Neuropsychology of Mild TBI: What Do We Know?

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Diagnosis
American Congress of Rehabilitation Medicine Criteria
Definition of Mild TBI

- Traumatically induced physiologic disruption of brain function as indicated by at least one of the following:
  - Any period of loss of consciousness
  - Any loss of memory for events immediately before or after the accident
  - Any alteration in mental state at the time of the accident
  - Focal neurologic deficits that may or may not be transient

- Severity of the injury does not exceed:
  - Loss of consciousness of 30 min
  - GCS score of 13-15 after 30 min
  - Posttraumatic amnesia of 24 hr

Mild Traumatic Brain Injury

- Mild TBI accounts for about 80-90% of reported new cases of head injuries each year
- Controversy exists regarding the long-term effects of mild TBI on cognitive functioning

Criteria for Severity of TBI

<table>
<thead>
<tr>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC ≤ 30 min with normal CT &amp;/or MRI</td>
<td>LOC ≤ 6 hours with normal or abnormal CT &amp;/or MRI</td>
<td>LOC &gt; 6 hours with normal or abnormal CT &amp;/or MRI</td>
</tr>
<tr>
<td>GCS 13-15</td>
<td>GCS 9-12</td>
<td>GCS &lt; 9</td>
</tr>
<tr>
<td>PTA ≤ 24hr</td>
<td>PTA ≤ 7days</td>
<td>PTA &gt; 7days</td>
</tr>
</tbody>
</table>
Complicated Mild TBI

- When clinical neuroimaging findings are present following a MTBI, the classification changes to "complicated MTBI," which has a 6-month outcome more similar to moderate TBI.\(^1\)\(^2\)


TBI Screening Reminder

April 2007

“TBI Screening Reminder” Functions

- Identify possible OIF/OEF Participants
- Confirm deployment to OIF/OEF Theatres of Deployment
- Screen for TBI if deployed in OIF/OEF Theatres
- Identify those with an OIF/OEF-related history of TBI
Screening Questions: 4 Sections

- Section 1: Events
- Section 2: Immediate Disturbance of Consciousness Symptoms after Events
- Section 3: New or Worsening Symptoms after the event
- Section 4: Current Symptoms
Screen Interpretations

- A “no” response to any of the sections terminates screening and is a “negative screen”
- A “yes” response to ALL FOUR sections is a “positive screen”

Screen Interpretations

- The screen will not yield a positive result if there is an historical TBI and there are currently no symptom complaints
- This is therefore *not* a screen for mild TBI but rather a screen for ongoing symptom complaints + history of “possible” TBI

Private Sector Diagnosis

- Accuracy of Mild Traumatic Brain Injury Diagnosis
  (Powell, Ferraro, Dikmen, Temkin & Bell, 2008)
  - Compared identification of mild TBI via
    - (1) retrospective chart reviews of Emergency Department
    - (2) prospective identification of cases using structured interview and medical record data.
Private Sector Diagnosis

- Accuracy of Mild Traumatic Brain Injury Diagnosis
  (Powell, Ferraro, Dikmen, Temkin & Bell, 2008)
  - Of those cases identified in the ED by study personnel as having mild TBI, 56% did not have a documented diagnosis from the ED physician indicative of mild TBI.

Neuropsychologist Role

- Assist in clarifying diagnosis
- Symptoms can support a diagnosis of mild TBI but cannot be used to make the diagnosis
- In most cases (due to lack of injury severity medical records) diagnosis based on: Careful interview of events:
  - Ask them to describe in detail what happened
  - Assess for mechanism of injury (i.e., blunt trauma or acceleration/deceleration forces)
  - Assess for any period of confusion, disorientation, or impaired consciousness associated with mechanism
Postconcussion Symptoms

- Physical
  - Headache, dizziness, fatigue, noise/light intolerance, insomnia
- Cognitive
  - Memory complaints, poor concentration
- Emotional
  - Depression, anxiety, irritability, lability

PCS-Like Complaints of NP Dysfunction

- Common
- Nonspecific
- Potentially related to non-neurological factors (anxiety, depression, fatigue, stress)
- Correlate better with distress than with objective indicators of CNS injury
- Susceptible to attribution bias

Problems with Using Complaints as Evidence of Cognitive Dysfunction

- Mittenberg et al. (1992, 1997): “expectation as etiology”
  - ‘imaginary concussion’ produces symptom complaint cluster identical to that reported by patients with ‘real’ head injury
  - patients with minor TBI significantly underestimate degree of pre-injury problems
Cognitive Sequelae

What we know

Acute Symptoms

- There is no doubt that a mTBI causes acute disruption of brain functioning
- Initial Symptoms:
  - At Best: dazed, confused, temporarily disoriented, often with memory gaps for the injury itself and for some period of time thereafter (seconds to hours)
  - At worst: unconscious for up to 30 minutes
- Unresolved are questions of how long the disruption of normal brain functioning lasts and whether symptoms and impairments can continue long-term

Mild TBI:
Five Meta-analytic Studies: I

(Binder, Rohling, & Larrabee, 1997; Binder & Rohling, 1996; respectively)
- Found the long-term cognitive impairment effect size for mild TBI was very small (0.1 - 0.2) and not statistically significant
- In contrast the long-term effect of financial incentives on cognitive impairment in a mild TBI population was larger (0.5) and significant
Mild TBI: Five Meta-analytic Studies: II
(Schretlen & Shapiro, 2003)

- A second recent meta-analytic study found that overall neuropsychological effect size (d) for MTBI in prospective studies was 0.24
- Categorized into 4 time-since-injury intervals the effect sizes were:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 7 days</td>
<td>0.41</td>
</tr>
<tr>
<td>7-29 days</td>
<td>0.29</td>
</tr>
<tr>
<td>30-89 days</td>
<td>0.08</td>
</tr>
<tr>
<td>&gt; 89 days</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Mild TBI: Five Meta-analytic Studies: III
(Frencham, Fox & Maybery, 2005)

- Overall effect size was moderate (g=.32) but tended toward zero with increasing time since injury.
- Categorized into 2 time-since-injury intervals the effect sizes were:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 months</td>
<td>0.33</td>
</tr>
<tr>
<td>More than 3 months</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Mild TBI – Cognitive Findings: Meta-Analysis IV
(Belanger, Curtiss, Demery, Lebowitz, Vanderploeg, 2005)

- Inclusion Criteria
  - Evidence of mild head injury
  - Control group utilized
  - Separate results by severity level
  - Time since injury reported
  - Cognitive measures, experimental or clinical
  - Means and SDs presented
Mild TBI – Cognitive Findings: Meta-Analysis IV
(Belanger et al., 2005)

Study Search
- 1970 to March 2004 PubMed and PsychINFO, other MTBI study reference sections
- 133 studies from which 39, with a total of 41 effect sizes, met inclusion criteria
- 1463 cases of MTBI and 1191 control cases

Mild TBI – Cognitive Findings: Meta-Analysis IV
(Belanger et al., 2005)

Moderators Examined:
- Cognitive domain
- Time since injury (< 90 days versus > 90 days)
- Selection context of the study participants
  - Litigation
  - Symptomatic/clinic-based
  - Unselected samples

Mild TBI – Cognitive Findings: Meta-Analysis IV

Cognitive Domains Examined:
- Global Cognitive Ability
- Attention
- Executive Functions
- Fluency
- Memory Acquisition
- Delayed Memory
- Language
- Visuospatial Skill
- Motor Functions
Mild TBI – Cognitive Findings: Meta-Analysis IV
(Belanger et al., 2005)

- Overall effect size, $d$, associated with MTBI was $0.54$.
- Statistically significant deficits in all domains except motor functions (only two studies included motor functions).
- Most effect sizes were moderate to large (Cohen, 1988) with fluency ($d = 0.77$) and delayed memory ($d = 0.69$) having the largest overall effect sizes.
- Smallest overall effects were found on motor ($d = 0.16$) and executive measures ($d = 0.21$).

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Mild TBI: Meta-Analysis IV
(Belanger et al., 2005)

<table>
<thead>
<tr>
<th>Time Post-Inj.</th>
<th>Litigation Based</th>
<th>Clinic Based</th>
<th>Unselected Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 90 days</td>
<td>0.52</td>
<td>No studies</td>
<td>0.63</td>
</tr>
<tr>
<td>≥ 90 days</td>
<td>0.78</td>
<td>0.74</td>
<td>0.04</td>
</tr>
</tbody>
</table>

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Sport Injury Mild TBI – Cognitive Findings: Meta-Analysis V
(Belanger & Vanderploeg, 2005)

- 21 studies from which a total of 41 effect sizes, met inclusion criteria.
- 790 cases of MTBI and 2016 control cases.
Overall effect size of concussion was 0.49
- Comparable to general MVA acceleration/deceleration effect size in mTBI; $d = 0.54$
- Acute effects (< 24 hrs) largest for:
  - Delayed memory; $d = 1.00$
  - Memory acquisition; $d = 1.03$
  - Global cognitive functioning; $d = 1.42$
- However, no residual effects when evaluated > 7 days postconcussion

**Conclusion**
- When looking at the mild TBI population, there are generally no long-term cognitive sequelae
Yes, But….

Is our population (OEF/OIF) somehow different?

“Diagnostic Threat”
(Suhr & Gunstaad, 2002, 2005)

- Evaluations of the same mild TBI population if conducted under the “explanation” of studying mild TBI results is poorer neuropsychological performance than the same evaluation conducted with a neutral “explanation.”
- Unfortunately, the context of the evaluation influences the findings.

PTSD and Cognitive Deficits

- Persian Gulf War veterans
- PTSD was associated with relative performance deficiencies on tasks of:
  - sustained attention
  - mental manipulation
  - verbal learning
  - executive control, and
  - performances were characterized by errors of commission and intrusion

Vasterling et al., Neuropsychology, 1998;12:125-33
Neurocognition Deployment Health Study
Vasterling et al., JAMA, 2006

- 600+ soldiers tested before and after Iraq deployment
- "Neuropsychological compromise" on sustained attention, verbal learning, and visuospatial memory
- Increased negative state affect
- History of mild TBI had no effect on neuropsychological findings

Screening for cognitive dysfunction in OIF/OEF service members with explosion injuries admitted to a burn unit.
(Mercado et al., 2008, published abstract in Archives of Clinical Neuropsychology)
- 123 evaluations on patients with burns secondary to explosive munitions.
- No differences on cognitive measures (RBANS) between those with mild TBI and no mild TBI.
- Mild TBI group more likely to have psychiatric diagnoses.

Performance on the Automated Neuropsychological Assessment Metrics (ANAM) in a Non-Clinical Sample of Soldiers Screened for Mild TBI after Returning from Iraq and Afghanistan: A Descriptive Analysis
(Ivins, Kane & Schwab in press JHTR)
- Convenience sample of 956 soldiers administered the ANAM
- History of deployment-related mild TBI up to two years prior to cognitive testing was not associated with poor ANAM performance post deployment.
- No associations between poor ANAM performance and the number of lifetime TBIs, injury severity or the number post-concussive symptoms
What about Different Mechanisms?

Functional Outcomes of Blast vs. Non-Blast Injuries

(Sayer, Chiros, Sigford, Scott, Clothier, Pickett, Lew, APMR, 2008)

- Chart reviews of 188 OEF/OIF patients admitted to PRCs during 1st 4 years of OEF/OIF
- Outcomes assessed were:
  - Cognitive FIM
  - Motor FIM
  - Length of Stay (LOS)

<table>
<thead>
<tr>
<th>Mechanism of Injury</th>
<th>Blast (n=106)</th>
<th>Other (n=82)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injured System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain Injury</td>
<td>96%</td>
<td>99%</td>
<td>NS</td>
</tr>
<tr>
<td>Type of brain injury</td>
<td></td>
<td></td>
<td>.001</td>
</tr>
<tr>
<td>Closed</td>
<td>42%</td>
<td>70%</td>
<td></td>
</tr>
<tr>
<td>Penetrating</td>
<td>58%</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Cognition</td>
<td>88%</td>
<td>93%</td>
<td>NS</td>
</tr>
<tr>
<td>Pain</td>
<td>83%</td>
<td>80%</td>
<td>NS</td>
</tr>
<tr>
<td>Balance</td>
<td>68%</td>
<td>62%</td>
<td>NS</td>
</tr>
<tr>
<td>Motor Fx</td>
<td>62%</td>
<td>65%</td>
<td>NS</td>
</tr>
<tr>
<td>Sleep</td>
<td>66%</td>
<td>57%</td>
<td>NS</td>
</tr>
<tr>
<td>Mechanism of Injury</td>
<td>Blast</td>
<td>Other</td>
<td>p-value</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>Injured System</td>
<td>(n=106)</td>
<td>(n=82)</td>
<td></td>
</tr>
<tr>
<td>Seeing</td>
<td>58%</td>
<td>46%</td>
<td>NS</td>
</tr>
<tr>
<td>Hearing Loss</td>
<td>48%</td>
<td>33%</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Tinnitus</td>
<td>26%</td>
<td>12%</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Communication</td>
<td>50%</td>
<td>49%</td>
<td>NS</td>
</tr>
<tr>
<td>Mental Health Sx</td>
<td>61%</td>
<td>52%</td>
<td>NS</td>
</tr>
<tr>
<td>Depressive Sx</td>
<td>57%</td>
<td>50%</td>
<td>NS</td>
</tr>
<tr>
<td>PTSD Sx</td>
<td>42%</td>
<td>24%</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Other anxiety</td>
<td>26%</td>
<td>24%</td>
<td>NS</td>
</tr>
<tr>
<td>Psychotic Sx</td>
<td>4%</td>
<td>4%</td>
<td>NS</td>
</tr>
<tr>
<td>Behavior</td>
<td>26%</td>
<td>22%</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Functional Outcomes of Blast vs. Non-Blast Injuries**
(Sayer, Chiros, Sigford, Scott, Clothier, Pickett, Lew, APMR, 2008)

- Mechanism of injury (blast vs other) did not predict functional gain scores (FIM).
  - Baseline fx was strongest predictor of FIM gain and LOS

**Neuropsychological Effects of Blast vs. Non-Blast TBI**
(Belanger, Kretzmer, Yoash-Gantz, Pickett, Tupler, JINS, 2009)

- 102 consecutively assessed post-TBI individuals primarily returning active-duty or veteran military personnel who were injured in Afghanistan or Iraq (67% active duty).
- Excluded:
  - failed SVT (n = 31)
  - comorbid neurological disorders (e.g., stroke) (n = 1)
  - brain injury due to gunshot (n = 3)
Demographic Information
(Belanger, Kretzmer, Yoash-Gantz, Pickett, Tupler, JINS, 2009)

- Mean age = 28.7 (sd 7.7)
- Mean education = 12.9 years (sd 2.0)
- WTAR-predicted FSIQ = 97.2 (sd 13.7)
- 96% male
- 91% right-handed
- 63% inpatient

Demographic Information
(Belanger, Kretzmer, Yoash-Gantz, Pickett, Tupler, JINS, 2009)

<table>
<thead>
<tr>
<th></th>
<th>Blast (n=61)</th>
<th>Non-Blast (n=41)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>29 (7.9)</td>
<td>28.2 (7.5)</td>
<td>p&gt;.59</td>
</tr>
<tr>
<td>Education in years</td>
<td>13.1 (2.1)</td>
<td>12.16 (1.7)</td>
<td>p&gt;.21</td>
</tr>
<tr>
<td>WTAR FSIQ</td>
<td>98.5 (14.2)</td>
<td>95.2 (13.0)</td>
<td>p&gt;.24</td>
</tr>
<tr>
<td>Days Since Injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;90 days</td>
<td>28</td>
<td>24</td>
<td>p&gt;.13</td>
</tr>
<tr>
<td>90 days to one year</td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>&gt;1 year</td>
<td>25</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

Blast vs. Non-Blast in Mild TBI
(Belanger, Kretzmer, Yoash-Gantz, Pickett, Tupler, JINS, 2009)

Note: PCL scores and time since injury entered as covariate.
Blast vs. Non-Blast in Mild TBI
(Belanger, Kretzmer, Yoash-Gantz, Pickett, Tupler, JINS, 2009)

- More PTSD sx reported by blast group and more PTSD sx reported over time.

Summary

- No evidence that mild TBI due to blast or experienced in OEF/OIF is any different in terms of cognitive sequelae
- There is evidence that PTSD may impact cognitive functioning
- There is evidence that deployment itself may have an adverse impact on cognition, albeit quite small.

Let’s look at an individual study that found long-term cognitive difficulties....
Vietnam Experience Study

Subjects

- Vietnam Experience Study Data/Center for Disease Control Vietnam Experience Study 1988a, 1988b [JAMA]
- 4,462 randomly selected male US Army vets (community dwelling, not clinic-referred or self-referred)
- Entered military between 1/65 - 12/71
- Minimum of 4 months active duty
- Served only one tour of duty

Subjects cont’d

- Racial makeup of the 4,462 participants:
  - 81.9% Caucasian
  - 11.8% African-American
  - 4.5% Hispanic
  - 1.9% Other
- Mean age = 38.36 years (SD = 2.53)
- Mean level of education = 13.29 years (SD = 2.3)
- Mean IQ = 105 (SD = 20.32) (based on GTT)
Subjects cont’d

- Participants underwent a 3 day evaluation including:
  - extensive medical, psychological, and neuropsychological examination
  - included were questions regarding MVA, head injury, loss of consciousness, and subsequent hospitalization
- Evaluations took place approximately 16 years post-military discharge

Measures

- Diagnostic Interview Schedule (DIS-III-A)
- Extensive surveys of physical functioning and symptoms
- Battery of neuropsychological tests

Groups and Sample Sizes

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>No MVA, No Head Injury</td>
<td>3057</td>
</tr>
<tr>
<td>MVA, No Head Injury</td>
<td>521</td>
</tr>
<tr>
<td>Head Injury with LOC</td>
<td>254</td>
</tr>
</tbody>
</table>

MVAs or TBIs occurred an average of 8 years prior to the current evaluation
Neuropsychological Measures

- Multivariate analysis of variance (MANOVA) was conducted with 14 neuropsychological measures, which cover the domains of:
  - Complex Attention
  - Psychomotor Speed & Coordination
  - Verbal Abilities
  - Executive Abilities
  - Non-Verbal Abilities (visuospatial)
  - Verbal Memory
  - Visual Memory

Statistical Analyses: Neuropsychological Measures

- MANOVA was not significant
  \[ F(30,7620) = 1.28, \ p = 0.14, \]
  \[ \eta^2 = 0.005 \]

- On average, the MTBI group performed 0.03 of a standard deviation more poorly than either control group.

Current Cognitive Functioning: Examples of the 14 Measures

<table>
<thead>
<tr>
<th></th>
<th>Normal Control (n = 3057)</th>
<th>MVA Control (n = 521)</th>
<th>Mild TBI (n = 254)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Fluency</td>
<td>20.5 (5.1)</td>
<td>21.0 (5.4)</td>
<td>20.7 (5.3)</td>
</tr>
<tr>
<td>Rey-O Copy</td>
<td>32.7 (3.4)</td>
<td>32.8 (3.0)</td>
<td>32.7 (3.0)</td>
</tr>
<tr>
<td>CVLT Sum of Trials 1 to 5</td>
<td>46.0 (8.7)</td>
<td>45.9 (8.5)</td>
<td>46.3 (9.7)</td>
</tr>
</tbody>
</table>
BUT: Subtle Attention Problems

- Using the power of a within subject design (repeated measure within the same subject) can we detect subtle problems with attention?
- Attention is the neuropsychological domain that may be accounting for the reported memory complaints

PASAT Findings

- On this difficult measure of sustained concentration, working memory, and cognitive flexibility
  - Subjects with mTBI "dropped out" of the test at a higher rate than "Normal Controls" or "MVA (non-TBI) Injury Controls"
California Verbal Learning Test

- List A – Five learning trials of 16 words
- List B – One learning trial different 16 words
- Test for memory of List A

California Verbal Learning Test

Proactive Interference – previously learned material interferes with learning of new material

--- Memory for List B relative to memory for the 1st trial of List A

--- Proactive Interference: CVLT Trial 1 vrs List B

--- MTBI

--- MVA Control

--- Normal Control
CVLT Memory Findings:
Proactive Interference

- On a measure of proactive interference, i.e., the ability to "screen out" the effects of previous cognitive tasks on subsequent cognitive tasks.
- Subjects with mTBI had a higher rate of proactive interference than "Normal Controls" or "MVA (non-TBI) Injury Controls".

---

**Percent with Left-sided Visual Imperceptions**

<table>
<thead>
<tr>
<th></th>
<th>MTBI</th>
<th>MVA</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continued</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dropped</td>
<td>10</td>
<td>14</td>
<td>16</td>
</tr>
</tbody>
</table>

**PASAT Performance**

**Percent with Impaired Tandem Gait**

<table>
<thead>
<tr>
<th></th>
<th>Normal PI</th>
<th>Excessive PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTBI</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>MVA</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Control</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>
These Long term Subtle Attention Problems in mTBI had “External” Neurological Correlates

- Excessive problems on the PASAT were associated with subtle visual inattention problems on formal visual examinations
- Excessive proactive interference was associated with higher rates of impaired tandem gait on formal neurological examinations

Neuropsychological Findings: Conclusions

- Most cognitive sequelae associated with MTBI resolve by 3 months post-injury
- Evidence for subtle long-term problems with complex attention (small effect)
- Subtle complex attention problems have external neurologic correlates
- Need prospective study replication!

Cognitive Sequelae

What we don’t know…
Unresolved Issues

- Multiple concussions versus single concussions
  - Single concussions resolve w/in 30 days: Do multiple concussions resolve?
  - Multiple concussions are associated with higher levels of trauma exposure: So is it multiple concussions or additional trauma exposure causing increased symptoms?

Multiple Concussions

- Adverse long-term effects on cognitive performance (Collins et al., 1999; Moser & Schatz, 2002; Moser et al., 2005; Wall et al., 2006).
- No adverse effect (De Beaumont et al., 2007; Iverson et al., 2006; Pellman et al., 2004).
- Those studies that have found adverse effects found these effects on tests of attention, executive functions, psychomotor speed and total symptoms reported.
  - Notably, these studies did not examine psychological variables and relied exclusively on samples of athletes.

Unresolved Issues (continued)

- Treatment: Diagnosis-based, Symptom-based, Both; Integrated Interdisciplinary Treatment vrs Sequential; etc.
Treatment of Mild TBI

- A standardized postconcussion program developed by Mittenberg (1996)
- Patients receive a 10 page manual, *Recovering From Head Injury: A Guide for Patients*
  - Focus on a reattribution of symptoms to: 1) selective attention, 2) normal transient responses to stress, and 3) anxiety-arousing or depressive self-statements
- Therapist provides stress management and cognitive behavioral therapy for several weeks

Unresolved Issues (cont.)

- Differentiating among overlapping conditions: mTBI, PTSD, Depression, Insomnia, Pain, Somatoform disorders, etc.
- Risks versus Benefits of population screening for mTBI