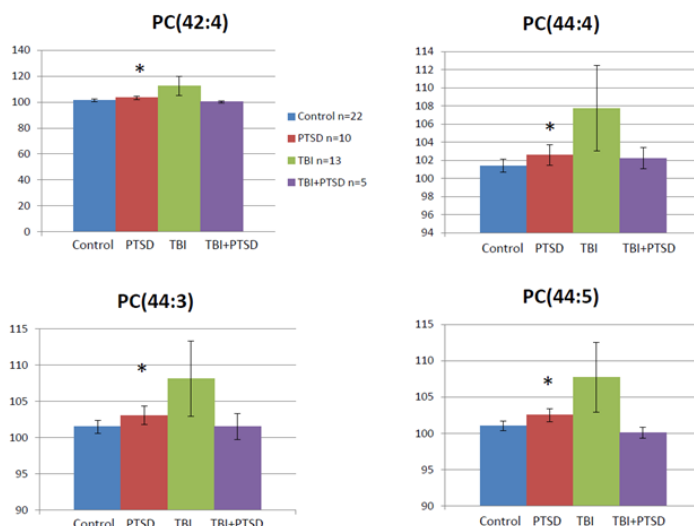
- a) Plasma samples collected under strict SOPs
- b) Deployment-related diagnoses determined: Controls (n=22); TBI (13); PTSD (10); and TBI+PTSD (5)
- c) Lipid species analyzed by LC-MS/MS
- d) Selected data from phosphatidylcholine species showing significant changes of plasma levels post versus pre- deployment
- e) 19 species showed significant changes (after correction for multiple testing) in one of the three diagnostic categories: TBI – 4 PC species changing; PTSD – 10 PC species changing; TBI+PTSD – 5 PC/SM species changing
- f) Proteomic analysis to follow



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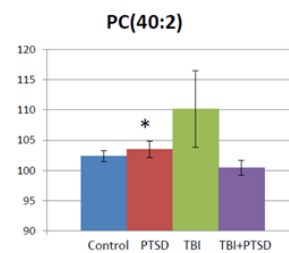
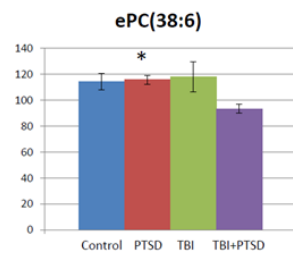
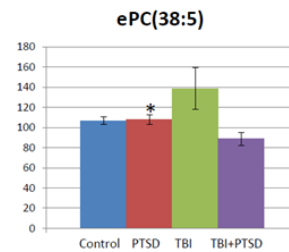
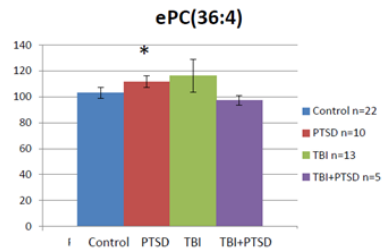


PTSD only

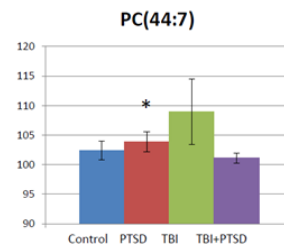
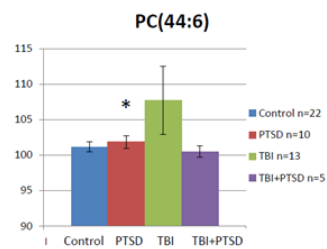




PTSD only

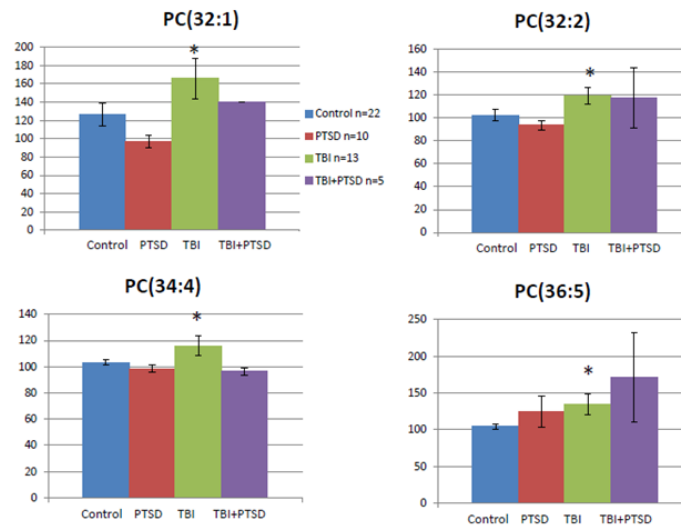


PTSD only

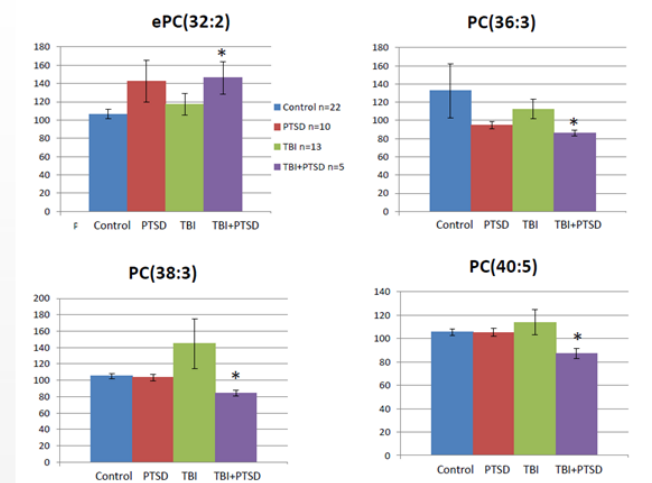




TBI only

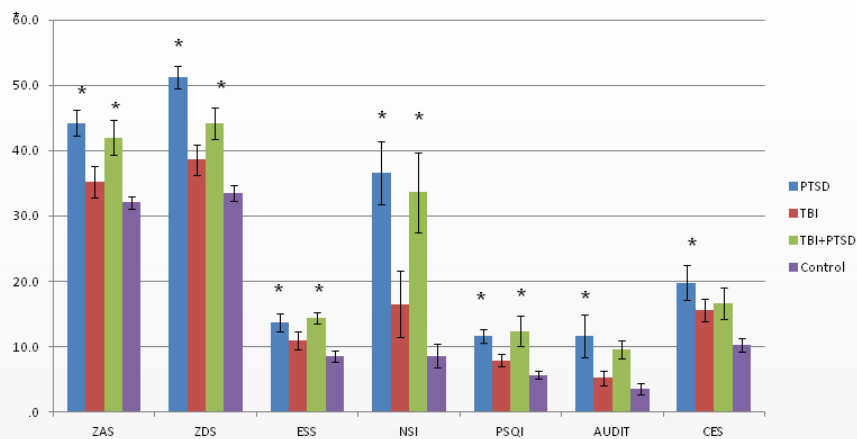
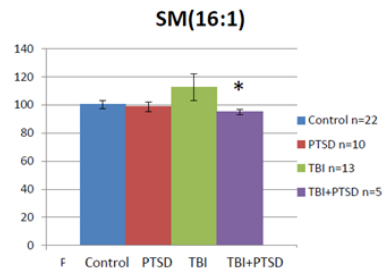


TBI+PTSD





TBI+PTSD



- No significant differences between groups on neurocognitive domains
- No significant differences between mTBI and controls
- Controls significantly different from PTSD and PTSD+mTBI



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Genotype Results

Gene loci of interest:

- Apolipoprotein E (APOE)
 - Brain-Derived Neurotrophic Factor (BDNF)
 - Dopamine receptor D2 (DRD2)
-
- APOE $\epsilon 2$ carriers have lower **depression**, **anxiety**, and **stress**;
 - higher scores in **working memory** functioning and **impulsive-sensation seeking** compared to non- $\epsilon 2$ carriers

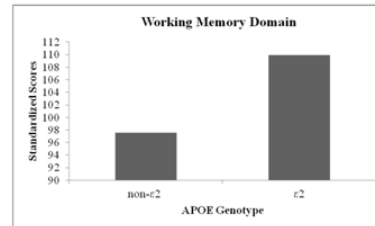


FIGURE 1. Group comparison based on APOE genotype ($\epsilon 2$ vs. non- $\epsilon 2$ carriers) of median standardized scores of Working Memory Domain from CNS-VS.

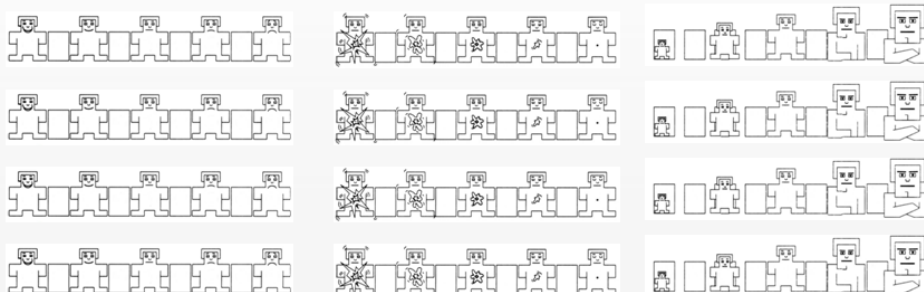


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Development of the Military Affective Picture System (MAPS)

Military and civilian normative ratings of valence, arousal, and dominance on military-related picture stimuli



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Data collected:

- 200 active-duty service members
- 20 civilian college students



High Arousal/Pleasant: # 503



Low Arousal/Pleasant: # 504

Currently being validated in on-going studies:

- fMRI
- Psychophysiology measures

RTD Application

MAPS will be used for activating the ANS:

- Detect changes in emotional responses and
- Ability to regulate



High Arousal/Unpleasant: # 350



Low Arousal/Unpleasant: # 501



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Brain Imaging and Biochemical Indices of PTSD and TBI

USAARL in collaboration with Auburn University & Roskamp Institute

Brain imaging, genetic, proteomic/lipidomic, and behavioral measures

Progress:

- 8 controls (4 awaiting scheduling)
- 3 target (3 awaiting scheduling)

AIMS

- Identify mechanisms of PTSD/TBI
- Validation of on-line (during MRI) and off-line tasks
- Validation of proteomic and lipidomic profiles
- Genotyping for therapeutic targeting



RTD Application

Novel tasks for treatment and rehabilitation studies
Tasks to be used for making RTD decisions by clinician



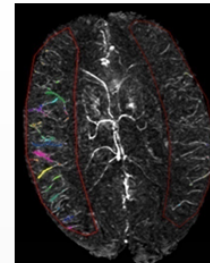
Title and Classification

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Siemens 3T and 7T MRI sequences:

Diffusion Tensor Imaging (DTI) – Fiber tracking
Susceptibility Weighted Imaging (SWI) – perfusion of veins and arteries
Functional MRI - BOLD



MRI Analyses:

Task activation
Resting state voxel intensities
Resting State Connectivity
Task-based connectivity



Title and Classification
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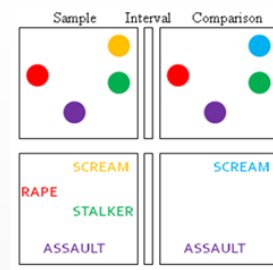


MRI tasks:

- Affect Regulation Task
- Change Detection Task
- Fear Conditioning Task

Off-line tasks:

- Affective Dot-Probe (MAPS)



General Analyses:

Between- and within-subject comparisons
ROC sensitivity/specificity
Correlations between proteomic/lipidomic with MRI and neurobehavioral measures



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Discussion/Future Directions

- Our preliminary findings provide evidence that lipidomic assays have potential as biomarkers of PTSD and TBI.
- Non-traditional, emotion-based tasks also have potential but efforts need to continue to establish psychometrics.
- Our current efforts include validating these tasks and proteomic/lipidomic profiles using MRI
- The effects of Tx on task performance and biomarkers will be assessed for establishing cutoff scores to be used for RTD decisions



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Acknowledgments

- Dr. Fiona Crawford, Roskamp Institute, Sarasota FL
- Command leadership of the U.S. Army Brigade Combat Teams (BCTs) involved in our study
- Dr. Mark Haub, Human Nutrition Laboratory, Kansas State University
- Dr. Geoffrey Hudson and Dr. Mike Webster, School of Human Performance, University of Southern Mississippi



Title and Classification
UNCLASSIFIED

Comment highlights:

CPT Dretsch: It is important to build on something. Looking at neurocognitive testing, there is a need for objective measures for assessing recovery from mTBI and PTSD. There is a strong interest and potential with blood-based biomarkers for TBI and PTSD.

Dr. Fiona Crawford: We're using an unbiased approach to our screening. We are trying to identify lipidomics when they occur. The field [of study] is exploding. Many are still under development at the moment. In animal studies, they are looking at TBI models of head injury. We'll look at cytokinesiology. Future directions – lipidomic assays have potential as biomarkers for PTSD and TBI.

Ms. Helmick: This PTSD/TBI work is intriguing. There is a PTSD consortium. CPT Dretsch should link up with those studies. Synergize with their findings with that of 17 studies. Diagnostic differentiation and assessments. The 5-year consortium is ending; find areas for leverage. Also, regarding TBI definition – if you concentrate on the loss of consciousness group, it's unfortunate. Consider instead to make sure that you are inclusive of the whole concussion group.

CPT Dretsch: Agreed. We'll include all [groups] once we have the full dataset together.

Dr. Kelly: CAREN Central puts subjects through simulation of Afghanistan theatre, along with cognitive tests, and saliva and blood tests. Consider accessing their samples.

1300 – 1330: RTD Research at the Center for the Intrepid

Return to Duty: Ecologically-Based Assessment in Virtual Reality – Christopher A. Rábago, DoD-VA Extremity Trauma and Amputation Center of Excellence



ARMY MEDICINE
Serving To Heal...Honored To Serve

Return to Duty: Ecologically-Based Assessment in Virtual Reality

Christopher A. Rábago^{1,2}, Michael C. Vernon², Michelle A. Haines²,
and Jason M. Wilken^{1,2}

¹DoD-VA Extremity Trauma and Amputation Center of Excellence
²Military Performance Lab, Center for the Intrepid
Brooke Army Medical Center
Ft. Sam Houston, TX

christopher.rabago@us.army.mil

September 19-20, 2012
Military Operational Medicine Research Program
Return to Duty Workshop



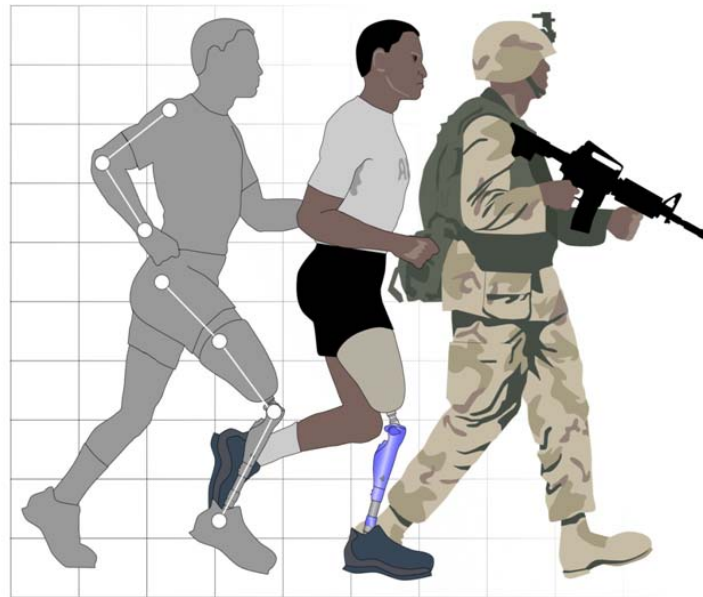
Disclosures

- No personal disclosures
- The view(s) expressed herein are those of the author(s) and do not reflect the official policy or position of Brooke Army Medical Center, the U.S. Army Medical Department, the U.S. Army Office of the Surgeon General, the Department of the Army, Department of Defense or the U.S. Government.
- All patients have given their expressed written consent to be filmed and photographed for this presentation.

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Military Performance Lab



Measuring Motion to Enhance Function

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MPL Clinical Research Line(s)

Development of ecologically-based assessments which highlight the functional deficits that negatively impact an injured service member's ability to successfully return to their desired role (Active duty or Civilian).

~~~~~

Development of ecological treatments to facilitate an injured service member's ability to successfully return to their desired role (Active duty or Civilian).

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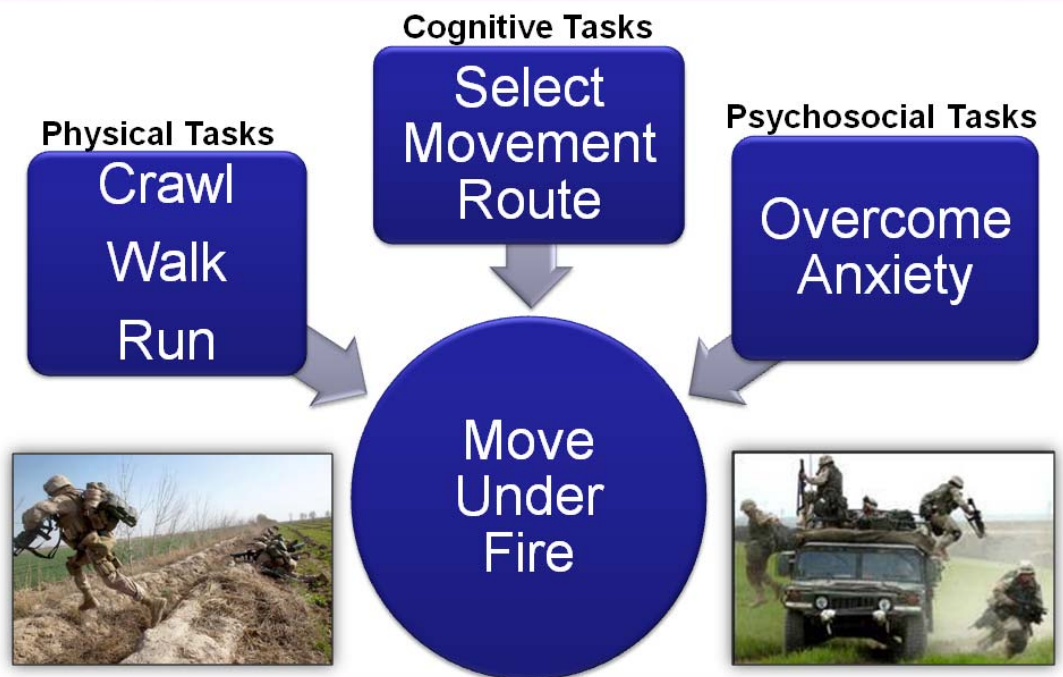
## Our Challenge

- How do we know when we have maximally rehabilitated a service member?
- Limited number of available metrics assess or predict “true” function during military tasks.
- Metrics often focus on a single domain/sub-domain of function.
  - Physical (cardio-vascular, balance, strength, mobility)
  - Cognitive (memory, attention, executive function)
  - Psychosocial (emotion, motivation, life quality, relationships)
- Gaps exist between what we can test in the clinic and what is performed in the “real-world”.
  - (i.e. timed single-limb balance test)

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## Most Warrior Tasks are Multi-tasks



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# Warrior Task Sub-domains

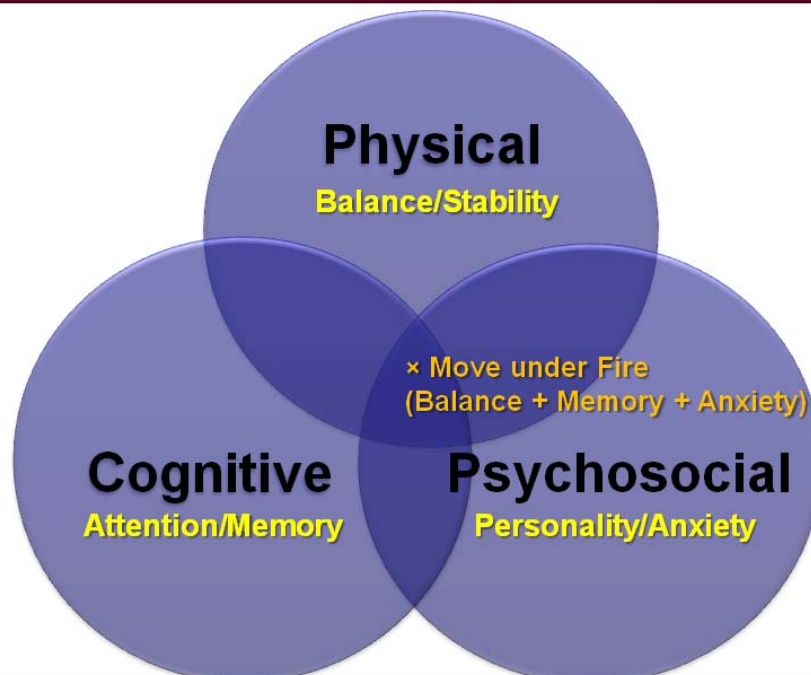
From Army Physical Readiness and Training Manual (TC 3-22.20, Table 1.3)

| Move under fire | Physical Components | Theoretical Constructs      |                         |
|-----------------|---------------------|-----------------------------|-------------------------|
|                 |                     | Cognitive Components        | Psychosocial Components |
| X               | Muscular Strength   | Verbal Comprehension        | Emotional State         |
| X               | Muscular Endurance  |                             |                         |
| X               | Anaerobic Endurance | Perceptual Organization     | Personality             |
|                 | Aerobic Endurance   |                             |                         |
| X               | Agility             | Learning and Memory         | Symptom Perception      |
| X               | Balance             |                             |                         |
| X               | Coordination        | Executive Function          | Status of Others        |
| X               | Flexibility         |                             |                         |
| X               | Posture             | Attention and Concentration | Quality of Life         |
| X               | Stability           |                             |                         |
| X               | Speed               | Processing Speed            | Relationships           |
| X               | Power               |                             |                         |

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# Domain Metrics: Task Interaction



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# CFI's Virtual Reality Environment



Distance 1257.16 m 0.75 mi  
Time 20:57:2 Speed 0.00 m/h 0.00 m/s

## Computer Assisted Rehabilitation Environment (CAREN)

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# Foundational Work in VR with Multi-tasking

## Novel methods for identification of concussion associated impairments

**Principle Investigator:** Jason M. Wilken, PhD, MPT  
**Funding:** MRMC Military Operational Medicine Research Program

**Purpose:** To determine the feasibility and initial effectiveness of a virtual reality based assessment and treatment paradigm for individuals with concussion associated motor and cognitive impairments

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### CASE STUDIES

#### Application of a Mild Traumatic Brain Injury Rehabilitation Program in a Virtual Realty Environment: A Case Study

*Christopher A. Rabago, PT, PhD, and Jason M. Wilken, PT, PhD*

JNPT • Volume 35, December 2011

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- Active duty Army driver/gunner
- Persistent post-concussion symptoms (non-deployable)
- Unresolved with time, meds, conventional rehabilitation

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## Pre & Post Treatment Assessment



**CFI Military Performance Lab**



**CFI Military Performance Lab**

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## Returned to Duty!



**CFI Military Performance Lab**

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## Current: Return to Duty Assessment

Physical and Cognitive Assessment Battery for  
Severely Injured Service Members



CFI Military Performance Lab "Convoy"

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## RTD Methods

We will assess physical and cognitive performance in individuals with severe lower extremity trauma (polytrauma) using:

- Day 1: Standardized clinical tests
  - Cardio, Balance, Agility, ANAM, PCL
- Day 2: Virtual Reality based military-tasks
  - Biomechanics, Task Performance, Physiologic Responses

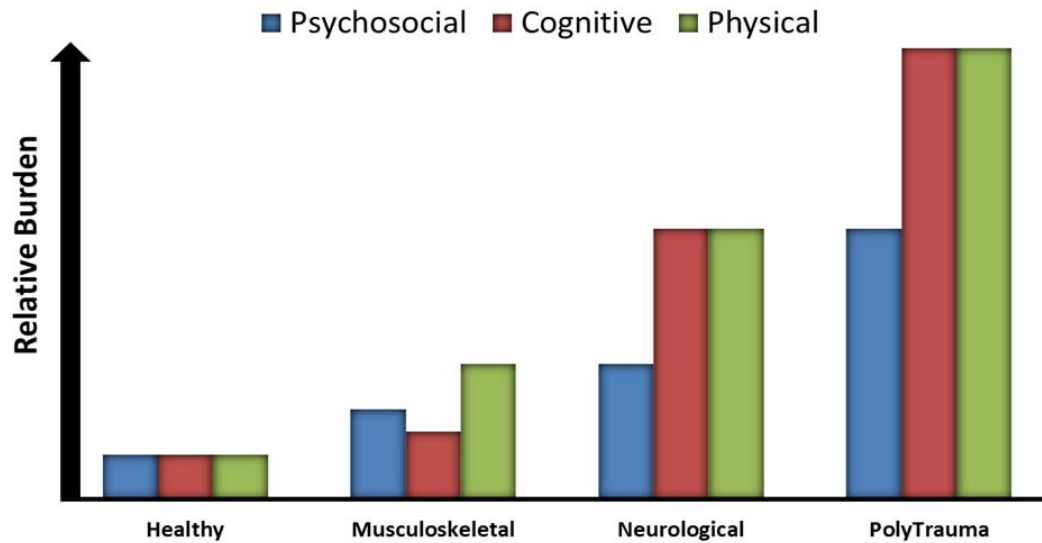
Determine: Convergent validity of measures,  
Normative values, Reliability of measures

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## Post-Injury Task Burden

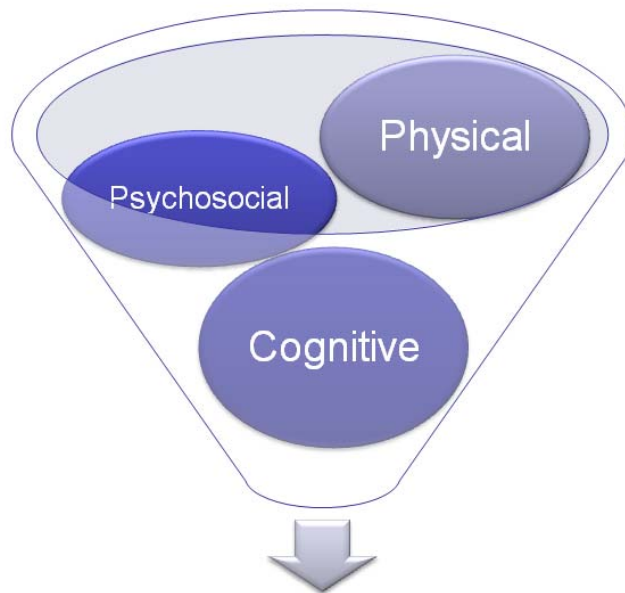
'Move Under Fire'  
Conceptualized Relative Burden on Following Injury



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## Functional Deficits $\leftrightarrow$ Outcome Metrics

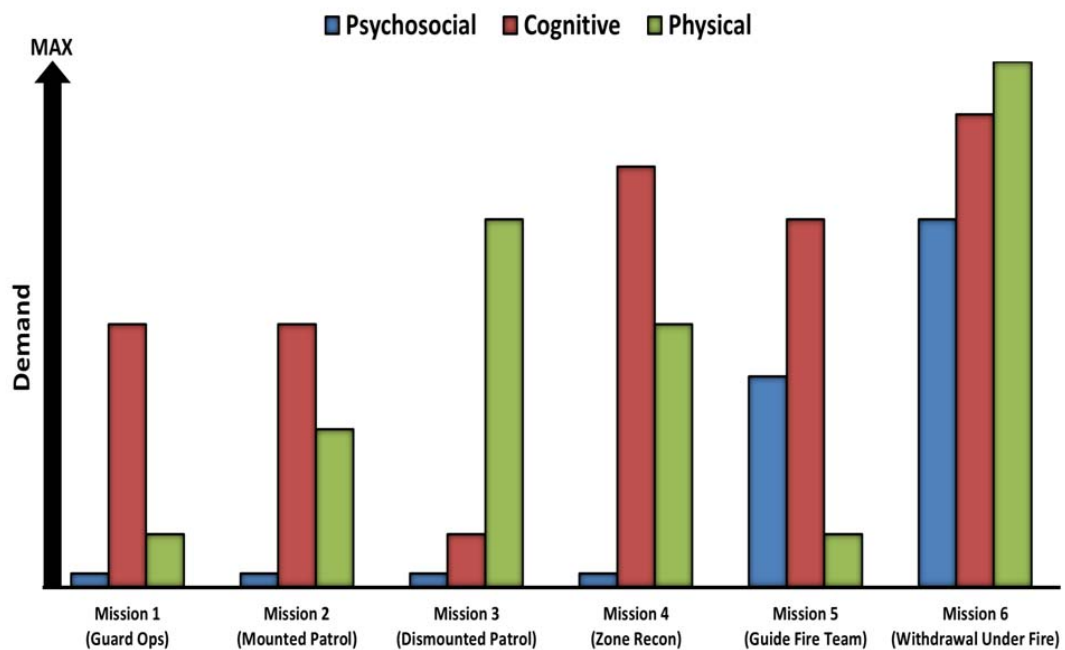


“Missions and Tasks”

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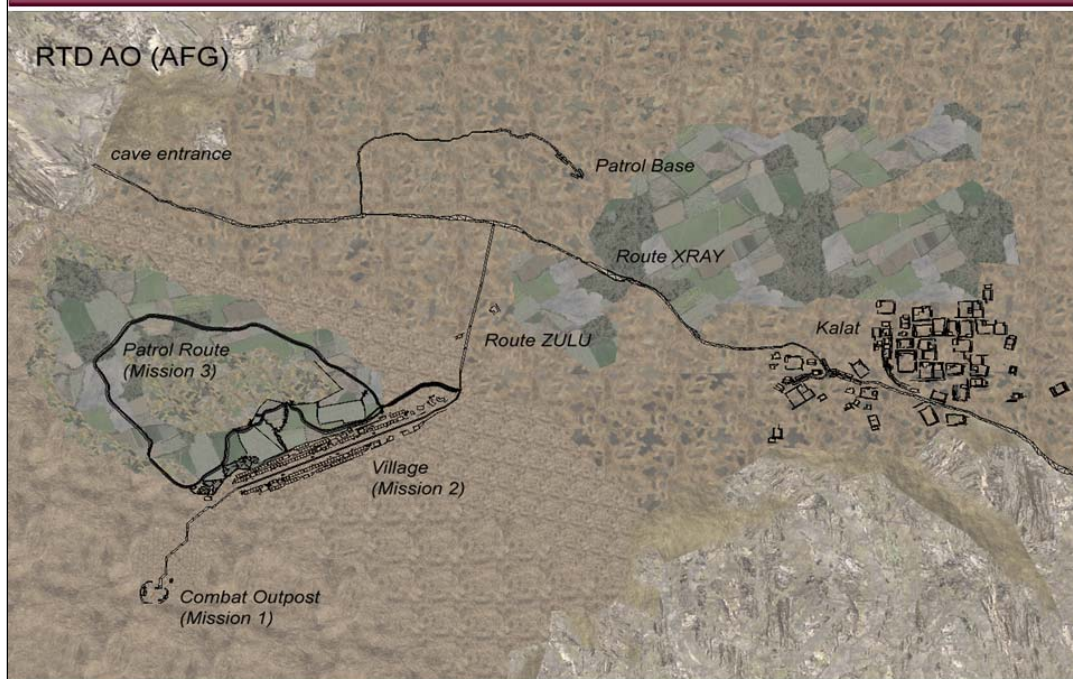
## Conceptualized Demand on Domains



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## Mission VR Environment

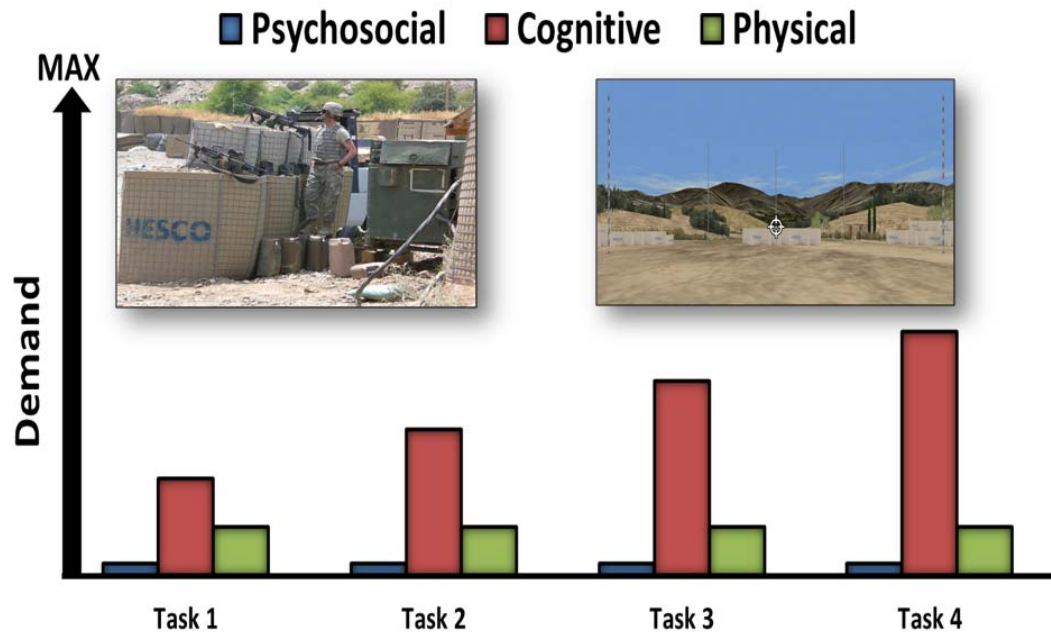


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## Mission 1 Concept: Guard Ops



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## Mission 1 Task 4

1 2 3 4

**Rule(s):** Only shoot circles appearing in sectors 1 and 3 and squares in sectors 2 and 4; always shoot **RED** shapes, never shoot **BLACK**

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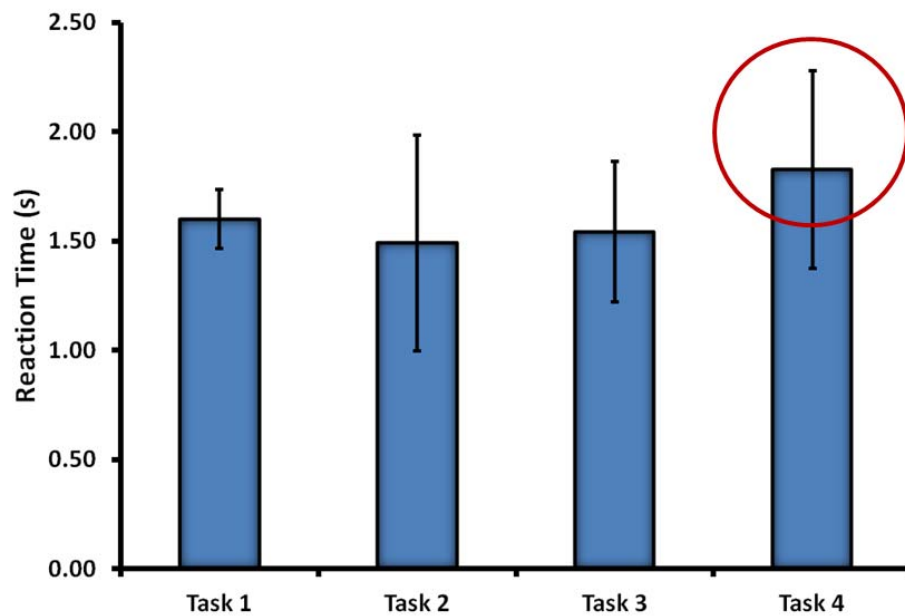
## Mission 1 Practice



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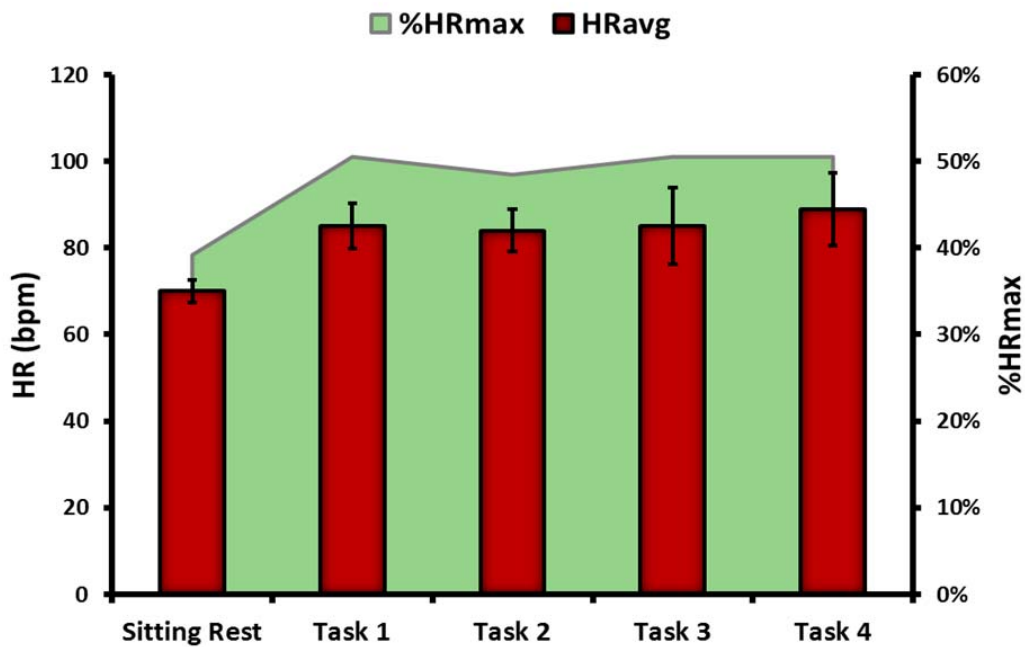
## Mission 1 Cognitive Demand



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## Mission 1 Physical Demand



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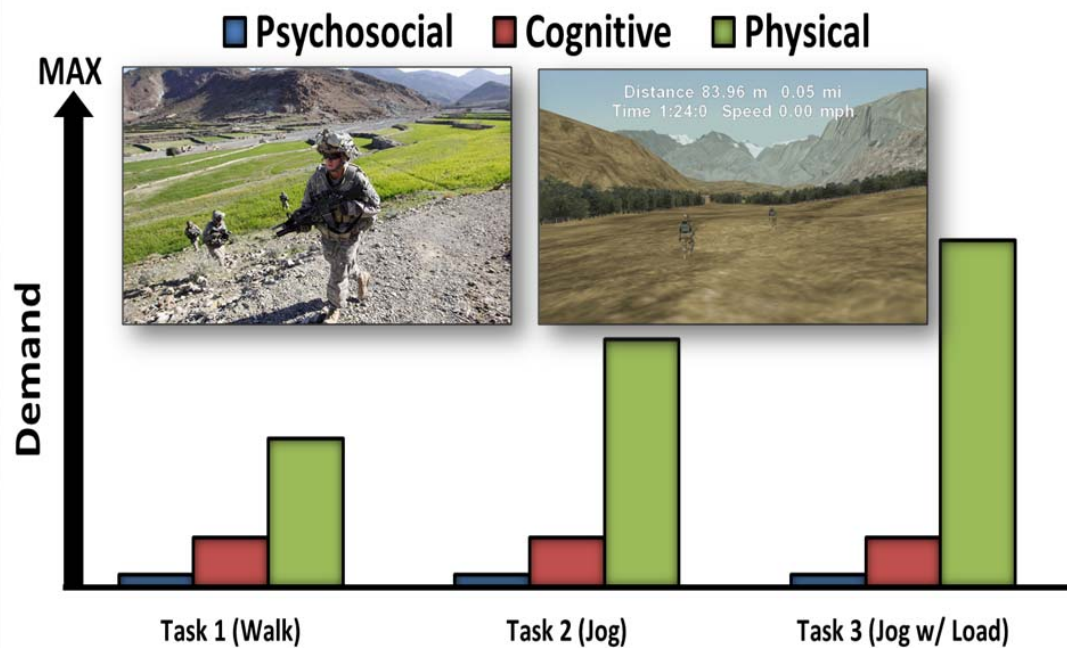
## Mission 2 Concept: Mounted Patrol



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## Mission 3 Concept: Dismounted Patrol



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## Mission 3 Practice

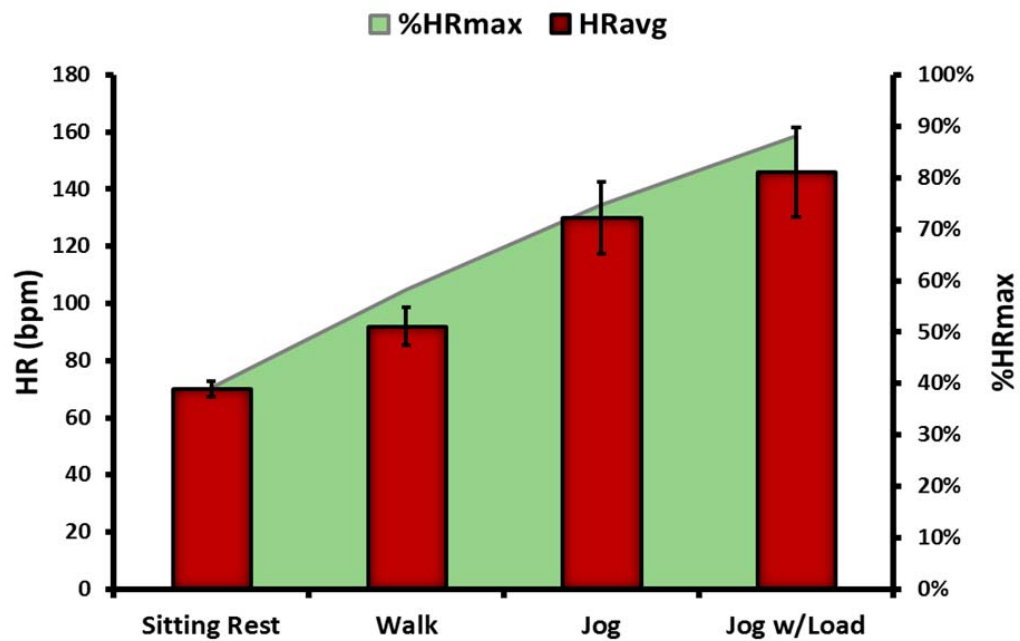
### CFI Military Performance Lab



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## Mission 3 Physical Demand

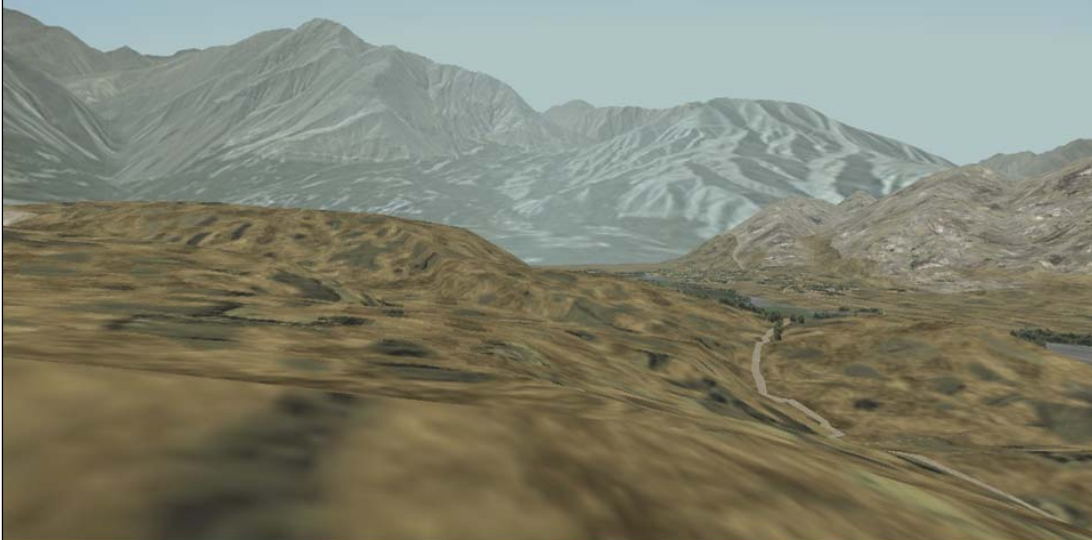


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## Mission 4 Concept: Zone Recon

Distance 1408.18 m 0.84 mi  
Time 23:28:2 Speed 2.24 m/h 1.00 m/s



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## Mission 5 Concept: Guide Fire Team

Speed 0.00  
Distance = 244.77m  
Time = 5:02:6



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## Mission 6 Concept: Withdrawal Under Fire

Distance 1292.34 m 0.78 mi  
Time 21:32:3 Speed 0.00 m/h 0.00 m/s



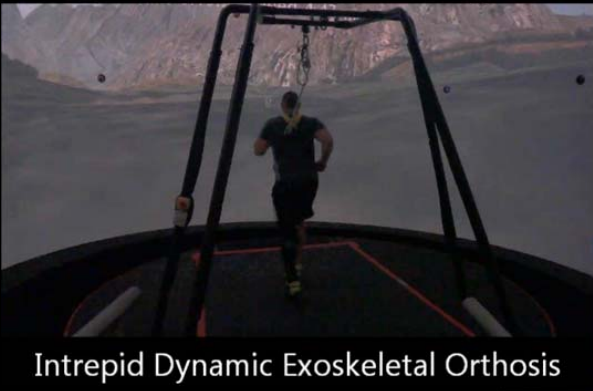
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# Current Clinical Care

## MPL Return to Run Pathway



Intrepid Dynamic Exoskeletal Orthosis



CFI Military Performance Lab

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# Challenges: Physiological Status Monitors



UTILITY IN advanced rehabilitation for patient monitoring?

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## Challenges: VBS2 Integration



### US Army Games For Training Program



U.S. ARMY

#### Description

The Games for Training Program provides Soldiers and leaders with low overhead, easily adaptable and readily available, Commercial and Government off the Shelf (COTS/GOTS) gaming applications.

Each application has unique characteristics that lend themselves to augment and improve an existing training capability and prepares the soldier for full spectrum operations within the Contemporary Operating Environment (COE).

#### \*Virtual Battlespace 2 (VBS2)

VBS2 is a commercial-off-the-shelf game-based training platform, incorporating a high-fidelity virtual environment, scenario and mission editors, after action reviews (AARs) and a powerful development suite.

The system provides:

- First-person environment that supports mounted and dismounted operations.
- Ground and air vehicles, small arms and vehicle-mounted weapons, communications, and interactive opposing forces.

\* Flagship product

#### VBS2 & Joint Military Training

Linking platoon and battalion levels battle command systems greatly enhances multi-echelon training.

|                                    |                                 |
|------------------------------------|---------------------------------|
| United States—US Army & Marines    | Afghan National Army            |
| Australian Defence Force           | Royal Netherlands Army (OTCMAN) |
| Romanian Armed Forces              | Singapore Armed Forces          |
| United Kingdom Ministry of Defence | Canadian Forces                 |
| Iraqi Army                         | New Zealand Defence Force       |

54 Fielded Sites-including Germany, Japan and Korea



#### Gaming Suite

- VBS2
- VBS2 Fires
- ELECT BiLAT
- Operational Language & Culture
- Moral Combat
- UrbanSIM
- SE CORE API
- IED3
- Tactical Combat (TC3) In work

#### Products created for Korea:

- JTCOIC is building a large underground facility and supporting terrain
- NSC has created 3 Geo-specific VBS2 terrain boxes including:
  1. Rodriguez Range (5Km)
  2. Twin Bridges (10Km)
  3. Story Life Fire Center (5Km)
- Early distribution of v1.5

#### Point of Contact

Name: LTC Mark Bliss, PM ACTT  
Contact info: [mark.bliss@us.army.mil](mailto:mark.bliss@us.army.mil)

Name: Leslie Dubow, Project Director  
Contact info: [leslie.dubow@us.army.mil](mailto:leslie.dubow@us.army.mil)



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## VBS2 Example



JTCOIC  
SIMS DIRECTORATE

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## Challenges: Weapon System Integration



### DSTS

#### Instrumented Simulated Weapon (ISW)

##### ISW Functionality

- Provide a physical interface for the Soldier to interact with a weapon that is identical to the virtual weapon being used for the training mission
- Provide all necessary instrumentation to emulate most of the operational functions that a Soldier performs with their weapon and to be able to capture that information in real-time to recreate those actions as part of the scenario shared by all participants



- Provide instrumented trigger events and real-time aiming (weapon orientation)
- Provide accurate pointing and aiming capability to emulate in the virtual environment the physical action of aiming and shooting in the real world
- Provide mobility input data (speed and direction of motion)



- Reload via cartridge
- Integrated four activity buttons
- Stock/shoulder contact/pressure sensor
- Safety or model selector switch



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## Future: VR Assessment without a CAREN



### Virtual Soldier Manned Module (VSMM) Subsystem Breakdown

- Helmet Mounted Assembly (HMA)
- Man-Wearable Assembly (MWA)
- Human Sensor Network (HSN)
- Instrumented Simulated Weapon (ISW)
- VSMM Software
- Haptic Feedback Pad (HFP)



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## RTD Research Team

- **Jason Wilken, PhD, PT**
  - MPL, Director
- **Christopher Rábago, PhD, PT**
  - Research Physical Therapist
- **Michael Vernon, (CP36)**
  - VR Developer
- **Michelle Haines**
  - Research Assistant



- RTD Assessment Battery
- Funding provided by the DOD Defense Health Programs' Center for Rehabilitation Sciences Research, NF90UG.

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Comment highlights:

Dr. Estrada: Did the participant have PTSD?

Dr. Rábago: No, it was a hit in the head with a softball. They are now are doing co-morbid RTD assessments; they want to look at convergent validity.

Dr. Estrada: Could the participant see the metrics on the screen?

Dr. Rábago: Yes, he could see some of them. The distance is fixed.

1330 – 1430: Current Approach and Problems with RTD Care – User Perspectives and Research Needs

Return to Duty Following Musculoskeletal Injury – LTC Deydre S. Teyhen, Telemedicine and Advanced Technology Research Center

Slide presentation withdrawn by presenter's request.

Comment highlights:

LTC Teyhen: Seventy-three percent of all VA disability cases have a musculoskeletal component. Measuring risk of injury from a musculoskeletal perspective is multi-factorial. There is a need to measure many tasks to calculate the likelihood of injury. Reports go to unit Fitness Test coordinators to use in preventing injuries. The new model is to send the patient immediately to the physical therapist rather than to a specialist and imaging. It's better to get to rehab early. It decreases cost and RTD time. There is a need to build the Soldier athlete focus on mobility, strength, and endurance. The Army does not do musculoskeletal screening annually, yet it is its #1 type of injury.

MAJ Hill: Regarding the slide with physical readiness strategy title, what happens if the Soldier scores low?

LTC Teyhen: If at the Basic Combat Training [BCT] level, the Soldier gets specific exercises. Those in the orange category meet with a coach. Those in the medical referral category are sent to someone who does a full evaluation.

Dr. Estrada: Does it have to do with the current generation being one that plays video games rather than getting physical exercise?

LTC Teyhen: Yes. At TATRC [Telemedicine and Advanced Technology Research Center], we now have tests to screen for that. The platform could be expanded for implementation at the Brigade level.

Dr. Kelly: What about expanding the standards? What if they didn't train to weakest link?



LTC Teyhen: The negative trend with performance training was that it was squad based and trained to lowest denominator. When does that make musculoskeletal injuries worse? We need to give them more than a walking track as means of reintegrating?

Dr. Kelly: The same is true for nutrition. Are you seeing correlations between poor nutrition and healing?

LTC Teyhen: This is scalable. The Indianapolis Colts use this. Our movement tests are the #2 criteria for the football draft.

The Military Functional Assessment Program: An Occupational Therapy Perspective on RTD after TBI – Jenny Owens, Blanchfield Warrior Resiliency and Recovery Center



## Warrior Resiliency & Recovery Center

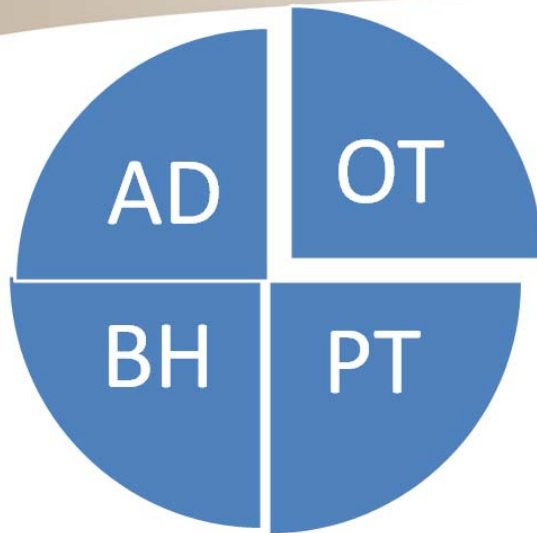
- Clinic opened in September, 2008
- 3- Building Complex at Ft. Campbell, KY
- Serve Active Duty Army, Reserve, National Guard, Air Force and Retirees
- Multi-Disciplinary Treatment Team
- 12 wk program for mTBI/Concussion, PTSD and other neuropsychological dysfunction



## Military Functional Assessment Program (MFAP)

- Provides **quantitative and qualitative** input to inform Return to Duty decision-making
- Structured observation of SMs performance on basic **Army-Relevant** tasks
- Functions as the final stage in **TBI Rehabilitation Program**
- Completed in **5 Days**
- Uses a **Multidisciplinary** approach
  - Occupational Therapy
  - Physical Therapy
  - Behavioral Health
  - Active Duty/Operations SME

## Discipline-Specific Task Analysis



### **Occupational Therapy:**

- Level of independence with cognitive and visual demands of task

### **Physical Therapy:**

- Functional impact of the task on balance and vestibular systems

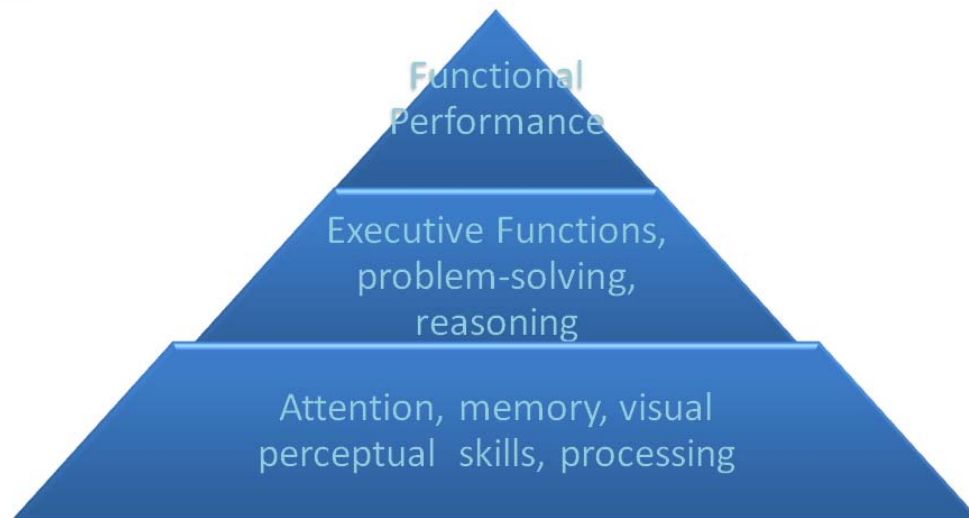
### **Behavioral Health:**

- Functional impact of stress/anxiety stimulated by each event

### **Active Duty Coordinator:**

- Adherence to standard operating procedures, maintenance of military bearing, fulfillment of rank/role expectation

## Occupational Therapy: Top-Down Assessment





HEAT instructors present brief class on rollover safety. SMs complete 3 rollover drills:

1. Basic egress
2. Egress with limited visibility
3. Egress out the turret

On final egress, SMs extract casualty and provide TCCC and call up a 9-line Medevac request.

High physical impact

## HMMWV Egress Assistance Trainer (HEAT)



SMs complete 3 combat scenarios embedded with selected entities:

- IEDs
- RPGs
- Non-combatants
- Friendly forces

SMs must demonstrate:

- Appropriate use of radio
- SITREPs
- Visual scanning
- Safety/judgment
- Topographical orientation
- Teamwork
- Low physical impact

## Virtual Convoy Operator Trainer





SMs complete a 3 point land navigation course (max distance between points of 350 meters).

- Basic map reading skills
- Use of pace count
- Use of terrain association
- Visual scanning
- Problem-solving
- Cognitive flexibility
- Moderate physical impact

## Land Navigation



SMs demonstrate understanding of basic marksmanship skills

- Steady position
- Aiming
- Breath control
- Trigger squeeze

SMs must zero and qualify with 2 or less trials to pass

Judgmental shooting scenarios

Shoot/No-shoot

Low physical impact

## Zero and Qualify with M-4 Rifle Judgmental Shooting Scenarios





SMs complete 3 care under fire scenarios of escalating psychological demand and cognitive complexity.

SMs must demonstrate appropriate:

- Evaluation of a casualty
  - Hemorrhage control
  - Management of open chest wound
  - Airway management
  - 9-line Medevac Request
  - Management of personal stress
- Moderate physical impact

## Medical Skills Training: 'Care Under Fire'



SMs perform a dismounted patrol in a squad-sized element and are armed with paintball guns

The mission is to keep from being 'mortally' wounded while evaluating, treating, and evacuating a casualty while encountering an ambush and 'IED' attack.

High physical impact

## Tactical Simulation/IED Lane

## Process Challenges

### Logistic

- Training site cooperation
- Resources (personnel, equipment)
- Need for a well trained, experienced NCO/AD coordinator
- Reliant upon pre-existing functional standards combined with clinical tests

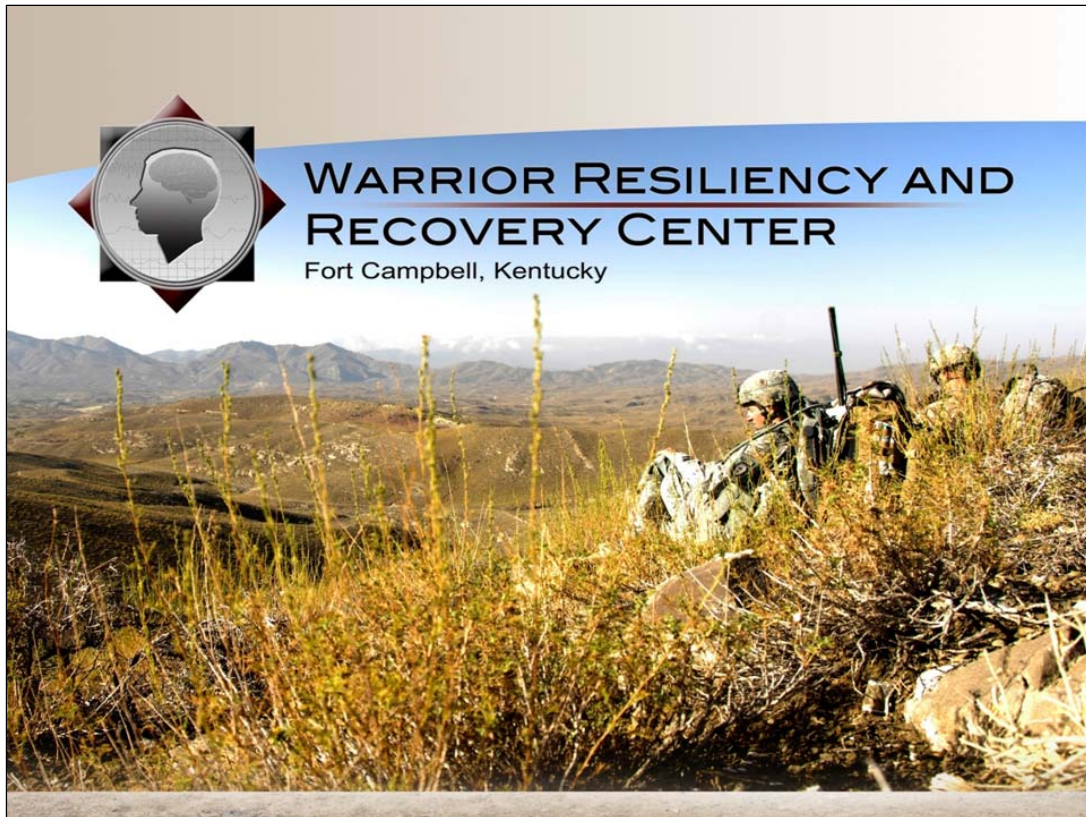
### Theoretical

- Challenges to reliability
  - Subjectivity of raters
  - Variable training conditions
- Challenges to validity
  - Interaction of multiple, semi-controlled variables (are we testing what we think we're testing?)
  - Activity selection



## Current Status

- 92% pass rate
- WRRC plans to begin follow-up surveys at 3, 6, and 12 months
- Quarterly model, may involve more disciplines
- Potential to broaden from TBI scope to assess other factors
- Need to validate scoring methods



Comment highlights:

LTC Whalen: What kind of command support do you have?

Ms. Owens: My experience has been good. We get good command buy-in and support.

LTC Whalen: What if the recommendation is to not return or to return under a different MOS?

Ms. Owens: At that point the person goes in front of a board and is beyond me. The board usually recognizes the degree of injury. [Our assessment] can help with the decision.





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For Psychological Health & Traumatic Brain Injury

## Current Approach and Problems with RTD Care after mTBI

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Ms. Kathy Helmick, MS, CRNP, ANP-BC, CNRN  
Deputy Director – Defense and Veterans Brain Injury Center (DVBIC)

September 2012

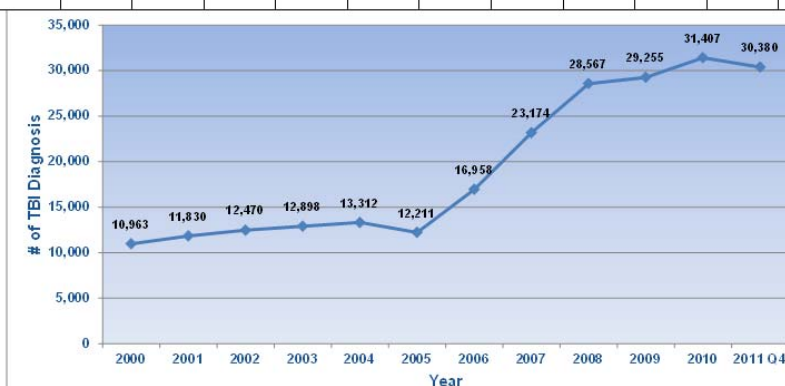


## DoD TBI Definition (OCT 2007)

- Traumatically-induced structural injury or physiological disruption of brain function as a result of external force to the head
- New or worsening of at least one of the following clinical signs:
  - Loss of consciousness or decreased consciousness
  - Loss of memory immediately before or after injury
  - Alteration in mental status (confused, disoriented, slow thinking)
  - Neurological deficits
  - Intracranial lesion
- DoD definition parallels standard medical definition:
  - Centers for Disease Control, World Health Organization, American Academy of Neurology, American Congress of Rehabilitation Medicine

# TBI Diagnoses in DoD are Increasing

| TBI Diagnoses (All Severities) 2000-2012 (CY12 Q1) |        |        |        |        |        |        |        |        |        |        |        |         |         |
|----------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|
| 2000                                               | 2001   | 2002   | 2003   | 2004   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012 Q1 | TOTAL   |
| 10,963                                             | 11,830 | 12,470 | 12,898 | 13,312 | 12,211 | 16,958 | 23,174 | 28,567 | 29,255 | 31,407 | 30,380 | 10,792  | 244,217 |



84% of all TBIs are non-deployment related

Source: <http://www.dvbc.org/sites/default/files/uploads/dod-tbi-2000-2012.pdf>  
Current as of May 2012

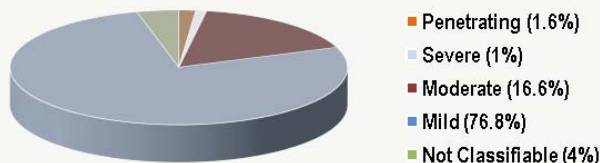
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# DoD TBI Incidence by Severity

| Annual New Traumatic Brain Injury Diagnoses in All Services<br>As of May 16, 2012 |                |
|-----------------------------------------------------------------------------------|----------------|
| Classification                                                                    | 2000 - 2012 Q1 |
| Penetrating (1.6%)                                                                | 3,786          |
| Severe (1%)                                                                       | 2,469          |
| Moderate (16.6%)                                                                  | 40,449         |
| Mild (76.8%)                                                                      | 187,539        |
| Not Classifiable (4%)                                                             | 9,883          |
| Total                                                                             | 244,217        |

Severity of TBI Diagnoses in All Services  
2000 - Q1 2012



Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS)  
Prepared by MHS Office of Strategic Communications  
<http://www.dvbc.org/sites/default/files/uploads/dod-tbi-2000-2012.pdf>

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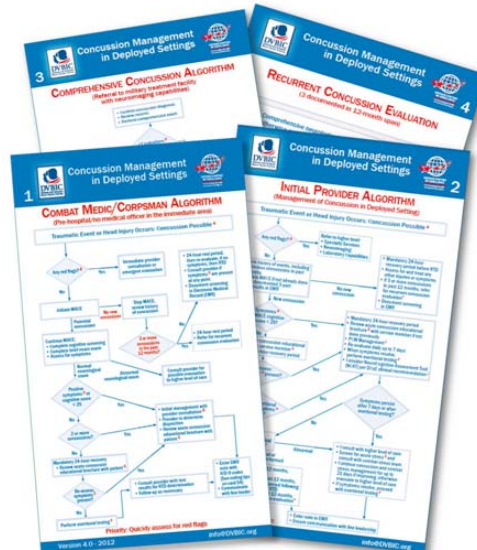
# Impact of mTBI on Warfighters

| Symptoms                                                                                                                                                                                                                                                                                                                                                                                                                    | Manifestation                                                                                                                                                                                                                                                                                                              | Impact                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Headache</li> <li>• Sleep disturbance</li> <li>• Fatigue</li> <li>• Dizziness/balance problems</li> <li>• Visual disturbance and light sensitivity</li> <li>• Ringing in ears</li> <li>• Slowed thinking</li> <li>• Difficulty finding words</li> <li>• Poor concentration</li> <li>• Memory problems</li> <li>• Anxiety/depression</li> <li>• Irritability/mood swings</li> </ul> | <ul style="list-style-type: none"> <li>• Failure to sleep at night</li> <li>• Decreased energy</li> <li>• Slower reaction time</li> <li>• Difficulty negotiating uneven terrain</li> <li>• Easily distracted</li> <li>• Difficulty processing multiple sources of information</li> <li>• Interpersonal problems</li> </ul> | <ul style="list-style-type: none"> <li>• Poor marksmanship</li> <li>• Decreased situational awareness</li> <li>• Difficulty performing quickly under time pressures</li> <li>• Difficulty multi-tasking: such as driving a vehicle while listening to instructions on a radio</li> <li>• Performance difficulties can affect self-esteem and confidence</li> <li>• Fear of performing in certain operational environments</li> </ul> |

## Clinical Algorithms



- Department of Defense (DoD) policy includes four concussion management clinical algorithms
  - Combat Medic/Corpsman
  - Initial Provider
  - Comprehensive Concussion
  - Recurrent Concussion
- Clinical algorithms were updated in 2012; current version is 4.0



Version 4.0 - 2012

# Mandatory Events Requiring Evaluation



- Exposure to the following events mandates prompt command and medical concussion evaluation, event reporting and a 24-hour rest period



Any service member in a vehicle associated with a blast event, collision or rollover

All within 50 meters of a blast (inside or outside)

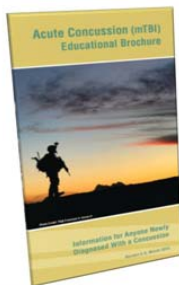
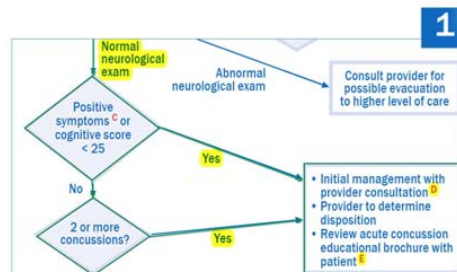
Anyone who sustains a direct blow to the head

Command directed, including (but not limited to) repeated exposures to blasts

# Initial Management



- Perform medic/corpsman initial management with provider consultation
- Specific medic/corpsman interventions outlined on card S1(superscript D)
- Provider to determine disposition
- Actively review standardized educational brochure as referenced on card S1 (superscript E) with service member



## **D** Medic/Corpsman Initial Management of Concussion:

1. Give acute concussion educational brochure to all concussion patients, available at: [www.DVBIC.org](http://www.DVBIC.org)
2. Reduce environmental stimuli
3. Mandatory 24-hour recovery period
4. Aggressive headache management
  - Use acetaminophen q 6 hrs x 48 hrs
  - After 48 hours may use naproxen prn
5. Avoid tramadol, Fioricet, excessive triptans and narcotics

## **F** Available Resources ([www.DVBIC.org](http://www.DVBIC.org)):

- Acute Stress Reaction Questionnaire
- Acute Concussion Educational Brochure
- Neurobehavioral Symptom Inventory
- Line Leader Fact Sheet
- Coding Guidance
- DCoE NeuroCognitive Assessment Tool (NCAT) Recommendation

**S1**



- 
- ```

graph TD
    Start([Continue RACE]) --> A[Complete pre-excitation screening  
• Review for symptoms  
• Assess for symptoms]
    A --> B{3 or more symptoms  
in the past  
12 months?}
    B -- No --> C{Normal neurological exam}
    B -- No --> D{Abnormal neurological exam}
    C --> E{Positive findings on ECG or  
imaging studies >20}
    D --> F{Consult provider for possible  
conversion to higher level of care}
    E -- Yes --> G{3 or more symptoms?}
    E -- No --> H{Re-evaluate in 3-6 mo.  
interval  
• Review within 1 mo. interval  
educational brochure with patient}
    G -- Yes --> I{Consult provider with test  
results for AF/A conversion  
Follow-up on intensity}
    G -- No --> J{Perform exertional testing?}
    I --> K{Enter GEM  
note with  
date  
flow testing  
on and off}
    J --> L{Re-assess symptoms  
present?}
    K --> L
    L -- No --> M{Perform exertional testing}
    L -- Yes --> N{Communicate with the leader}
    
```
- Version 4.0 © 2012 info@dvbnc.org

### **F Exertional Testing:**

- Version 1.0 (May 2012)

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- Mandatory 24-hour recovery period
- Review acute concussion educational brochure <sup>E</sup> with service member if not done previously
- PCM Management <sup>I</sup>
- Re-evaluate daily up to 7 days
- When symptoms resolve, perform exertional testing <sup>F</sup>
- Consider NeuroCognitive Assessment Tool (NCAT) per DCoE clinical recommendation

S3

Version 1.0 (May 2012)

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## What HURTS brain rest and recovery after a concussion?



### Cognitive/Thinking

- Mental exertion
  - Writing reports
  - Activities requiring intense concentration
- Inadequate sleep
  - Caffeine or “energy enhancers”
    - Interfere with proper sleep
    - Prevent relaxation

### Physical

- Exertion
  - Working
  - Heavy lifting
  - Exercising
- Physical activities that increase risk for a second concussion
  - Combatives
  - Sports



Version 1.0 (May 2012)

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## What activities HELP brain rest and recovery following a concussion?



### Cognitive/Thinking

- Maximize downtime or rest during the day
- Adequate sleep routines
  - Keep sleeping quarters quiet and dark
  - Get six to eight hours of sleep

### Physical

- Keep the heart rate low
  - Minimal heat exposure
  - Limited physical activity
  - Adequate sleep at night
  - Ample hydration; drink plenty of water



Version 1.0 (May 2012)

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## Problems with Current Approach

- No guidance for graded activity
- Does not take into account data other than self report of symptom resolution before consideration of RTD
- Exertional testing protocol was consensus based from unwritten sports model
- Does not mimic real life physical, cognitive or behavioral response to MOS/activity
- Little neurochemistry data in mTBI population that can help guide timing of safe RTD

## Current Solutions

- **Graded Activity Expert WG met in July 2012**
  - Will have graded progressive activity protocol outlined by physical progression, cognitive progression and vestibular/balance progression by January 2013
  - Based on the Borg Rate of Perceived Exertion (RPE) scale and HR
- **In depth analysis of USA MOS for those involved in potentially concussive events and those who sustain concussion**
  - Army only; analysis from August 10 – Apr 12
  - Approx. 6K
  - Combat Engineering, General and Infantry, General



## Gaps

- Lack of simulated environment to capture performance
- Targeted areas of performance
- Lack of objective data to capture performance (heavy reliance on self report)
- Outcome data about current RTD decision making (How many return with repeat concussion? How many do not successfully RTD? How many continue with symptoms after deployment)

Comment highlights:

LTC Whalen: What about the unit level data?

Ms. Helmick: I am crossing the unit with the type of events. I am looking at those involved in an event, then those that got a concussion. I also had RTD and symptom data to share.

Dr. Proctor: What is the source of the data?

Ms. Helmick: The Armed Forces Response Center is the source of data. JTAPIC [Joint Trauma Analysis and Prevention of Injury in Combat] also provides data to us. We are gathering helpful trend information on commander waivers for rest periods after concussion. We can bring it to attention to other commanders. Our analysis informed policy makers and those on the line. As for prognostics for those who will RTD, I am not hearing anecdotally that people are not ready to return.



# Behavioral Health Service Line

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## Information Brief

LTC Edward Brusher

September 2012

UNCLASSIFIED



"The views expressed in this abstract/manuscript are those of the author(s) and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the US Government."

Slide 2 of



## Service Line Definition

*A core team focused on a major AMEDD health domain with full visibility of assets, services, and resources. This team will assess domain performance, set policy, and build a collaborative enterprise community of practice around evidence based standards to equip commanders for mission success in a culture of health, safety and continual improvement.*

*Policy compliance and assessment will be through mission orders and the execution of Mission Command by MEDCOM CG, RMC and MTF Commanders*



## Behavioral Health Service Line Commander's Intent

- **Mission:** MEDCOM implements the Behavioral Health Service Line (BHSL) across the enterprise to provide integrated execution and standard management of the Behavioral Health System of Care (BHSOC).
- **Purpose:** Provide an OTSG-level oversight structure for all Behavioral Health (BH) services that is accountable for ensuring standard clinical practice and elimination of variance at the Military Treatment Facility level.
- **Endstate:** A single Army standard for BH delivery where any variance between facilities is documented and approved at the Service Line-level.



## Behavioral Health Service Line Goals

- Move to **enterprise model** by equipping RMCs and MTFs with:
  - uniform approach to delivering BH clinical care services.
  - tools to allow excellence in patient experience and command support effort.
- Introduce **authoritative standards of clinical practice** to be able to compare performance from one installation to another, and to offer Soldiers and families a uniformity of BH care experience at all locations.
- Promulgate **evidence-based programs** across the Army enterprise based on continuous program evaluation with appropriate monitoring and accountability at all levels.
- Rapidly **shift surge assets** to respond to dynamic demands across the enterprise.

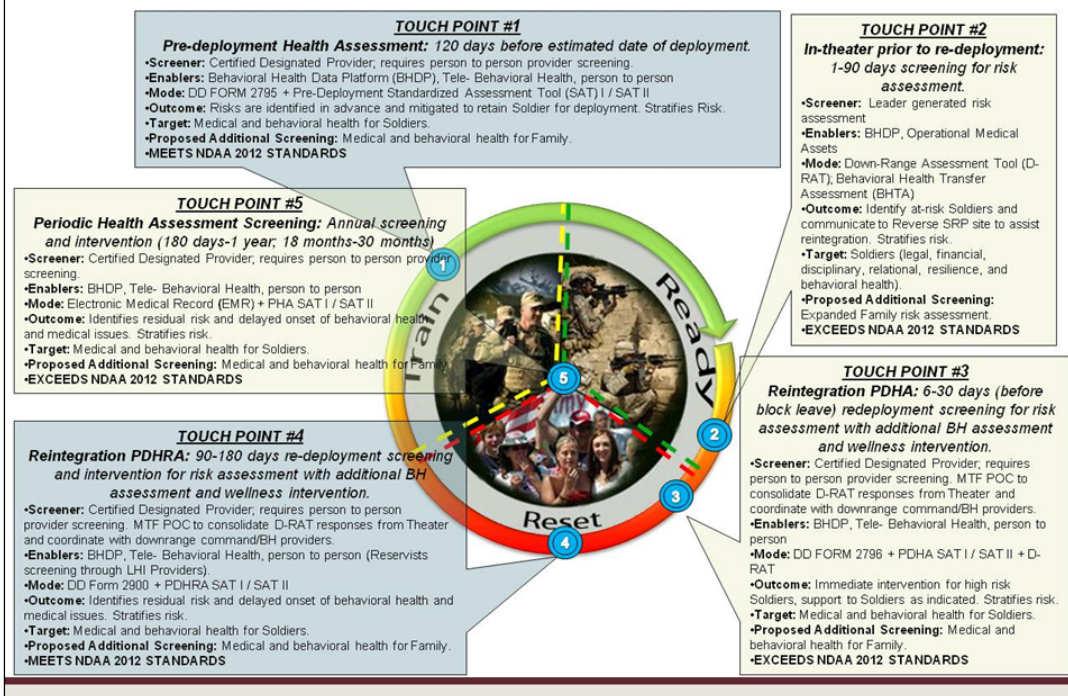


## Behavioral Health System of Care and Behavioral Health Service Line

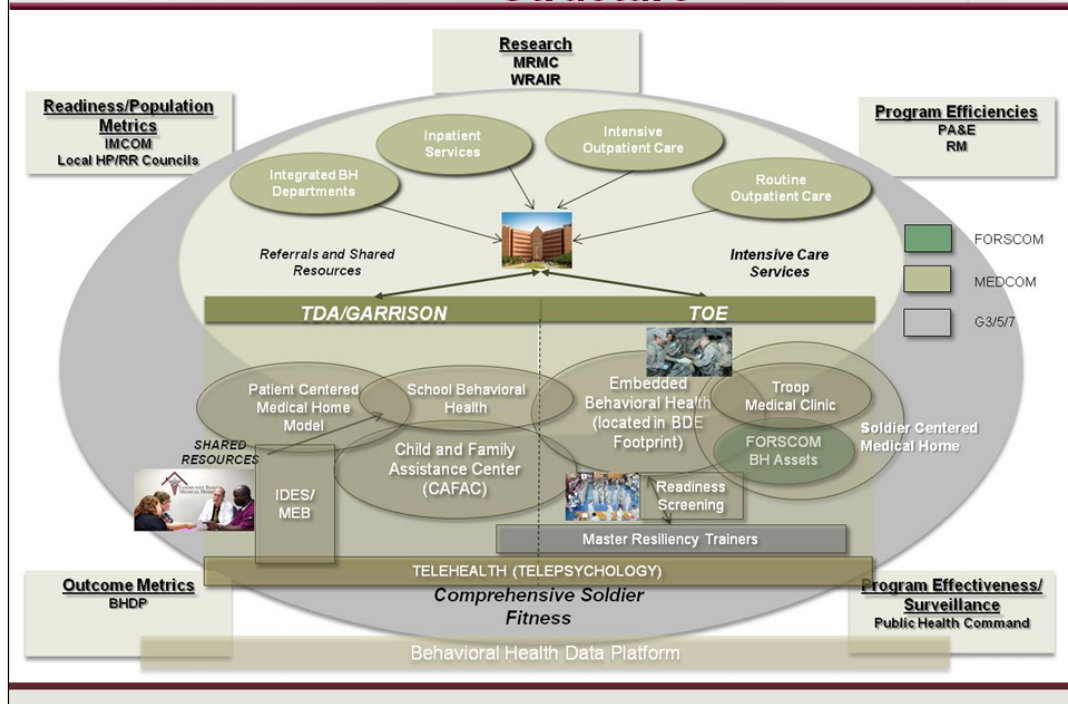
- The Behavioral Health System Of Care Campaign Plan (BHSOC) was established in SEP 2010 to standardize, synchronize, and coordinate clinical behavioral healthcare delivery:
  - Mandated via MEDCOM OPORD 10-70.
  - Establishes 30 core enterprise behavioral health programs (requiring additional resourcing to roll out validated programs).
  - Standardizes screening and intervention touchpoints aligned with ARFORGEN.
  - Optimizes care and maximizes limited resources.
- Behavioral Health Service Line responsible for management and execution of Behavioral Health System of Care:
  - Establishes accountability for execution through central management.
  - Enables visibility of data across directorates to inform decisions.
  - Provides uniform standards for measurement and evaluation.
  - Pending OPORD to supersede OPORD 10-70.



## Standardized Behavioral Health ARFORGEN Screening Touchpoints



## Model Behavioral Health Program Structure







## Enterprise Behavioral Health Programs

| Project Name                                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Behavioral Health Data Portal                              | Establishes a Behavioral Health Information Technology portal for standardizing and tracking BH data for assessment and outcome data tracking purposes.                                                                                                                                                                                                                                                                                                       |
| Embedded Behavioral Health (EBH)                           | Community Behavioral Health care to Soldiers in close proximity to their unit area and in close coordination with unit leaders.                                                                                                                                                                                                                                                                                                                               |
| BH Case Management into Primary Care                       | Integrates care managers into Primary Care utilizing current RESPECT-MIL RN RCFs.                                                                                                                                                                                                                                                                                                                                                                             |
| Child and Family Behavioral Health                         | Executes a comprehensive plan on the installation that provides direct Behavioral Health support for Army Children and their Families with all Behavioral Health resources integrated under a single umbrella organization to facilitate coordination, and increase capacity and flexibility in delivery of these services. Includes Child and Family Assistance Centers (CAFACs).                                                                            |
| Internal BH Consultants (IBHC) in Primary Care             | Integrates Behavioral Health providers into Primary Care, to include Patient Centered Medical Home (PCMH) and Soldier Centered Medical Home (SCMH).                                                                                                                                                                                                                                                                                                           |
| School BH Program                                          | Provides cost-effective, comprehensive behavioral health services to support military Children, their Families, and the Army Community in schools.                                                                                                                                                                                                                                                                                                            |
| Addictions Medicine Intensive Outpatient Program (AMIOP)   | Treats Soldiers with substance abuse/dependency symptoms. Program delivers organized outpatient treatment services during the day, in the evening, and weekends.                                                                                                                                                                                                                                                                                              |
| Addictions Medicine Residential Treatment Facility (AMRTF) | Provides a regimen of care, in a 24-Hour, live-in setting specifically targeting addiction treatment. Includes intensive treatment for dual diagnosis, as well as detoxification and psychiatric services as indicated.                                                                                                                                                                                                                                       |
| Behavioral Health Surveillance & Assessment                | Provides the ability to provide comprehensive behavioral epidemiology and surveillance programs to evaluate the full spectrum of health and wellness in Army communities and is vital in order to proactively address the Behavioral Health outcomes associated with Army operations. Includes Behavioral and Social Health Outcomes Program.                                                                                                                 |
| BH Facilities                                              | Initial renovation or construction in support of Behavioral Health space. Can include associated initial outfitting and transition requirements. Does not include sustainment.                                                                                                                                                                                                                                                                                |
| BH Services                                                | Provides Mental Health services to Soldiers through prevention, advocacy and treatment in an outpatient environment. Includes inpatient professional services focused on reducing patient's symptoms and progressing the hospitalized patient to outpatient care or independent functionality. Patients are hospitalized at an MTF or a community, off post facility but managed by DoD physicians. Includes Psychiatry, Psychology and Social Work services. |
| BH Training                                                | Provides training to Behavioral Health providers and staff focused on disease prevention and treatment, building resilience, etc. Includes Combat and Operational Stress Training.                                                                                                                                                                                                                                                                            |
| Care Provider Support Program (CPSP)                       | Program educates and trains Healthcare Providers on the prevention and treatment of signs and symptoms of Provider Fatigue (Compassion Fatigue and Burnout).                                                                                                                                                                                                                                                                                                  |



## Enterprise Behavioral Health Programs (cont'd)

| Project Name                                            | Description                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Child Adolescent & Family BH Office (CAF-BHO)           | Program management for implementation and sustainment of Child Adolescent and Family Assistance Centers (CAFAC) and School BH (SBH) initiatives across the AMEDD. Supports training efforts for BH in Primary Care and Embedded Behavioral Health. MEDCOM BH West office located at JBLM.                              |
| Family Advocacy Program (FAP)                           | Prevents and treats child and intimate partner abuse.                                                                                                                                                                                                                                                                  |
| Fusion Cell                                             | Transforms data from disparate sources into "actionable intelligence" and communicates this information appropriately with key stakeholders so early Soldier intervention can be provided, thereby optimizing Unit Readiness.                                                                                          |
| HQ Management - PTBI - MEDCOM                           | OTSG/MEDCOM program management for implementation and sustainment of Behavioral Health initiatives across the AMEDD. Includes TBI coordination efforts.                                                                                                                                                                |
| Integration of BH in IDES                               | Behavioral Health professional administrative review and documentation of BH conditions required by the Medical Evaluation Board process as part of IDES.                                                                                                                                                              |
| Marriage & Family Therapists (M&FT) Program             | Provides Marriage and Family therapy to Soldiers and family members who have been impacted by the deployment tempo and for intervening and treating Soldiers who have returned from deployments with PTSD/Depression symptoms that have been identified by family members as destructive to health family functioning. |
| MSW Training Program                                    | To provide educational opportunities for civilian employees to gain MSW degrees in support of the military environment.                                                                                                                                                                                                |
| OTSG BH Division                                        | OTSG BHD travel, equipment and supplies. Includes special travel requirements outside routine BHD TDY.                                                                                                                                                                                                                 |
| PH Program Initiatives                                  | Non standard and/or pilot Behavioral Health programs                                                                                                                                                                                                                                                                   |
| PH Telehealth                                           | Provides standardized, evidence based services virtually to Active Duty, Guard, and Reserve Soldiers and their families.                                                                                                                                                                                               |
| Psychological Health Intensive Outpatient Program (IOP) | Treats active duty Soldiers, family members and retirees presenting with Psychological Health adjustment issues through Intensive Outpatient Programs with a goal of reducing PTSD symptoms and affective disorders.                                                                                                   |
| PTSD Training Program                                   | Provides training to all AMEDD BH Providers on VA/DoD recommended treatment modalities for the treatment of PTSD.                                                                                                                                                                                                      |
| Resilience Training Office (RTO)                        | Provides training modules intended to strengthen individual service members, their families, their units, and communities, enhancing their ability to cope with stress.                                                                                                                                                |



## Enterprise Behavioral Health Programs (cont'd)

| Project Name                          | Description                                                                                                                                                                                                                                                                               |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Retention and Recruitment             | MEDCOM recruitment program to attract qualified applicants for referral to hard-to-fill Behavioral Health occupations.                                                                                                                                                                    |
| RMC Behavioral Health Management Cell | Regional Medical Command program management for implementation and sustainment of Behavioral Health initiatives across the respective regions.                                                                                                                                            |
| Traumatic Event Management (TEM)      | Provides traumatic event training to Behavioral Health providers and Unit Ministry Teams (UMT).                                                                                                                                                                                           |
| Warrior Resiliency Program (SAMMC)    | The Warrior Resiliency Program will focus on the prevention and treatment of combat and deployment stressors impacting on warriors and families.                                                                                                                                          |
| Directors of Psychological Health     | Mandated by DODI 6490.09, Commander's program at each Army installation providing both consultation to operational leadership on psychological health issues and vertical integration of military service and DOD-wide psychological health initiatives and population health monitoring. |



## Behavioral Health Service Line Way Ahead

- Embedded Behavioral Health Proliferation to all BCTs
  - HQDA EXORD published (ALARACT 186/2012) ; MEDCOM OPORD (OPORD 12-63)
    - End of FY12: 18 EBH teams in support of 16 BCT's and 2 other BDE-sized units
    - End of FY13: 36 EBH teams in support of 33 BCT's and 3 other BDE-sized units
    - End of FY14: All Army BCTs supported by EBHTs with clinics in their footprints
    - End of FY16: All operational units supported by EBHTs (total of 122 units)
- Behavioral Health Data Portal Proliferation to all installations (MEDCOM OPORD 12-47):
  - Initial Operational Capability NLT 30 SEP 2012
  - Full Operational Capability NLT 15 DEC 2012
- Consolidated Behavioral Health Service Line OPORD incorporating management and evaluation structure
  - ANNEX I, Behavioral Health Service Line in HOF DAHQ EXORD
    - Provides tasks to ACSIM, IMCOM, FORSCOM, MEDCOM, TRADOC, USAREC and G-1
  - MEDCOM BHSL OPORD TBD, will rescind OPORD 10-70 (CBHOSC CP).



Comment highlights:

COL Bliese: Who manages the data? Will it be collected at regular intervals?

LTC Brusher: Because we had to start faster than we were ready, it is all being done on hard paper copies. Soon it will be in electronic forms that others can access.

LTC Whalen: Is behavioral health involved in eProfile?

LTC Brusher: Yes.

## 1515 – 1545: The TRADOC Perspective – Practices and Problems in RTD

### TRADOC Surgeon – COL Carolyn A. Tiffany, TRADOC

Slide presentation withdrawn by presenter's request.

Comment highlights:

COL Tiffany: Army 20/20 is doctrinal concept recently rolled out by TRADOC [U.S. Army Training and Doctrine Command] over the next 20 years. The Human Dimension concept is part of it. The Army is doing a paradigm shift. TRADOC has moved beyond the OEF [Operation Enduring Freedom] and is focused on the next conflict. Human Dimension is looking at the soldier as a type of weapon to be fitted with what they need to operate.

The master fitness trainer (MFT) course ended in 1998. It has been reinstituted since then. The lesson plans have been revised. The MFT will be overseen by the PT [physical therapist], who will be at the mid-level. They are considering putting master resiliency trainers into the military initial entry training stage (BCT).

During AIT [advanced individual training] [is when] to find out the mental [requirements for MOSs; i.e.,] infantry versus a combat engineer or "Sappers," who are combat engineers who advance with the front-line infantry. It turns out women are often better Sappers than men. The combat exclusion for women will be gone in the next few years. It will be gender neutral and specific to the MOS. [TRADOC] RTD issues include when the cost/benefit is not worth keeping the person in the military. If they haven't completed BCT, is it worth keeping them? What are the criteria for drawing that line? What is the length of time in terms of weeks? It's about returning them to training instead of deploying them. Behavioral health problems need to be identified early; what is a temporary versus permanent problem?

LTC Brusher: For recruiting purposes, if they disclose, it's a responsibility of the PMO [Project Management Office]. They are going to dig into records never explored before.

Dr. Estrada: What about Facebook? Should postings be used to provide behavioral health data?

COL Renta: Most behavioral health issues occur beyond BCT [basic combat training]; for example, bipolar and schizophrenia. Has that been discussed?

COL Tiffany: There are some genetic components to try and screen for. There are mental health indicators. Recruiters screen for behaviors that indicate issues (drinking, relationships; school related).

LTC Whalen: Any thought to extending the 6-month period given the level of obesity, etc., once at the permanent duty station? It's more likely that some problem will first occur [then].

COL Tiffany: No, the 6-month period is a law that can't be changed. The problem isn't usually service induced; they get a medical board.

Dr. Estrada: As a futuristic approach, if CPT Dretsch comes up with the genotype with PTSD susceptibility, would that be politically acceptable?

COL Tiffany: The reality is that the Army would love it. But, she has had to answer congressional inquiries about not taking people who are already permanently disabled. It's unlikely that [anyone] would be able to set those entrance criteria. If we could find a biomarker that indicates the ability to adapt to changes, to transitions, and to have the strength to survive those changes, that would be really important.

Dr. Kelly: We measured biomarkers and found no relationships in those kicked out or choose to leave with injuries. Within a few weeks, the inflammatories returned to baseline levels during training. They might or might not have known what to expect.

MAJ Hill: There is a delayed BCT training program showing benefits.

COL Tiffany: I do not know if it's effective. I don't know what proportion of the recruits is in it. We don't want to lose people with skills. What should be done in terms of return to duty to retain them? We need screening tests [for recruits] for use by drill instructors and recruiters. [That] would help. [We would] need to identify those drill instructors that might become a predator and act inappropriately. Recruiters are coming up with criteria like [identifying] no alcohol or drug problems in the recruits. Can those with mTBI and PTSD perform these jobs?

Dr. Estrada: Regarding TRADOC, it does not fund research. It would be nice if TRADOC could identify [problem] issues and fund some research to address those issues.

COL Tiffany: I don't have a research budget. It's a four-star level command. If my Commander wants to do something, he can request it. I can find funds, if relevant, but I don't fund research.

#### 1545 – 1630: Summary and Discussion

There were no questions or comments. Dr. Crowley thanked all the presenters.



## Workshop Sessions – Day 2 Wednesday, 20 September 2012

0800 – 0830: Welcome and Administrative Announcements – Dr. John Crowley, USAARL

Dr. Crowley: Yesterday went well. As a plenary, is there any discussion desired before we start the breakout sessions? I will start the discussion by looking at some problem issues for my task area – RTD after neurosensory injury - we have timeline issues. There is a need to tighten up what to pursue, such as, the marksmanship task, the Sister Kenny study... COL Bliese, per his talk yesterday, has issues with identifying the psyche problems that his RTD program should target, so he is targeting epidemiology first. What psychological disorders account for lost duty time that drives his program; what things should he target for RTD standards?

COL Bliese: We'll probably discuss that in my breakout group. It's difficult. I'm not sure of the value in going after specific conditions. A practical perspective would be that any condition could be relevant, PTSD, depression, etc. Tools that are applicable across all conditions are more valuable. I liked Dr. Crowley's idea of a battery of tests that focus on a gamut of psychological injuries and tests that are predictive of a broad number of them.

LTC Teyhen: My data is not that clean. It's interesting in my single leg test, I was picking up upper quarter injuries which was unexpected. It's hopeful. It's different that functional reach, which is for impaired populations.

Dr. Crowley: The other part of the equation is more than diagnosis. Its impact on performance of duty is what matters. We need to add into the equation how to expend funds. Also, the different task areas, or research domains face very different challenges, in between suicide attempts the servicemember may be fine, just as between episodes, the same is true for alcoholics. But with musculoskeletal injuries, the condition is more ongoing.

COL Bliese: I hope we do not address suicide [in this workshop]. For other psychological issues, general tools may have utility; for example, sleep and cognitive performance. Perhaps we could push actigraphs out to the provider community and use sleep statistics to incorporate in RTD decisions. There is a need for sensitive things that target a broad range of disorders. Reaction time and impulsivity measures may be generalizable.

MAJ Scherer: [Some] Soldiers will fight to get a PTSD diagnosis as it is acceptable to have it, but will fight against an anxiety disorder diagnosis even though the compensation is similar.

COL Bliese: These are somewhat arbitrary distinctions. They may not have physiological basis. Also, co-morbidities weigh in.

COL Renta: For us, it's not about the diagnosis. Instead, we care about functional impairment. Although looking at depression parameters [is important], we need to address judgment and decision making impairments. That's not well documented.

LTC Teyhen: Those at the three-star level are looking at that. The EVAR [Evaluation of Risks] evaluations of risk survey tool might predict problems across the three domains.

CPT Dretsch: Decision making is a complex function. Measures capturing impulsivity and risk taking show advances in combat environments. There are measures like EVAR and the Iowa Gambling Task that tap into aspects of decision making.

Dr. Zambraski: We need to focus on RTD. Other task areas address screening and prediction for recruiters. The RTD effort is to shrink the ready for duty pool.

MAJ Hill: We need to develop strategies for intervention; provide evidence that [the strategies] are working. Policy makers will build off of that. Don't build everything at once. The top musculoskeletal condition for RTD decisions should be the focus.

Dr. Estrada: COL Castro wants us to look at everything.

Dr. Weightman: In neurosensory/mTBI, if it's acute, no duty. When it's resolved, RTD. Perhaps rehabilitation is beyond the scope

Dr. Crowley: In the TBI world, you don't want to return to the work environment so as to prevent another TBI. In the musculoskeletal world, they do return to the work environment. It's reasonable to assume the injury will recur. It's valuable to have strength test criteria studied in an epidemiological study. Was it predictive of ready to return?

Ms. Helmick: If you look at the continuum of care, it covered it: neurosensory, psychological health or musculoskeletal injury. What tools are available that can stimulate the effect of RTD on the injury? The desired end state is to make the pool waiting to return to duty smaller. She sees success in decisions to prevent another injury or failure to perform tasks

Dr. Rábago: With CAREN, they reproduce the situation and measure overlay in functional problems. My job is to make referrals, to reduce the pool size. I may uncover new problems. Soldiers come in with limb salvage, but in CAREN, post concussive symptoms may be revealed. So we can send them for rehab and then bring them back to be reassessed.

MAJ Scherer: We need to look at opportunities to decrease the medically non-ready pool. Is this the appropriate way to go?

Dr. Crowley: Criteria for go/no go are made by the same people who are assessing occupational performance.

MAJ Scherer: If we see a gap as a community and the overall aims we are seeking to achieve, COL Castro will support filling them.

Dr. Crowley: We need to define "management of person level assessments."

Ms. Helmick: The fear is of new information or hearing that someone else is doing something similar. The portfolio needs to be thinned out. The worry is how much we dip into other's lanes.

MAJ Scherer: Our group mandate is to "look at performance level issues."

Ms. Helmick: A gap analysis has been done for TBI. You could read the Jan 2012 Gap Analysis of DoD Research Portfolio for background. Terry Rauch in DMRDP/HA [Defense Medical Research and Development Program/Health Affairs] published it.

Dr. Kelly: CAREN use is not practical. There are too few of them. Is there a field measure to use instead for screening? Could they develop something as a musculoskeletal battery of tests?

Dr. Rábago: Agreed. CAREN is impossible to implement as a whole. My study looks at current clinical standards and compares to other tests that predict the work environment.

LTC Teyhen: Perhaps [we could use a] tiered process. For musculoskeletal injuries, have simple clinical tests for baseline. If they pass that then go to functional tests. The third tier would be a way to automate to get quantitative measures. The top tier might be the same for all three domains. Perhaps the servicemember wears sensors that measure all three domains at the top tier. An integrated approach might be very fundable. We would integrate tests to make RTD decision more standard.

Dr. Rábago: She is describing functional limitation levels to performance to occupational readiness.

Ms. Sharp: We need to include safety measures.

Dr. Rábago: We already have physiological monitors. Ideally, we want them to be in field. Virtual reality provides more control. Once we confirm hypotheses, we want to take the components as tools to the field. We want to use the same tools for training, for evaluation and for RTD.

Dr. Estrada: Simulators do cause nausea. Have you studied it with CAREN?

Dr. Rábago: Yes, we have studied it. CAREN does not cause the simulation sickness as it is immersive. Being in an artificial state can cause problems.

COL Bliese: In the psychological health program, perhaps we use tiered approach. I want field expedient devices. Also, think about how to evaluate the RTD decision, something more than did they attrit. Should they [decision makers] be in contact with the immediate supervisor for his rating? Use it in both cognitive and physiological domains. Also, there is a need for intervention; we need an actual study of technology given to providers. Did it help the servicemember after RTD? We need to measure the degree of being returned and how well they performed after returned.

Dr. Crowley: Dr. Estrada tried to collect supervisor data and had IRB problems with consent. And accessing [treatment] records is very difficult.

Dr. Estrada: The present study is being conducted as program evaluation. If the study is successful, we will provide the findings to the command.

Dr. Proctor: There are more steps to getting the [supervisor and treatment] data.

CPT Dretsch: It is IRB dependent.

MAJ Hill: Using secure data is dicey. Making the right assumptions is critical.

COL Renta: Could the data [be retrieved] from G1 records that are de-identified to answer questions? Disability Evaluation System (DI-ES) is held by G1 [personnel section], by service. Each service has different criteria. It identifies orthopedic measures of limb functionalities. Behavioral health evaluations and their affect on function could be used to fuel future studies.

LTC Teyhen: MAJ Al Nelson is working on his dissertation. The research is intended to predict those in the military who will fail after injury. He may be using same dataset.

MAJ Hill: We need a comprehensive description of each injury that results in high attrition. It may be in the DI-ES. Physical Disability Agency (PDA) controls it. It's both narrative and quantitative data.

MAJ Hill: TAIHOD has a potential role in RTD. One could consider outcome variables, methods, and design.

Dr. Zambraski: Yes, TAIHOD can be applicable. Exploring DI-ES should be a major recommendation of this working group.

Dr. Crowley: Are there any initiatives to identify that cross the domains; elements of batteries that cross? [For example], sleep, if not restored, affects psychological and musculoskeletal health.

COL Renta: There is another working group looking at sleep and performance. The goal is to prevent injuries. Keep the roadmap in mind to create screening tools.

Dr. Rábago: Could we have basic combat training groups wear actigraph bands before and during basic combat training to collect sleep pattern data?

Ms. Helmick: That would be fabulous. Breaking the line between sick and well is difficult. This may help. Thresholds and normal sleep definitions may be difficult. With sleep, we can establish norms. It would be an aid to decision making.

Dr. Crowley: We would need to have a link to performance as well.

LTC Teyhen: Sleep could be Tier 1 assessment.

CPT Dretsch: With younger Soldiers, they have to want to sleep. I'm unsure how to get them to sleep.

COL Renta: The sleep working group is looking at sleep hygiene training issues.

Dr. Rábago: If we could get normative values and look at sleep patterns in civilian students, I could establish those norms.

MAJ Leonard Mason: The FORSCOM [U.S. Army Forces Command] drive wears down servicemembers rapidly. They tag people to fill voids months in advance. Commanders want a body. The younger troops are the ones more likely to have injuries.

COL Renta: We need better criteria for RTD; functional at the MOS level or not at all.

MAJ Mason: The waiver process: it's a fight at the unit level.

Dr. Estrada: A few years ago, RTD assessments became ability based, not disability based. Philosophy seemed to be changed.

MAJ Mason: If a servicemember can't go to war, FORSCOM commanders want them moved out.

COL Renta: FORSCOM is the exception. The main group that can function can do so with some disabilities.

#### 0830 – 1200: Break-Out Groups (Facilitator Led)

The general discussion concluded with Dr. Crowley inviting the attendees to form into their assigned break-out groups. Dr. Zambraski provided his thoughts by encouraging the discussion to link Warrior Task Battle Drills due to their importance to TRADOC. Attendees were encouraged to focus on the RTD population and how get more information about them. The groups were instructed to define where their program lies in the 6-step research approach (as relevant to each task), to consider developing the research plan to focus on RTD, and to prioritize any new efforts. The other group objectives were reviewed: a) identify gaps or threats, b) identify proposed research to address data gaps, c) identify changes to existing research plans, and d) identify competencies, capabilities, and funding required to address threats. Also, each group was to consider ways to integrate with the other 2 task areas, or with the RAD5 (rehabilitation) and think about tangible products, like Technical Bulletins Medicals, that could result from the work. It was suggested that a summary state of the science paper could be drafted by the leaders.

#### Neurosensory Break-Out Group Discussion – Dr. John Crowley, USAARL, Facilitator

##### **Participating group members**

- Dr. John Crowley, USAARL
- Dr. Arthur Estrada, USAARL
- Katherine Helmick, DVBIC
- Dr. Benton Lawson, USAARL
- Jenny Owens, Blanchfield WRRRC
- MAJ Matthew Scherer, USARIEM
- Dr. Margaret Weightman, SKRC



### **Action Items**

- Dr. Estrada & Dr. Crowley
  - Complete the Task Area Out-brief PowerPoint presentation
  - Obtain algorithm cards concerning the exertional test in process since 2007
- Ms. Helmick
  - Send introductory email to her 4 POCs at the Vision COE [Center of Excellence] concerning RTD initiatives to connect them with USAARL
  - Can send the study on boxing and reaction time to Ms. Owens
  - Send Continuum of Care Studies slide to group members.
  - Begin efforts to propose a Practice Based Evidence study.
- MAJ Scherer
  - Provide Dr. Crowley a copy of the VA paper that discusses mTBI affecting brain circuits that prevent PTSD
- Dr. Weightman
  - Send Ms. Helmick a 1 page paper discussing Practice Based Evidence

Dr. Crowley: We want to continue a free flowing discussion from our participants who are looking at our program from outside the lab; what you saw about our neurosensory program, deliverables, what we're generating, and how on target or off target we are.

### **Discussion Summary**

- Ms. Helmick
  - RTD has a natural linear correlation to TBI, but those in the Vision Center of Excellence and auditory focused persons would say there is too much focus on TBI. (There is power in DCOE [Defense Center of Excellence] advocacy because issues are greater than just TBI.)
  - Vision and hearing injuries, in their own right, should be [included].
  - As the Neurosensory group, we need to be comprehensive to look at performance and functions needed for those two particular neurosensory groups that have developed Centers of Excellence to look at certain conditions that affect unit readiness.
  - COL Don Gagliano (Army), Chief of the Vision Center of Excellence is a good POC to find out if there is any activity concerning Vision and RTD.
  - I will do an introductory email for USAARL to COL Gagliano.
- Dr. Crowley
  - Hearing loss is one of the Army's greatest issues. We are doing things related to end organ injury and its relationship to RTD.
- Dr. Lawson
  - Need to identify what are the most frequently and disturbing effects to one's job.
  - Vision is obvious as it is part of the brain.
  - Others are clearly relevant, such as vestibular.

- MAJ Scherer
  - 80 percent of spatial orientation is from vision.
  - The vestibular system can be damaged from hazardous noise as well.
  - Polytrauma of vision and vestibular issues is a concern.
  
- Ms. Helmick
  - The VA held a conference in 2009 on dual sensory impairments.
  - It seems there is little research in this area and needs to be enhanced.
  - The message that TBI and PTSD overlaps has even gone to the Secretary of Defense level.
  - The publicized issue of repeat concussions with NFL [National Football League] players has helped to identify TBI as its own field.
  - Now that we have more data and leadership indicating failure in the area of TBI and PTSD, TBI is more accepted as its own condition/discipline.
  - Part of the issue is the concern of stigma with TBI and access to care issues, similar to the situation with PTSD.
  - We are so deeply invested in this new thought that we will not go back. The future projects will focus on TBI as its own condition.
  
- Dr. Weightman
  - The VA system in Minneapolis and a few others believes that mTBI is there for about 7, 8, 9 months and they say that all the rest is PTSD is coming from the TBI. Concerning basic science, they are in the same brain circuit.
  - The damage from TBI affects the limbic system.
  
- MAJ Scherer
  - Has a copy of the VA paper discussing mTBI affecting circuits of the brain that prevent PTSD.
  - Cortisol has indiscriminate effects concerning TBI/PTSD.
  
- Ms. Helmick
  - The biggest pocket of people who get concussion (70 to 80%) feel better after 24 hours (pure TBI) and get back in the swing. The majority do not get treatment.
  - The largest proportion of people injured on the battlefield gets checked out immediately, per policy, and are told to come back tomorrow. If they pass exertional testing and say they feel better, they are considered good to go.
  - Evidence indicating we are making poor decisions: they come back worse, with another concussion, and cannot perform.
  - There are no data on these items, which is problematic.
  - What group is the program going to focus on – the one where they go back after 24 hours, or the one where they end up in a concussion care center for weeks or months?
  
- Dr. Weightman
  - She has identified that the exertional test is not sufficient where patients look good, but she feels a dual task combination of exertion is needed.

- Evidenced in sports literature, therapists are concerned, having instrumented testing and finding problems (reaction time is off) for weeks after, even though patients are sent back.
  - There is the need to identify if current testing is not sufficient.
- Dr. Crowley
  - If there is published literature that current exertional tests may not be adequate, this research can be taken to and discussed with the exertional test proponent.
  - Research Question: Do we need to adjust course to address this issue?
    - If there is enough data to support conceiving a dual task or if there is a disagreement in the community and a research study needs to be done.
- Ms. Helmick
  - The two-minute exertional test is not acceptable. Patients report they are ok when they are not. Laundry and EOD [explosive ordnance disposal] are considered the same type of task. I believe that most of the leadership would say that the test is not acceptable.
  - We need to develop a basic template to identify common functions as a performance approach and focus on the biggest population. This approach will affect the end state – The strongest force possible, whether or not injured.
- Dr. Crowley
  - We need a driver from MEDCOM OTSG indicating the test is not adequate.
- Ms. Helmick
  - OTSG has already said they are not happy, and requested an RTD workshop.
- Dr. Crowley
  - So, what research question do we want to pursue?
- MAJ Scherer
  - In theatre now, the last step before RTD is the equivalent of an exertional test.
  - We could make the test more ecologically valid and need to do better than symptom self-report.
- Dr. Crowley
  - We would need to prove (with a long term study) that those who were cleared with the two-minute exertional test actually have long term effects.
- Ms. Helmick
  - We have enough high level support to not need to identify problems.
  - We need to show the common symptoms or impairments are following mTBI.
  - Consider the ultimate end state: Optimal unit readiness and Soldiers are not a threat to themselves or the unit.
  - Match the common deficits to performance. Evaluate how well the Soldier will do in the actual scenario.

- o Policy makers would want validity of the test.
  - o There is a tolerance for the threshold of evidence based guidance on mTBI and the consensus of what is best now is acceptable to not wait for the research.
  - o However, the tests need validity studies and mapping to common deficits.
- MAJ Scherer
  - o There is a gap for clinicians in the field for functional assessments. Symptoms are not enough and they do not know about function.
- Dr. Lawson
  - o Other groups will probably also say to make the test realistic, but this may not be adequate for the neurosensory component.
  - o The neurosensory component in simulated environments is not the same.
    - E.g., pilots more sick in simulations. They are calibrated for reality.
  - o We should focus on real tests and not try to make it realistic by making it virtual.
  - o Feedback from various members: Get data, duplicatable, control conditions.
- Dr. Weightman
  - o Part of the problem in realistic settings (e.g., Fort Campbell) is conditions are not the same in every setting. Need to rate it reliably across the board.
  - o We are looking for as much technology to put in that is sensitive.
- Dr. Crowley
  - o You need a sensitive tool/test to be applied to the correct populations and not misapplied where everyone will pass or normal subjects would fail.
  - o We need to determine how to test for and detect the “Don’t feel right” component.
- MAJ Scherer
  - o This is why we need sensitive technology with granularity, better than a clinical test.
  - o For example, OHSU [Oregon Health and Science University] has an inertial sensor system that test effects in concussed athletes.
  - o With single domain impairment level clinical tests, patients can compensate.
- Dr. Lawson
  - o A tiered approach would fix this problem. First quick field functional test → if any red flags, go to aid station for more tests → then to a full care center.
- Ms. Helmick
  - o We could start this with a slide (Ms. Helmick has) indicating symptoms and manifestation. The manifestation and impact pieces can be modified.
  - o Use this tool (if accurate) to target to look at performance based on symptoms.
  - o Quick win/Low hanging fruit – to offer a battery of validated tests (like a Chinese menu) to pick what is appropriate for the individual patient situation. This could expand both acute and chronic realms. This could be expanded upon to different

MOSs. Can determine what percolates to the top as the most debilitating concussive issue. This would be military relevant for safety, etc.

- MAJ Scherer
  - Neurosensory group needs to pursue the functional/performance Warrior Task-based line of research.
  - We need opportunities to collaborate with RAD5.
  - This could be good since there is a gap in ecological validity of TBI, that we have license to fill.
- Ms. Helmick
  - Headache: #1 reported symptom, attached to other issues such as sleep disturbances and vision, and somewhat ignored as not conducive to objectivity.
  - Would like to see studies on cerebral blood flow after headache.
  - Significant to performance.
  - A study (Terrio, 2009) suggests physical symptoms surge acutely, but chronically, cognitive symptoms are reported and physical symptoms decrease.
  - Amy Boles identified different acute symptoms (headache, sleep disturbances, and memory) than Heidi Terrio's symptoms (headache, dizziness, imbalance, attention/memory problems)
  - Feedback - Dr. Lawson – Others found that 80 to 90% of people have balance issues
  - This is due to selective bias – the population is people who come into the clinic
  - Based on a MACE [Military Acute Concussion Evaluation] study, if everyone at the table had a concussion, everyone would report three different symptoms. Not all people out of 100 would complain of dizziness.
  - This makes objective testing difficult. If someone only has one symptom, but the test used is not indicative of that symptom, the test may yield a false negative concerning diagnosis of concussion.
- Dr. Lawson
  - We definitely need an objective test, but the question now is the top symptoms to focus on for a test to pick up (construct validity).
- Ms. Helmick
  - The two, Reaction Time and Marksmanship, cover it all (including cognitive and vestibular). We have covered most of the common symptoms.
  - Headache is a glaring area though.
- Dr. Weightman
  - Therapists can clinically measure headache.
- Ms. Helmick
  - Richmond, VA has studies on headache and intensity. Goal to get validated tools to better understand prognostically post traumatic headaches. Unfortunately, focus on severe penetrating population in patient rehab.



- o Of the studies that have been funded, we are at 94% of understanding.
- o There is a statistical continuum of care slide (built by COL Hack and Dr. Curley, RAD2) indicating how many studies there are for each section and how much money that correlates to. It is frequently updated. – Ms. Helmick will send this to table members. – There is a portfolio manager for each sector.
- o To get our studies in a database, they should be sent to the central repository, MRMC.
- o TBI work is done by MOM[RP] [Military Operational Medicine Research Program] some and CCC[RP] [Combat Casualty Care Research Program]
- o **Practiced Based Evidence**
  - Look at current practices and comorbidities and problems of patients and define them across the board. Multisite involvement. Describe the patient populations. Define/describe specifically the details of the unique therapies of different programs. Everyone must agree on the definitions. Everyone must code things the same way. Collect data from all programs. Data is of interventions noted in medical records. MAJ Owen Hill is familiar with this. Determine from data what intervention factors result in better outcomes. Describe the outcomes. The first part is only objective data collection (and perhaps follow over time), not policy change, then look at the outcome measures to see what interventions worked.
  - This is done in rehabilitative medicine. This is done before randomized control studies.
  - You could use this method to look at policy.
  - Feedback – Dr. Crowley: So, you could compare what interventions they are using at Fort Campbell, Fort Carson, Fort Bliss, etc. and determine best practices and niches. You can determine what works best for that particular population care center.
  - The challenge is the effort needed up front. All therapists at the site must agree how to define the intervention the same way.
- Dr. Weightman
  - o Many groups use Practice Based Evidence (PBE), but the electronic medical records make a huge difference. Everyone must score and agree on the definitions and code comorbidities and outcomes the same.
  - o We need to measure the therapist interventions for the system of Wounded Warriors. This would be better to give money to one particular site for a particular intervention. We need to look at the many interventions out there.
- Ms. Helmick
  - o We need to involve the right players. There are 52 army TBI programs and we should use a joined platform/institute that you can control and is high caliber.
  - o There are nine NICOE [National Intrepid Centers of Excellence] satellites building ground now (seven Army, two Marine)
  - o NICOE is struggling with outcome metrics as they only have information from NICOE-Bethesda, which has only been open 18 months. Satellite decisions have

- only been based on SECDEF-accepted [Secretary of Defense-accepted] philanthropist donations, not data or business case analysis.
  - o Practiced Based Evidence would sell well with a controlled laboratory of nine MTFs [Medical Treatment Facilities] (1. Fort Campbell, 2. Fort Bragg, 3. Fort Bliss, 4. Fort Hood, 5. Fort Carson, 6. Fort Lewis, and some more) with robust programs.
  - o The people running these programs have the goal of standardization, but there is wiggle room, which exactly points to PBE.
- Dr. Weightman
  - o Susan Horn (in Nevada) is well known for this and would love to help the military.
- Ms. Helmick
  - o It would help to have a small 1-page paper describing Practiced Based Evidence, that it is well entrenched in the literature, and what the benefits are. This will help their proposal look more put together.
  - o (Dr. Weightman will send a PBE paper to Ms. Helmick)

#### Musculoskeletal Break-Out Group Discussion – Dr. Edward Zambraski, USARIEM, Facilitator

##### **Participating group members**

- Dr. Edward Zambraski, USARIEM
- MAJ Mark Thelen, U.S. Army-Baylor
- LTC Deydre Teyhen, TATRC
- Marilyn Sharp, USARIEM
- Dr. Karen Kelly, NHRC
- MAJ Leonard Mason, FORSCOM
- MAJ Owen Hill, USARIEM
- Dr. Christopher Rábago, BAMC
- Sarah Campbell, MOMRP/CITS

##### **Working Group Goals and Task Area P2 “endstate” objectives**

- Evaluate our research portfolio relative to Levels I-VI.
- To determine when new efforts are needed to fill in identified research gaps.
- Formulate those studies and fund those efforts.
- To foster collaboration across the Services.
- To build upon prior research and accomplishments of other international military organizations; develop collaborative efforts.

##### **General Notes**

- Was a clear consensus that “Soldier Performance” should be linked to WTBD [Warrior Tasks and Battle Drills].
- The group stated the importance of focusing on the “medically not ready” individuals to characterize this group and determine outcomes.

- For RTD Musculoskeletal the research program was very strong and established specifically for Levels I and IV.

## Review of Levels I-VI

### I. **Based on epidemiological data, define the top 5-7 conditions responsible for loss of duty time.**

- Strong evidence in musculoskeletal area
- Sites: lower leg, ankle, knee, back, shoulder – identifiable pathologies
- MAJ Hill (USARIEM): The TAIHOD could be used to address these items
  - Produce expected loss of duty time durations
  - Provide a wealth of normative data
  - Facilitate comparing observed vs. expected
- MAJ Hill will discuss with his supervisor the time and effort required to explore these analyses.

### II. **Relevant metrics: amount of lost duty time, when they returned, issue of re-injury, those who never return, etc.**

- This is an area that all three TAs need to address.
- Downtime and cost is unknown.
- Address gap by studying that population through various inputs or sources of information (e.g., individuals, supervisors, epidemiological).
- MAJ Hill: Most important goal – to clearly define RTD.
- ACTION ITEM: See attached definitions of “RTD” (levels/descriptors vs. epidemiologic data).**
  - MAJ Leonard Mason – FORSCOM, extremely helpful with these classifications or descriptors.
- How to evaluate RTD data – and benefit to link identifiable data to other medical records?
  - Link on injuries needed.
- Can we get data later on the subjects’ actual fates on survey form?
  - Survey data on medically not ready individuals is needed.
  - What were the outcomes?
- LTC Teyhen’s Fort Carson study was discussed.
  - Potentially 300 to 500 medically not ready subjects could be studied
- ACTION ITEM:**
  - Consider amending the Fort Carson study – assess the fate and features of individuals within this RTD population**

### III. **The “clinical” approach: current practices, evidence of efficacy**

- There was prolonged discussion on “models” of screening and testing that might be used. See Attachment.

- b. It was indicated that the R&D [research and development] might be to test the efficacy of the model but it was not within our TA to necessarily develop the model.

#### **IV. Development of Assessment Tools/Decision Aids**

- a. Agreement to link functional tests to WTBDs
- b. Relevant to Marilyn Sharp's work developing tests of Soldier performance
- c. USARIEM has been testing primarily the physical aspects; tests could be expanded to include the neurosensory and psychological
- d. Mimic what Soldiers would face in Afghanistan
- e. The Marine "MC-LEAP" [Marine Corps – Load Effects Assessment Program] testing course was identified.
- f. A major RTD study is underway at USARIEM (Dr. Barry Spiering-PI [Principal Investigator])
  - i. Take common tasks – do task analysis, develop tests
  - ii. Plan to measure large numbers of Soldiers
  - iii. Series of predictive tests will be developed from this (capacities)
  - iv. Collect and examine normative data
  - v. Issue of what is acceptable (Level V)
    - 1. SMEs [Subject Matter Experts] –either rate actual performances and/or show them a film of people performing a task and then rate
    - 2. Acceptable could be either Pass/Fail or a certain number of standard deviations within normative data
  - vi. Minimal acceptable level would correlate with "successful" ability to complete the task in an operational environment. This would be MOS specific.

#### **V. Define "standards" for Soldier physical/sensory/cognitive performance**

- a. One of the most difficult issues to resolve.
- b. Does this help improve clinical decision making?
- c. Use of screening tools
- d. Example: Functional movement screening
  - i. Predictive of performance versus predictive of injury
  - ii. Screening is predictive
  - iii. Referral to treatment
  - iv. The treatment can prevent injury
- e. Work in this area is well advanced in the Canadian Armed Forces
- f. The USARIEM study described above is an important contribution to this area.

#### **VI. Application of Assessment Tools/Standards: Determine if metrics change (Are we decreasing the pool of "Medically Not Ready"?)**

- a. Don't want to test a clinical approach for basal activities (ADLs) [Activities of Daily Living]

- b. Want to test assessment tools that would benefit clinicians to make soldier performance RTD decisions.
- c. Could we assess using WTB [Warrior Transition Battalion] drills then funnel down to other efforts existing in musculoskeletal detailed areas
- d. ACTION ITEM
  - i. **See attached model for tiered testing at different levels.**
  - ii. (Global problem first, refer down for detailed evaluations)
  - iii. When using a tiered approach – determine the re-injury rate
- e. How would we test for the efficacy of a new treatment paradigm
  - i. Start with 20 tests initially – see who does and does not get injured
  - ii. Still need to make the battery of tests (does not exist)
  - iii. Currently individual based (by clinicians)
  - iv. Issue of access to the correct population
  - v. Can create reliable study and follow individuals
  - vi. Possible subjects: In garrison population at Ft. Sam, non TRADOC population – if DPT [Doctor of Physical Therapy] students team with BAMC
- f. **Tentative Proposal**
  - i. Predicting re-injury rates through functional screening at point of discharge
  - ii. Assessed on how many discharges (patient)
  - iii. After visits, PT says ok – see if reinjured or excel
  - iv. Need big *N* [population] since study needs some to get reinjured
  - v. Stratify degree of injury.
  - vi. Psychological batteries included – predict who will seek medical care

#### **Other Comments Pertaining to additional Task Area Goals:**

#### **ACTION ITEMS (Longer term)**

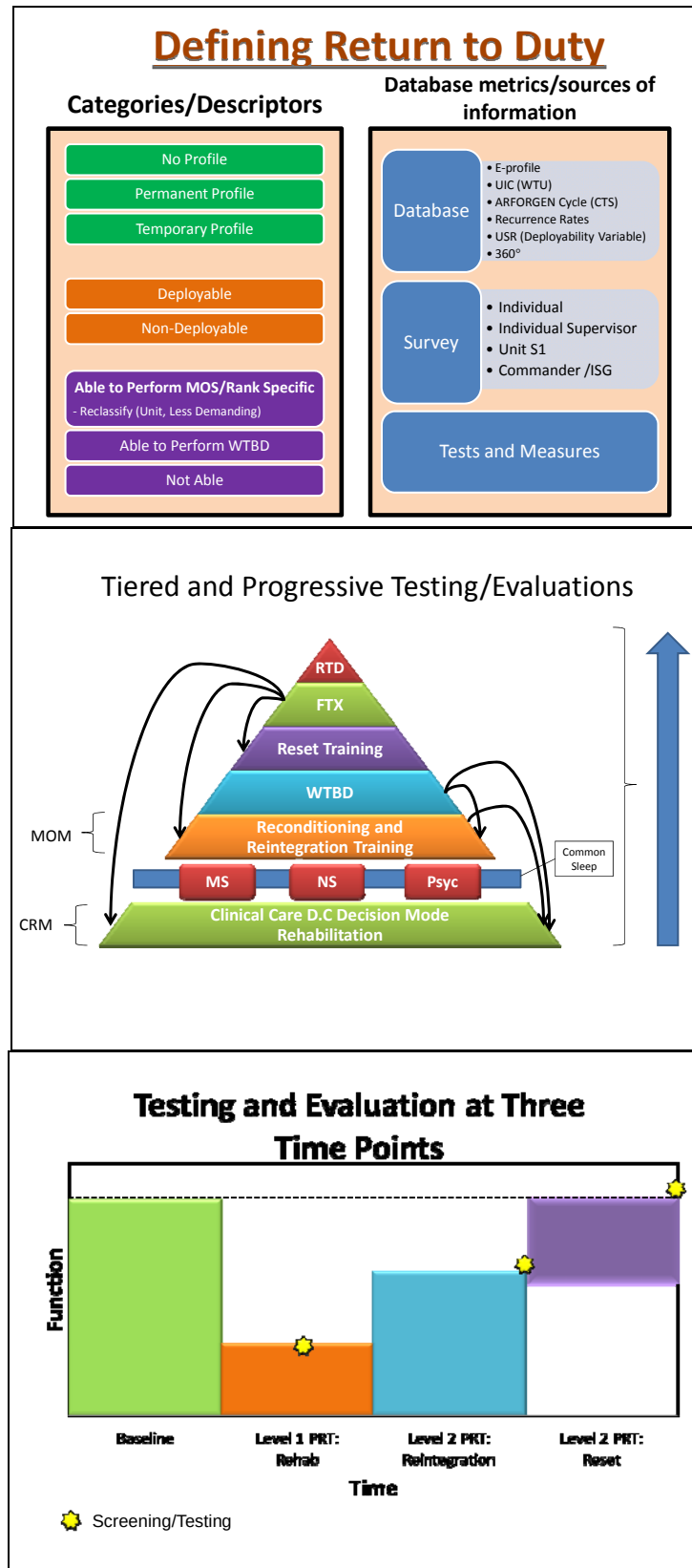
- Discuss with NHRC an RTD study using Marines (Drs. Zambraski [USARIEM] and Kelly [NHRC])
- Fort Bragg has an RTD program – Womack. Evaluate what they are doing and what populations/conditions they are involved with. Possible efficacy study with them. The focus would be to follow the individuals and characterize outcomes.
- Expand opportunities to work with Australians and Canadians on their RTD studies, and in particular, their processes and data on defining acceptable soldier performance standards. Marilyn Sharp (USARIEM)
- Revise P2 TA Plan (Zambraski/Spiering)

#### **ACTION ITEMS (Short term)**

- Provide Dr. Crowley some immediate feedback on the group's discussions and PowerPoint Slides (Zambraski)
- Clean up notes and diagrams – send to group (Zambraski).



## MUSCULOSKELETAL GROUP DIAGRAMS



## Psychological Break-Out Group Discussion – COL Paul Bliese, WRAIR, Facilitator

### **Participating group members**

- COL Paul Bliese, WRAIR
- Dr. Susan Proctor, USARIEM
- LTC Ronald Whalen, WRAIR
- Dr. Joshua Wilk, WRAIR
- Dr. Fiona Crawford, Roskamp Institute
- LTC Edward Brusher, MEDCOM OTSG
- CPT Michael Dretsch, USAARL

### **Action Items:**

- **COL Bliese** will connect LTC Brusher with UMD [University of Maryland] researcher Tom Britt regarding other funded study that could support TRADOC's impulsivity research needs.
- **COL Bliese** will connect LTC Brusher with Larry James at Georgia Tech on the ANAM battery of tests that predict stealing, etc.
- **LTC Whalen** will email parameters to LTC Brusher to ask in regards to how many CDE [command-directed evaluations] are seen in BH [behavioral health] clinics on training bases.
- **LTC Brusher** will provide the information to LTC Whalen and COL Bliese.

### **Discussion Summary**

- COL Bliese, WRAIR
  - o Provided detailed description of TA plan
  - o Wants executable set of plans for LTC Whalen to use and to brainstorm with this group
  - o Key elements – area funds split across USARIEM, WRAIR, and USAARL
  - o After FY [fiscal year]13, Dr. Proctor doesn't have funds
  - o USARIEM has epidemiological focus. Data to be ready at end of year.
  - o Biased toward being practical; want tools for providers to make clinical judgments
  - o CPT Dretsch focused on basic research questions; looking at SSRIs [selective serotonin reuptake inhibitors] and imaging but won't be able to use in RTD decisions for those in field; data to be used to understand the pathophysiology; are validating instruments being used.
  - o Three potential areas: CPT Dretsch data; Ft. Campbell data; and Dr. Proctor data
  - o Could pick a handful of neuropsychological (NP) tests to computerize to predict BH outcomes; see if reaction time correlates with PCL [Post Traumatic Stress Disorder Checklist]/depression, for anxiety, PTSD symptom levels. If not predictive, we don't want to use it.
  - o Dr. Proctor found many tests; her paper found 2 to 3 related to PCL/depression scores; others with similar functional domains.

- LTC Brusher, MEDCOM OTSG
  - If looking for access to resources, new top down driven requirement from the Secretary of the Army to expend \$30 million for product that will last 1 week; directed toward a test battery addressing sleep deprivation, impulsivity, and trustworthiness.
  - Performance and functionality measurements for senior leader use in predicting Soldiers will perform appropriately and be trustworthy; there is a requirement to address these. It will open doors across the commands. There is latitude for approaching at individual or group level.
  - Perhaps battery will have a week's worth of predictability. Will need Secretary of the Army to direct TRADOC to mandate incoming soldiers do battery of tests and then follow them.
- COL Bliese, WRAIR
  - It is too much of a stretch for RTD. Impulsivity might fit; others fall under a different task area. It is more a trait assessment
- LTC Brusher, MEDCOM OTSG
  - It is an opportunity to vet RTD measures
- Dr. Proctor, USARIEM
  - This would be a new task area, to look at novel tools to assess impulsivity
- CPT Dretsch, USAARL
  - What about decision-making? Impulsivity is a part of that on the battlefield
  - How do behavioral performance measures mesh with decision-making in the combat environment? How do they adapt to battle drills?
- LTC Whalen, WRAIR
  - How will they evaluate the functional impairment?
- COL Bliese, WRAIR
  - Start brainstorming:
    1. Epidemiology area – USARIEM working it; will be delivered; Dr. Proctor has OTSG deployment outcomes data that could link to TAIHOD; potentially to other datasets. Deployment history; characteristics data can be linked into. Need to craft the right questions. Perhaps link to other datasets? FY13 has been funded. Dr. Proctor has ANAM records for 750,000; can link to pre- and post-deployment; probably a pre-deployment predictor of PH [psychological health] diagnoses and RTD status. Instead of only looking at TAIHOD, it is more valuable to look at ANAM data, for retention, those diagnosed with MH [mental health] problem while deployed; there are other reasons Soldiers go to care and get ANAM testing while deployed; look to see ANAM predictive of anything; get population norms from it.

2. Policy Capture area – provide different scenarios to different providers; analyze as to what factors providers pay attention to in making decisions. It would be a formal study with a protocol; time consuming; need to get enough providers to participate; need someone experienced in policy capture.
- Dr. Wilk, WRAIR
    - Pro argument is the needed understanding of what is useful in decision-making. This would give clues as to what helps influence the changes in practice.
  - COL Bliese, WRAIR
    - Could they leverage MHAT [Mental Health Advisory Team]?
  - Dr. Wilk, WRAIR
    - They are looking at adoption of evidence based practices; get attitude information from it
  - COL Bliese, WRAIR
    - They could modify the task area to leverage the MHAT to include policy capture to increase likelihood of success
      3. Brainstorming of third area – after finish analyses, identify five prominent things. Then consider how to design study that would involve BH providers testing a 10-minute PC-based packet of tools. Would roll out during intake process, to determine what to do with newly injured SM during BCT; use to make RTD or more evaluation needed decision. Or, try to work with BH providers to do the study, to note when a patient is evaluated if packet would be useful. Or, roll it out at the unit level.
  - LTC Whalen, WRAIR
    - Do it as a pre-deployment screen step as in a decision cycle stage; will be motivated to do it.
  - COL Bliese, WRAIR
    - By the time the study gets underway, the U.S. may no longer be in Afghanistan.
  - LTC Brusher, WRAIR
    - Only ePortal is to be used; it's been selected for others to merge into it; it is garrison-based care. At PC [Primary Care] clinics there is now something based on RESPECT-MIL [Re-Engineering Systems of Primary Care Treatment in the Military]. It's a user burden at the administrative level, but they could tie the study to its PTSD and other screens. Within BH clinics, they would tie into ePortal. Perhaps for deployed force they could make it a theatre portal that can be dialed in to. There will be a need for BH to use tools (AHLTA-T [Armed Forces Health Longitudinal Technology – Tactical] tools don't exist now) in making RTD decisions when deployed.

- Dr. Proctor, USARIEM
  - Perhaps we could try to tie tool into the primary care educational system rather than BH.
- COL Bliese, WRAIR
  - Would it provide tools to the leaders?
- LTC Brusher, WRAIR
  - There is interest in that; concern is not to use clinical skills. Don't turn leaders into pseudo-clinicians.
- Dr. Proctor, USARIEM
  - Not sure how one would validate it. Do tools make more sense in leadership or provider context?
- CPT Dretsch, USAARL
  - How sensitive are tests for a single person? The need is for a large sample; combine with other tests to be more realistic. I would prefer a functional task for assessment.
- Dr. Wilk, WRAIR
  - People are already making decisions; these could be used as confirmatory of clinical decisions.
- COL Bliese, WRAIR
  - Get with Mil Brown early in the process; engage early; integrate tests early; show efficacy.
  - Don't compete with ePortal; build on its efficacy; propose updates to the system.
- LTC Brusher, WRAIR
  - ePortal is modular and builds over time. Future design includes risk prediction capability; these tools might help; might have Commander dashboard to view Soldiers' function. RTD decision may be Command-directed and made right then. In routine care, a functionality assessment is always made. Limitations are noted. The requirement is to notify Command of them per policy regardless of HIPAA [Health Insurance Portability and Accountability Act] concerns. Need to have assessment module at the front end.
- COL Bliese, WRAIR
  - We need to have criteria to evaluate its value.
- CPT Dretsch, USAARL
  - We can look at the literature to determine the criteria. We'll get five things from the ANAM. We need to establish the dependent variables upfront.



- LTC Whalen, WRAIR
  - It's return to functionality with or without limitations; return to functionality within the original, or transferred, unit.
- COL Bliese, WRAIR
  - Don't compound with the treatment. How should we design the study of decisions made after treatment as ready/not ready for RTD?
- LTC Brusher, WRAIR
  - You add a tool for the primary care provider to use, measure PTSD and other rate changes, across the grades, and the National Guard, as component of the annual Periodic Health Assessment (PHA).
- COL Bliese, WRAIR
  - We'll have a huge n and we can randomize by post as to which post gets chosen to have addition of tools with questions to the PHA. PHA has BH questions in it being updated to reflect new two-stage process. This tool would pick up those that were already on profile and note the change in rates associated with the scale as well. Plan it in combination with PHA that is already mandated and simply augment it. PHA is timed by an individual's requirement, not a unit requirement. There will be a central repository; right now enhanced BH part is a hard copy scan into AHLTA. It's not usable now. The fix is to come 1 October with the new DoD forms. It will be more user-friendly.
  - What if it's integrated into RESPECT-MIL instead of PHA? Yes, it could do that, will continue to screen everyone, and will migrate to the portal. The tools could be added to it. It would be done at troop medical clinics. It is being implemented now, but the mining of data will be delayed. They're still hiring the Mental Health providers. Every patient-centered primary care clinic will have RESPECT-MIL. It may provide a broader measure of functionality at a higher level beyond BH.
- LTC Brusher, WRAIR
  - I suggest putting tools into both RESPECT-MIL and PHA. PHA occurs through a PC, annually; RESPECT-MIL collects data at each medical encounter while sick.
- CPT Dretsch, USAARL
  - There are platforms: ANAM, timing, and training issues. Perhaps we could see a CDE measure of functionality process?
- LTC Brusher, WRAIR
  - We could probably get enough CDEs to use in the study. We could get clinicians' perspective on its utility and referral rates. It would serve leadership and they would be more receptive to it. It could be done at brigade and BCT levels. With no forms to fill out, it will support radical change in how business is conducted. CDE can be requested at the lieutenant level.

- COL Bliese, WRAIR
  - If they said the focus was on CDE, it would be simple to do. It would be less intrusive to the BH community who lack a current tool to predict RTD. The evaluation would be a bit ambiguous. You don't have to do initial integration into the portal at the beginning. You could do that later. We would first need to do a study to establish its utility. One criteria variable would be the percent admitted and the percent returned to duty; and whether the right decision was made by 3 month follow-up with the person requesting the CDE or their peers. You would focus first on BCT RTD as its finite. Passing BCT after RTD would indicate that the right decision was made.
- LTC Brusher, WRAIR
  - We need to include the impulsivity test to get TRADOC funds. It will provide access to TRADOC bases.
- COL Bliese, WRAIR
  - We can try to implement with TRADOC funds. Not sure about integrating more than impulsivity.
- LTC Whalen, WRAIR
  - There are DA [Department of the Army] directed CDEs for drill sergeants, perhaps we could study them.
- CPT Dretsch, USAARL
  - A tool to measure impulsivity, cognitive control, working memory, reaction time for functionality assessment would be useful to recruiters.
- Dr. Proctor, USARIEM
  - It's a pattern of performance test rather than a single test that is needed.
- LTC Whalen, WRAIR
  - We could study from BCT through Advanced Individual Training and first duty station or through the life of a career if we use TRADOC funds for research.
- COL Bliese, WRAIR
  - I want the task area to look at NP tests that are not all cognitive. It should include self composure. The ANAM has many other batteries that might be useful. I want to look at both groups that are CDE identified as problematic and the normals, and track them over time. Other complementary efforts might apply to a TRADOC funded study. We could focus study on CDE for BCT or AIT population at Ft. Jackson.
- LTC Whalen, WRAIR
  - We need reasons to separate servicemembers during the AIT phase; a protocol to look at datasets years later that evaluate variables for predicting long-term outcomes.

- Dr. Wilk, WRAIR
  - That is politically acceptable and will streamline the CDE process.
- COL Bliese, WRAIR
  - Does it fit in with the Warrior Task and Battle Drill? It fits with BCT for cognition and decision-making; the concrete tasks and criteria and gets around BH qualitative measures and notes being used for decisions. Measures will indicate whether they can facilitate doing a soldier-specific task. The predictability will be that the servicemember can do the particular task. RTD will be to do a particular task which is what the leader wants.
- Dr. Proctor, USARIEM
  - We need to think through outcomes and statistical power. We need to validate and repeat the administration of the same tool and measure scores over time. Some will vary normally. It needs to be obvious when a person is faking their test results.
- COL Bliese, WRAIR
  - We could get 10 item functional assessments from the Drill Sergeant or platoon leader of SM [service member] sent back to BCT with limitations: we can't measure the percent that actually go back to the BCT.
- LTC Whalen, WRAIR
  - The diagnosis, presenting problem, functional performance, and the supervisor evaluation could be studied.
- COL Bliese, WRAIR
  - We need to indicate what approach provides the highest quality decision.
- LTC Whalen, WRAIR
  - We could repeat the tool at successive visits to predict improvement or need for more treatment. Might get a chapter recommendation at first session but we could see again during follow on sessions. RTD could be simply for administrative separation. It could use good functional scores to alleviate command concerns.
- COL Bliese, WRAIR
  - If chosen by the CDE, it could be touch-point to put an actigraph on the Soldier. It could be used as tool to recommend more treatment. On that basis, it could continue to do sleep measurements over time, to inform treatment planning and finalize support services.

1145: Closing Comments – Dr. John Crowley, USAARL

Attendees were thanked for their time, insights, and contributions, and contact sheets were distributed to facilitate continued correspondence and collaboration.

## Workshop Summary and Concluding Comments

This two-day workshop was the first time the various players in DoD Return-to-Duty research had gathered together with each other and their stakeholders to discuss user needs and research issues. It was immediately apparent that many of the challenges and goals in developing standards and criteria for RTD are shared across the three domains represented—neurosensory, musculoskeletal, and psychological—yet there are highly unique aspects to these research domains as well.

Common challenges to the RTD programs presented at the workshop include the need for better definition of how military performance relates to specific diagnoses or illnesses, and what constitutes ‘adequate’ performance of military jobs, especially from cognitive and sensory standpoints. It was also significant that the three TA Managers were quick to agree on a common research approach to RTD standards development, recognizing that minor differences in detailed approach would be inevitable. The presence at the workshop of researchers from the U.S. Air Force (USAF) and U.S. Navy (USN), as well as academia, was invaluable and presented many opportunities for efficiency and collaboration.

The TA Managers were able to clearly articulate to the audience the important differences among the three research areas. Aside from the obvious differences in clinical domains (neurological vs. musculoskeletal vs. psychological), the programs are at different stages of maturity, with the psychological program being the newest. These differences translated into differing programmatic needs—the psychological program is deciding which disorders are important causes of disability and unfitness, while the other more mature programs are ensuring customers will endorse research products currently under development. The relevance of the common RTD research approach to the three programs, despite the maturity differences, was reassuring to the research managers.

In an era of shrinking resources for military medical research, it is critical to achieve maximum efficiency—delivering well-researched products that are targeted at real Warfighter needs, at the right time and cost. Collaborative research planning workshops such as this can be invaluable in achieving these goals. The enthusiastic response and support received from all of the attendees during the workshop serve as an indication of the importance and relevance of the MOMRP RTD research program(s), and should reassure those providing funding that their investment is wise. Numerous actions were taken from the meeting and their successful completion will assure the value of this workshop.

Appendix. Return to Duty Workshop Attendee List  
19-20 September 2012  
Frederick, MD

| <b>Name</b>            | <b>Organization</b>                                | <b>E-mail Address</b>             |
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