

Mild Traumatic Brain Injuries

Reviewing the
Literature on
Incidence, Prevalence,
Diagnosis and
Prognosis

A Comprehensive Literature Review by Brindlea
Peterson
Completed as part of the graduation requirements
for Lee Honors College

Objectives

#1

Explain the importance of researching mTBIs

#3

Examine existing literature on mTBI research in military personnel

#5

Understand what mTBI treatment looks like in combat through an interview case study



#2

Examine existing literature on mTBI research in civilians

#4

Review recent studies and advances in research

#6

Identify current gaps in literature and outline future research needs

Introduction



01

Mild traumatic brain injuries (mTBI) make up approximately 90% of all traumatic brain injuries (TBIs) (Vos et al., 2012)

02

A mTBI is characterized by a hospital admission following a head injury, loss of consciousness less than 30 minutes if at all, and a Glasgow Coma Scale (GCS) of 13-15 (Vos et al., 2012)

03

Mild traumatic brain injuries gained attention when they were coined the “signature injury” of the 21st century conflicts in Iraq and Afghanistan (Combs et al., 2015)

04

According to the World Health Organization (WHO), annual incidence of mTBIs throughout the entire population is approximately 0.6% (Donovan et al., 2014)

WHO Meta-Analysis (2004)

2004 World Health Organization Collaborating Centre for Neurotrauma Task Force on Mild Traumatic Brain Injury at the Karolinska Institute in Sweden

Hospital treated mTBIs: About .1-.3% of the worldwide population
Self-reported mTBIs: .6% of the population annually (Holm et al., 2005)

Only 5% (GCS score of 15) and 30% (GCS score of 13) have abnormalities on the intracranial computerized tomography (CT) scan (Holm et al., 2005)

Pediatric prognosis is better than adult prognosis with pediatrics having a quicker recovery time and fewer lasting symptoms (Holm et al., 2005)

More severe mTBIs (GCS score of 13 or 14) had increased rates of disability (Holm et al., 2005)



Notable Gaps in Literature

- Watching documentation for evidence of deaths after repeated mTBI or concussions in order to further understand the validity of second impact syndrome (SIS);
- study the ability of clinical factors to predict the CT scan abnormalities and need for intervention in children;
- updated studies of cost analysis as most previous studies had been done over a decade prior to this analysis;
- well-designed, non-bias, confirmatory studies of symptom reporting and resolution over time using appropriate control groups;
- studies designed to support guidelines around emergency room triage of children with mTBI;
- studies around timing of interventions;
- an in-depth review of the existing criteria used to classify a traumatic brain injury as mild (Holm et al., 2005)

ICoMP Meta-Analysis (2012)

The International Collaboration on mTBI Prognosis (ICoMP), was funded and formed in 2011 to update the previous WHO Task Force and focused on 101 scientifically admissible studies from years 2001 to 2012 (Donovan et al., 2014)

Athlete prognosis: those with previous history of concussions presented with delayed recovery times over those with no previous concussion history (Donovan et al., 2014)

Adult prognosis: full cognitive recovery in adults may take six months to a year rather than the first month post injury (Donovan et al., 2014)

Prognosis after MVC: approximately 24% of people who experience MVC injuries sustained a mTBI and that of those affected, 23% reported not having fully recovered after 1 year (Donovan et al., 2014)

Pediatric prognosis: majority of children, self-reported symptoms resolved rather quickly, usually within 2 to 3 month with no long lasting mTBI-specific cognitive deficits (Donovan et al., 2014)

Military personnel prognosis: there was a high association between PTSD and postconcussive symptoms after a mTBI in those with no other injuries (Boyle et al., 2014)



Notable Gaps in Literature

- Return to Play (RTP) guidelines currently focus mainly on injury in males playing contact sports and would greatly benefit from further studies across a wider scope of genders, ages, and sports type;
- research quality of RTP remained the same between the 2004 review and the 2012 review and needs methodological improvements to better protect athletes from further injury;
- RTP analysis tools such as the Zurich Consensus guidelines are currently based on opinions and judgements from clinicians rather than scientific evidence, therefore the ICoMP recommends that randomized controlled trials be conducted to test the current RTP guidelines and make improvements based on the findings;
- improved research about SIS and any continued monitoring of any fatal outcomes after mTBIs;

Notable Gaps in Literature (continued)

- studies of methods for triage of those at higher risk for poor recovery early in the treatment, such as prognostic prediction rules, as well as whether early treatment programs are effective in improving recovery;
- a shift in research from biomedical markers to biopsychosocial markers for recovery after MBTI;
- studies regarding the relationship between mTBI and Whiplash Associated Disorder (WAD) and how their criteria should be separated from each other early during diagnosis to avoid overlap in prognostic research;
- return to school protocols for pediatrics after mTBI;
- longitudinal studies on the long and short term outcomes of military personnel to determine important characteristics of injuries in relation to prognosis;
- long term outcomes and effectiveness of the “return to duty” or “return to work after deployment” protocols;
- and the prognosis of military personnel who are exposed to multiple blasts while in combat (Boyle et al., 2014)

VHA Meta-Analysis



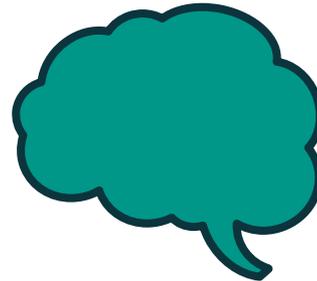
The military initially began their post-deployment screenings for mTBI in April of 2007 (Belanger et al., 2016)



The screening itself consisted of a series of questions, including deployment location, previous TBI diagnosis, and then more detailed questions about injuries sustained and specific symptoms (Belanger et al., 2016)



Between 2007 and 2014, 846,711 veterans of OEF and OIF were screened for any type of TBI but it was found that the screen missed between 30% and 64% of cases that were later diagnosed (Belanger et al., 2016)



The KD test is a valuable screening tool to be used in combat given that the VHA begins collecting pre-combat KD data (Walsh et al., 2016)

Recent Studies

Visual Biomarkers as Diagnostic Tools

Oculomotor functions such as accommodation, version and vergence eye movements have specific tests that can be done quickly to objectively determine the presence of a mTBI (Ciuffreda et al., 2014)



Persistent Post-Concussive Symptoms

This study found that mTBI patients showed reduced memory performance and concluded that mTBI may be linked to memory deficits (Oldenburg et al., 2016)

Multimodal Diagnostic Tools

The study was successful in that the multimodal approach proved to be more effective than the singular test approach in determining previous mTBI but there were some limitations with the tests that will need further research (Baruch et al., 2016)

Areas Needing Prompt Research



01

Studies with larger sample sizes for vision biomarkers as a tool for diagnosing mTBI



04

Studies needed pertaining to return to school protocols for children following mTBI



02

The effects of repeat mTBIs and the validity of SIS



05

Studies on RTP guidelines across a wider scope of genders, ages, and sports type



03

Whether or not screening for mTBIs post-deployment improves the actual clinical outcomes



06

Research on biomedical markers versus biopsychosocial markers for recovery after MBTI

Case Study



Major RH, MS, OTL was sent to Afghanistan to work in a field office where she assessed, treated, and monitored those with mTBIs

Though military personnel in combat have a higher incidence rate of mTBIs than civilians, they have much less ease of access to healthcare providers



Specific guidelines for who to treat and how to treat them (typical case seen)

Diagnostic tools used included Military Acute Concussion Exam (MACE), cranial nerve screens, Balance Error Scoring System (BESS), Romberg test, exertion testing, Automated Neuropsychological Assessment Metrics (ANAM)



Conclusions & Significance

Improvements and discoveries have been made in diagnosing and treating mTBIs in the twenty-first century

1

The ability to use visual feedback alongside other tests to more accurately diagnose an mTBI has given many people the knowledge to rest and recover after an injury

2

One of the many areas in urgent need of further research is the effects of repeat mTBIs and the validity of SIS

3

It is imperative to the health of the world's military servicemen, athletes, and general population that the research and advancements for diagnosis and treatment of mTBIs continue

4



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Questions or Comments?

