Current Neuropsychological Perspectives on Assessment and Treatment of TBI in Returning Veterans

Contemporary Mental Health Treatment for Returning Veterans

Portland, OR
6/13/12

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Incidence: TBI in the USA

- Every 21 seconds an individual sustains a TBI
- More than 1.5 million individuals sustain TBI annually
- 50,000 to 52,000 die of TBI annually
- Vast majority are mTBI, likely underestimated

(1999 CDC Report to Congress)
Non-Combat Causes of TBI

Traumatic Injuries
Major Causes of Traumatic Brain Injuries

- Falls 28%
- Motor Vehicle Accident 20%
- Struck by... (incl. Sports) 19%
- Assault 11%
- Other 21%
- Suicide 1%

Source: National Center for Injury Prevention and Control, CDC
Risk Factors

- Young age
  - 0-4 (falls)
  - 15-19 (MVA)
- Male (1.5 times more likely) CDC, 2006
- Alcohol abuse history
  - 55-66% (Corrigan, 1995)
- Intoxication at injury
  - 37-51% (Parry-Jones, 2006); 36-51% (Corrigan, 1995)
- Previous TBI (Guskiewicz et al, 2003)
- Old age (Falls)
TBI Definition

“A traumatically induced structural injury and/or physiological disruption of brain function as a result of an external force that is indicated by the new onset or worsening of at least one of the following clinical signs immediately following the event:

1. Any period of LOC
2. Any loss of memory for events before or after (PTA)
3. Any alteration in mental state (confusion, disorientation)
4. Neurological deficits that may or may not be transient
5. Intracranial lesion”

Departments of Defense and Veterans Affairs Consensus Definition of Traumatic Brain Injury (2009)
Assessing Severity

LOC

Retrograde Amnesia

Injury

Post-traumatic Amnesia (PTA)

Alert and Oriented

Ruff, 2007
## Classifying Severity of Injury

<table>
<thead>
<tr>
<th>Severity</th>
<th>LOC</th>
<th>PTA</th>
<th>GCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>&lt;30 min</td>
<td>&lt;6 hrs</td>
<td>13-15</td>
</tr>
<tr>
<td>Moderate</td>
<td>&lt;6 hrs</td>
<td>&lt;7 days</td>
<td>9-12</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;6 hrs</td>
<td>&gt;7 days</td>
<td>3-8</td>
</tr>
</tbody>
</table>

LOC = loss of consciousness  
PTA = post traumatic amnesia  
GCS = Glasgow Coma Scale  

VA TBI publication, 2004
TBI Mechanisms

**Injury Source**
- Blunt trauma
- Penetrating wounds
- Acceleration/deceleration
- Explosions/blasts – high and low pressure waves

**Effects on the Brain**
- Bleeding/bruising
- Stretching or shearing of axons
- Edema, swelling
Most Frequently Reported Acute PCS in Athletes After mTBI (in order)

- Headache
- Dizziness
- Mentally Foggy
- Poor Concentration
- Mentally Slowed
- Memory Problems
- Light/noise sensitivity
- Fatigue
- Drowsiness
- Nausea
- Nervousness
- Sadness
- Numbness/Tingling
- Vomiting (low freq)
- Other

NCAA Concussion study, 2003
TBI In Returning Veterans

• 3.3 million U.S. OEF/OIF deployments as of December, 2011
• 73% OEF/OIF casualties blast-related
• Though difficult to capture accurately, around 15-20% OIF/OEF veterans meeting criteria for TBI (WRAMC, 2006; Hoge et al., 2008),
• The effects of blast-exposures are still not well understood
Challenges in Diagnosing mTBI in Veterans

• Often lack of acute injury information (most relevant for dx) and reliance on retrospective self report, often years later
• Military culture may lead to tendency to minimize initial symptoms, “suck it up”
• Research suggests persistent cognitive impairment after concussion is a low prevalence condition
• Co-morbidities and symptom overlap
Post Concussive Disorder is not specific to mTBI

• May see in those without TBI
  – Individuals (civilians) with Major Depressive Disorder endorse post-concussive symptoms (Iverson, 2006)
  – Somatic complaints secondary to physical trauma often identical to “post-concussive” symptoms (Meares et al., 2008)
  – Individuals with chronic pain (Iverson, 1997)
  – Patients with whiplash (Sullivan et al., 2002)
  – Personal injury claimants (Lees-Haley & Brown, 2003)
• Limited usefulness as a diagnostic category
Cognitive Changes are not Specific to mTBI

- **Deployment** is associated with cognitive changes (Storzbach et al., 2000; Vasterling et al., 2006)

- **PTSD** is associated with cognitive changes (Vasterling & Brailey, 2005)

- **Depression** is associated with cognitive changes (Zakzanis et al., 1999)

- **Chronic Pain** is associated with cognitive changes (Hart et al., 2007)

- **Chronic Insomnia** is associated with cognitive changes (Waters et al., 2011)
PTSD

• About 13.8% returning service members meeting PTSD criteria (Tenielian & Jaycox, 2008)

• 33.8%-44% of individuals with mTBI met criteria for PTSD (RAND study; Hoge et al., 2008)

• Brain related changes, not “all in your head”
  ○ Conditioned fear response in amygdala, difficult to extinguish
  ○ Structural brain differences in PTSD (e.g. hippocampus, anterior cingulate) that may alter inhibition of amygdala

• Most studies support some level of cognitive deficits in PTSD
  ○ Sustained attention, working memory, learning/acquisition are most frequently reported areas of cognitive deficit
mTBI & PTSD: Shared Symptoms

**Emotional**
- Irritability
- Mood Swings
- Temper Outbursts
- Depression
- Withdrawal
- Easily frustrated
- Loss of interest

**Cognitive**
- Memory
- Attention/concentration
- Processing Speed
- Executive functioning
Neuropsychology of mTBI

- Acute cognitive deficits are common, even without LOC
- Civilian studies show most symptoms resolve within days and for the majority (80-90%), do not persist beyond 1-2 weeks
- Recent meta-analyses show no measurable group differences on cognitive testing by 3 months
- Persistent/permanent complaints often associated with non-neurological factors (e.g. voc hx, pain, mood, anxiety, expectation bias, litigation) ...creates controversy
Neuropsychology of mTBI

- Complicated mTBI (those associated with structural changes on neuroimaging) may be more vulnerable to residual cognitive deficits
- Multiple concussions associated with longer recovery and worse outcomes, no clear threshold established
- We must acknowledge that there are differences between conditions in civilian studies and combat. There are insufficient studies on mTBI in combat.
- Though more research needed, no evidence to support differences in blast versus non-blast combat TBI on cognitive measures (e.g. Belanger et al., 2009; Lippa, 2010)
Neuropsychology of mTBI  
(subjective impressions of a clinician)

• No clear “pattern” of deficits that I have seen in returning Veterans with mTBI
  – Significant individual differences (e.g. normal results after severe TBI v. significant impairments after single mTBI)

• Attention is cognitive domain most often affected

• Retention of learned information generally better than initial learning

• Often perform better in structured setting compared to daily lives

• Not all blasts (many falls, MVA, training exercises, fights)
Acknowledging the Complexity

- Broad spectrum of injury in mTBI (dazed and confused to 29 minute LOC, with hemorrhage)
- While *most* have full recovery in mTBI, *many* don’t.
- TBI is not the only cause of memory trouble and PCS
- Balance between good screening and overdiagnosis
- Avoid conceptualizing as “either neurological or psychiatric”
- Simple scientific parsimony doesn’t explain poor outcome in mTBI
- A Biopsychosocial perspective better addresses the complexity
What treatments have been empirically supported in mTBI?

• **Answer:** almost none

• **Early education:** (e.g. symptoms and expected outcome, normalization of symptoms, reassurance about expected positive recovery) (Snell et al., 2009, Journal of Clinical and Experimental Neuropsychology)

• **Symptom-based treatment**
  – Rehab medicine, PT, OT, Speech, ENT, Mental Health, Neuropsychology, Voc Rehab...
  – Case manager can be helpful to help navigate complexity of system and multiple clinics that address different sx
Cognitive Rehabilitation

• Restorative Theories
  – Strengthening, reinforcing, or restoring functions that remain partially intact after injury
  – Most effective early in recovery
  – Typically done in rehab setting (high freq sessions)
  – Mixed support in literature

• Compensatory Theories
  – Teaching strategies and gaining tools to cope with cognitive impairment (e.g. day planner, routines)
  – Typically done in outpatient setting
Cognitive Rehabilitation for mTBI?

• No data on the effectiveness of cognitive rehabilitation for mild cognitive disorders in recent combat veterans

• Systematic reviews on cognitive rehabilitation for mTBI conclude:
  
  – Trials are small or poorly designed
  – Results are “inconclusive”
  – Little support for education beyond the acute stage

(Snell et al., 2009; Borg et al., 2004; Comper et al., 2005)
Cognitive Rehabilitation for mTBI?

Extensive systematic reviews on cognitive rehabilitation for civilians following single events, primarily stroke and moderate to severe TBI:

– Cognitive rehabilitation is of significant benefit compared with alternatives
– Compensatory strategy training for attention and mild memory impairments is effective
– Memory aids and assistive devices are effective

(European Federation of Neurological Societies, Cappa et al., 2005; Brain Injury Special Interest Group of the American Congress of Rehabilitation Medicine, Cicerone et al., 2002)
Portland’s Pilot Study

- 16 OIF/OEF veterans with Cognitive Disorder NOS and a history of combat-related TBI
- Age: 34 ± 8 years
- 100% male
- 81% Caucasian
- Education: 13 ± 2 years
- Time since combat (injury): 34 ± 12 months

(Huckans et al., JRRD, 2010)
Pilot Study - Conclusions

- Group-based CST is a highly feasible intervention for OIF/OEF veterans and can easily be integrated into, for example, a menu of typical VA mental health classes.

- OIF/OEF veterans are satisfied with group-based CST, and there are reasonable attendance rates.

Compared with pre-treatment, at post-treatment OIF/OEF veterans report:

- Increased usage of compensatory strategies
- Enhanced perception that these strategies are useful
- Decreased cognitive symptom severity
- Decreased depression
- Increased satisfaction with life

*(Huckans et al., JRRD, 2010)*
Portland’s Group-Based Cognitive Strategy Training (CST) Intervention

- **Cognitive and Environmental Strategies**
  - Mindfulness to remove internal distractions
  - Work in a quiet room - avoid interruption
  - Visual imagery and acronyms to aid recall

- **External Aids/Assistive Devices**
  - Day planner systems, PDAs, calendars
  - Timers, alarms, automated prompts
  - Voice recorders

*(Huckans et al., JRRD, 2010)*
Portland’s Group-Based CST Intervention

Session structure (8 weekly 2-hour sessions):

- Didactic – new information and strategies
- In-class practice - activities and discussion
- Home practice – apply strategies at home
- Home exercise review – discussion and feedback

Materials:

- Class Binder - detailed handouts
- Advanced Day Planner System

(Huckans et al., JRRD, 2010)
Portland’s CST Modules: Semi-Manualized

- Course Overview and Psychoeducation
- Lifestyle Strategies
- Organizational Strategies – Routines and Prioritization
- Attention Strategies
- Memory Strategies
- Planning and Problem-Solving Strategies
- Review, Integration, and Closure

(Huckans et al., JRRD, 2010)
Integrated Treatment?

• How do we address the complex symptom presentations involved with PTSD, TBI, chronic pain, insomnia, and medication side fx?
• Polytrauma at the VA
• Inpatient program of PTSD treatment and Cognitive Strategy training led to significant improvement in reported post-concussive symptoms (Walter et al., 2011, Rehabilitation Psychology)
• Motivation for lengthy, sustained treatments?
• What is working with your patients?
TBI and Suicide

- 4-fold increase (8.1% vs. 1.9%) in frequency of suicide attempts in clinical sample w/ history of TBI compared to control group with no TBI history (Silver et al., 2001)

- Individuals with no more than single concussion been found to have increased suicide risk (Teasdale et al., 2001)

TBI and Suicide

• Risk via presence of precipitating stressor (TBI)-Timing
• Risk via precipitant for psychiatric illness and subsequent suicidal behavior
• Risk via disinhibition and impulsivity secondary to frontal systems dysfx

TBI and risk for dementia

- Retired football players with histories of 3 or more concussions were 3X more likely to have memory impairment (MCI) than those without concussion history. No association with Alzheimer’s disease was found. (Guskiewicz et al., 2005)

- All based on self-report, no objective testing

- Recent study also presents case studies of dementia among retired NFL players (CTE)

- Overall, research supports some increased vulnerability in moderate/severe, less evidence in mTBI.
TBI and risk for Depression

- Despite lots of research, huge variability in rates of depression after TBI (10-77%)
- Bombardier et al., 2010
  - N=559 consecutively hospitalized adults with complicated mild-to-severe TBI from major trauma center
  - 297 (53.1%) met criteria for MDD at least once during follow-up period (1,6,8,10,12 mo.)
  - MDD at time of injury, MDD prior to injury, age, and hx alcohol dependence most associated with risk of MDD post-TBI
  - Only 44% those with MDD received meds or counseling tx, suggesting this is an under recognized issue
Alcohol intoxication clearly associated with risk for civilian TB (as many as 50%)
Less clear evidence regarding whether having a TBI will increase alcohol use post-injury
Little evidence to support that those without pre-injury abuse begin abusing post-injury
Trend toward decreased use in first year post-injury among those with high pre-injury use, while levels may rise toward pre-injury levels over time

Ponsford, et al., 2007, Brain Injury; 21 (13-14): 1385-1392
Resources

• DVBIC
dvbic.com
1.800.870.9244

• Portland VA Medical Center
503.220.8262

• Brain Injury Association of Oregon
http://www.biaoregon.org/
503.740.3155
1.800.544.5243

• Brain Injury Association of Washington
http://www.biawa.org/contact.htm
1.800.523.5438

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Thank you

• Veterans of all eras
• Conference Participants
• Kathy Lovrien, LCSW
• Dan Storzbach, PhD (slides)
• Marilyn Huckans, PhD (slides)