Complexities in the Assessment and Treatment of Traumatic Brain Injury

Jacobus Donders, PhD, ABPP
Objectives

• Describe predictors of recovery from TBI of the entire range of severities.
• Understand the nature and consequences of various psychiatric comorbidities.
• Appreciate the importance of both base rates and validity in test interpretation.
• Explain the empirical basis for assessment and intervention after TBI.
Conflict of interest

• Just kidding! I have none.
Definition of TBI

• Acute external force to the head that is associated with at least temporary interruption of cerebral processing.
• May be open or closed.
• Primary and secondary injury mechanisms.
• Common measures of severity include length of coma, GCS and PTA.
Pathophysiology

- Primary: linear or rotational mechanisms that cause direct brain compromise such as focal contusions or axonal trauma.
- Debate about frontal vs. extra-frontal, and about cortical vs. subcortical importance.
- Secondary: indirect injuries (ischemia and edema) from disrupted cerebral circulation and neurochemical cascade.
Some of the changes

- Persistent Ca$^{2+}$ influx contributes to axonal injury and cell death.
- Excitotoxicity due to $\uparrow$ Glutamate and $\downarrow$ GABA.
- Imbalance between glucose metabolism and blood flow.
What do you see?

TBI  Normal
How about here?
And what are these?
Evolvement over time
(day of injury, 2 days later, & 2 years later)
Bigger and smaller
New ways to track projections
Tractography of the corpus callosum
Caution about DTI

- Very pretty pictures but not clear at all what falls within the range of normal variance.
- Technique is quite sensitive but not specific.
- DTI “abnormalities” have been described in anything ranging from anxiety disorder to ADHD to autism; and even adiposis.
- And that’s just the A’s.
Review of cognitive outcome after TBI
(Dikmen et al., 2009, JHTR, 24, 430-438)

• There is *sufficient evidence* of a relationship between sustaining a penetrating TBI and decline in neurocognitive function associated with the affected brain region and volume of brain tissue lost.

• Side note: penetrating TBI is also associated with greater risk for late seizures.
Review of cognitive outcome after TBI
(continued)

• *Sufficient evidence* of an association between severe TBI and cognitive deficits.

• *Limited/suggestive evidence* of an association between moderate TBI and cognitive deficits.

• *Inadequate/insufficient evidence* to determine whether an association exists between mild TBI and cognitive deficits.
General outcomes after TBI

• There is no ‘signature’ profile.
• The vast majority of individuals with uncomplicated mild TBI have an essentially unremarkable long-term recovery when compared to orthopedic controls.
• With more severe TBI, persistent deficits are common, but may be moderated by various demographic and other variables.
Relatively most common sequelae
(even though there is no signature profile)

- Reduced speed of information processing.
- Diminished capacity / efficiency of novel learning and memory.
- Suboptimal social adaptation / integration.
- Family burden and distress.
Family burden after TBI
(Hanks et al., NeuroRehab, 2007, 22, 43-52)

- 60 primary care-givers of adults with moderate-severe TBI; ≈ 4 years post.
- 89%: dissatisfaction with burden.
- 92%: insufficient mastery to deal with daily problems.
Burden is not the same as distress
(Davis et al., JHTR, 2009, 24, 145-154)

- 114 caregivers; 1-2 years post inpatient rehab for TBI.
- Caregivers’ pre-TBI functioning and current coping style predict their distress.
- Disability of person with TBI, plus current social support and caregiver coping style, predict caregiver burden.

![Graph showing % variance explained for Distress on BSI and Burden on CAS with factors like Social Support, Escape-Avoidance, Caregiver psych hx, Caretiver med hx, and TBI disability.]
Processing Speed: WAIS–IV after TBI

Scaled Score

Uncomplicated Mild
Complicated Mild
Moderate-Severe
Healthy Controls
Memory cluster subtypes after TBI

- No persons with pre/co-morbid complications.
- Those with invalid test scores removed.
- Variables chosen on basis of confirmatory factor analysis: A1, A5, LD, and FP.
- *Note*: FP reverse-scored for consistency.
Above v. below average on CVLT-II
(significant differences in duration of coma)
Many v. few errors on CVLT-II
(significant differences in processing speed)
Gainers and losers on CVLT-II
(gainers more common in uncomplicated mTBI)
TBI as a risk factor for dementia

• Many studies are retrospective in nature and may suffer from recall and selection bias.
• TBI severity is often poorly defined.
• TBI is seldom considered as a risk factor in concert with other variables.
• Most studies do not differentiate between sensitivity to normal ageing v. dementia.
• Same genetics (e.g., APOE-ε4 alleles) do not necessarily mean same disease.
Prospective studies

• Meta-analysis suggests a statistically significant but weak association between Hx of severe TBI and dementia (Starkstein & Jorge, 2005, *International Psychogeriatrics*, vol 17, pp S93-S107).

• More likely that severe TBI lowers threshold in predisposed individuals as opposed to causing ‘new’ dementia.

• Findings regarding influence of gender, APOE-ε4 status are inconsistent.
Chronic traumatic encephalopathy

- Purportedly the result of cumulative uncomplicated mild head injuries.
- Some allow for single or subconcussive blows.
- Mood disorder + cognitive impairment.
- Presumed to be relatively prominent in a variety of professional sports.
- Proposed explanation for some suicides.
Specified unique pathology

- Perivascular foci of p-tau immunoreactive neurofibrillary and astrocytic tangles with little amyloid β deposition.
- Irregular cortical distribution with a predilection for depth of the cerebral sulci.
- Unique subpial and periventricular clusters of astrocytic tangles.
- High concentration of neurofibrillary tangles in the frontal region.
Examples of differences (1)
(McKee et al., 2013, *Brain*, 136, 43-64.

**Alzheimer’s Disease**
- Neurofibrillary tangles in outer layers of cortex, with fairly even distribution

**CTE**
- Prominent astrocytic tangles in depths of sulci, with irregular distribution.
Examples of differences (2)
(McKee et al., 2013, *Brain*, 136, 43-64.

**Alzheimer’s Disease**
- Small blood vessels show no clusters of perivascular pathology.

**CTE**
- Prominent perivascular concentration of astrocytic and neurofibrillary tangles.
Examples of differences (3)
(McKee et al., 2013, Brain, 136, 43-64.

Alzheimer’s Disease
• Not much pathology in the mammillary bodies.

CTE
• Prominent pathology in the mammillary bodies.
But, maybe not so fast

• Highly selective case series, with little appreciation for premorbid complicating factors (e.g., substance abuse).
• No epidemiological, prospective studies.
• Pathology distribution is neither as unique nor as consistent as originally proposed.
• Often co-existing pathology.
• Low-quality evidence for link to suicide.
Some recent critical reviews


### Definition of mild TBI (mTBI)

- Worst Glasgow Coma Scale score > 12.
- Duration to follow commands < 30 minutes.
- Length of post-traumatic amnesia < 24 hours.
- No focal neurological signs.
- If CT/MRI negative: *uncomplicated*
- If CT/MRI positive: *complicated*
Does “complicated” really matter?

- Smits et al. (2008), *AJNR*, vol. 29, pp. 506–513: only evidence of parenchymal damage on CT was consistently associated with poor outcome.
- Lange et al. (2012), *ACN*, vol. 27, pp. 480–494: more reports of anxiety-related disorders after uncomplicated mTBI in a military sample.
Small subarachnoid hemorrhage

Figure 3 - A very small hyperdensity of the left frontal area represents a subarachnoid hemorrhage (arrow).
Parenchymal hemorrhagic contusion
Consensus reviews about mTBI (1)

- Children’s prognosis is good, with quick resolution of symptoms.
- For adults, symptoms are common in the acute stage. The majority of studies report recovery for most within 3–12 months.
- Where symptoms persist, compensation / litigation is a factor.
Consensus reviews about mTBI (2)

- March 2014 Supplement of the *Archives of Physical Medicine & Rehabilitation*.
- Very systematic review of the literature 2001-2012, including controlled trials, cohort studies, and case-control studies.
Main conclusions

• With regard to outcomes in adults:
  – Most recover within 1 year.
  – Those with more premorbid problems and more injury-related stress tend to recover slower.
  – Lower levels of education, extracranial injuries and/or early complaints of severe pain may delay return to work.
Main conclusions

• With regard to outcomes in children:
  • Most children recover fully within 3 months.
  • Children with lower cognitive ability at baseline or with intracranial pathology on imaging may experience persisting symptoms.
  • At 1 year, prevalence of “PCS” symptoms is no different from that in orthopedic controls.
Main conclusions

• Special populations:
  – NO evidence for an effect of return-to-play guidelines on prognosis after sports concussion.
  – Persistent symptoms after blast injury in the military are related to factors other than mTBI.
  – NO evidence for ↑ risk for dementia after mTBI.
  – In general: provide educational information early + encourage gradual resumption of activity.
Problems with symptom-based approach

• The base rate of many ‘post-concussive’ symptoms is high in the general population.
• PCS symptoms are not specific to concussions.
• Over-emphasizing brain impairment may make people worse.
• Primary and secondary gain issues.
## 100 referred pediatric patients (6-16 years) seen for mTBI

### Your guess
- Treated for ADHD?
- Outpatient treatment for other psychiatric condition?
- Special education placement for learning disability or similar disorder?

### Actual numbers
- ADHD: 27
- Psychiatric: 17
- Special ed: 18

- Note: several children had more than 1 premorbid condition.
- 51 had none of them.
- 22 had intracranial findings on neuroimaging.
Recent Study
Donders & DeWit (2016), *Child Neuroψ*, in press

- Evaluated within 1-12 months after injury.
- Parents completed standardized rating scales of daily functioning (BRIEF, CBCL).
- Children completed a test of learning and memory (CVLT-C).
Predictors of parents’ ratings

- Prior ADHD was the strongest predictor of behavioral and cognitive ratings ($p < .001$).
- Prior psychiatric history also influenced ratings of emotional regulation ($p < .02$).
- *Neither* parental education nor presence / absence of intracranial findings on neuroimaging was significant ($p > .30$).
- Same for prior special ed placement ($p > .78$).
Predictors of child test results

• Prior ADHD was *not* statistically significant.
• Prior psychiatric history was significant but associated with *better* performance ($p < .02$).
• Both parental education (better; $p < .002$) and presence of intracranial findings on neuroimaging (worse; $p < .04$) were significant.
• But *prior special ed Hx* was the strongest predictor ($p < .0001$).
What does this tell us?

• Emotional and behavioral outcomes after pediatric mTBI are predominantly affected by premorbid factors.
• Higher parental education may be a buffer against impact on cognition whereas prior special education is a risk for worse learning.
• Intracranial compromise has a modest but notable effect on cognitive outcomes.
100 adult patients with mTBI & persistent complaints: Your guess

- Physical or sexual abuse
- Prior substance abuse
- Prior psychiatric history
- Ongoing litigation
- ADHD and/or LD
### Actual numbers

- Physical or sexual abuse: 13%
- Prior substance abuse: 15%
- Prior psychiatric history: 49%
- Ongoing litigation: 28%
- ADHD and/or LD: 13%
- Only **26%** had none of these.
Recent study
Donders, Oh & Gable (2015), *JHTR, 30*, E30-E39

- 100 persons with mTBI who came to the evaluation with a knowledgeable informant.
- All seen within 1 year after injury.
- Completed the self and informant versions of the Behavior Rating Inventory of Executive Function – Adult Version (BRIEF-A).
- Remember: 74% with pre/co-morbid issues.
Self and others’ ratings after mTBI

Behavioral

Metacognitive

Composite

BRIEF-A T score

SELF

OTHER
Higher ratings (*more reported problems*) were associated with:

- Longer time since injury \((r = 0.26, p < .01)\)
- Lower levels of education \((r = -0.25, p < .02)\)
- Presence of a prior psychiatric history (affecting both self and other’s ratings)
- Absence of an intracranial lesion on neuro-imaging (affecting only self ratings)
Influence of prior psychiatric history

Self ratings: With v Without

Others’ ratings: With v Without
Influence of neuroimaging

Others’ ratings: Pos v Neg

Self ratings: Pos v Neg
What does this tell us?

• Persons with persistent complaints after mTBI over-estimate their degree of impairment.
• Premorbid psychiatric history is a risk factor for more complaints and less response to Tx.
• It is important not to equate subjective symptoms to organic sequelae of mTBI.
• Important to screen for prior psychiatric Hx before initiating treatment.
Recent Study

- Evaluated persons who received treatment in a post-concussion program.
- 49 patients, evaluated at treatment onset & discharge.
- Mayo-Portland Adaptability Inventory – Fourth Edition: $M = 50$, $SD = 10$, with higher scores reflecting worse functioning.
Improvement noted

- Ability (Patient)
- Ability (Staff)
- Adjustment (Patient)
- Adjustment (Staff)

Comparison between Before Tx and At D/C
## Predictors of self ratings @ discharge

### Ability @ D/C; $R^2 = 0.31$

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### Adjustment @ D/C; $R^2 = .43$

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An even more recent study
Scott, Strong, Gorter & Donders (2016), *TCN, in press*

- Independent sample of persons who received treatment in a post-concussion program.
- 50 patients, evaluated at treatment onset, discharge, and at 3-month follow-up.
- Added formal measures of emotional distress.
- Eliminated those who failed PVT.
- Had a sufficiently high number of persons seeking $ compensation ($n = 14$).
Improvement again noted
## Predictors of self ratings @ 3 months

### Ability @ D/C; $R^2 = .32$

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<tr>
<td>BDI-2</td>
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<td>.03</td>
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### Adjustment @ D/C; $R^2 = .38$

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<td>$seeking$</td>
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<tr>
<td>BDI-2</td>
<td>0.26</td>
<td>0.11</td>
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What does this tell us?

• A thorough history and a brief psychometric screen can identify those persons with mTBI who are at risk for poor response to Tx.

• Inclusion of formal measures of emotional adjustment is important.

• After accounting for the impact of the mood, there is no longer an independent effect of cognitive status.
Recent, prospective study

- 6 ($n = 996$) & 12-month ($n = 386$) follow-up of ED admissions (80% mild, 15% severe TBI).
- At 6 months: satisfactions with, and quality of, life were worse for moderate and severe groups than for mild group.
- At 12 months: moderate group made greatest improvement; mild group at population norm.
SF-36 details @ 6 months
SF-36 details @12 months
Independent predictors

- Subjective outcome was worse with:
  - Female gender
  - Older age
  - Lower level of education
  - High original injury severity scale (reflecting injuries to other parts of the body)

*Note*: did not control of prior psychosocial Hx except substance abuse.
Study of hospitalized patients
Gardizi et al., 2013, APM&R, 95, 2496-2401

• 1-year f/u of a cohort (n = 70) who were hospitalized for TBI (TBI Model System).

• Range from complicated mild to severe.

• Outcome measured by Disability Rating Scale (scores 0 – 29; lower is better).

• Note: south-east MI sample with high proportions of ethnic minorities (64%) and blunt trauma / GSW as cause of injury (55%).
Regression model for DRS score

\[ F(5, 64) = 10.53, \ p < .05, \ \text{adj. } R^2 = 0.41 \]

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<tr>
<th>Variable</th>
<th>Standardized Regression Coefficient</th>
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<td>Age</td>
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<tr>
<td>Education</td>
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<td>PTA</td>
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<td>Medical co-morbidity</td>
<td>0.38</td>
<td>.01</td>
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<tr>
<td>Government insurance</td>
<td>0.44</td>
<td>.01</td>
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Study of SCI +/- mTBI
Macciocchi et al., 2013, ACN, 28, 684-691

- 64 persons with SCI.
- 53 persons with SCI + uncomplicated mTBI.
- Mean of 46 days post injury (range 26 – 76).
- Groups did not differ in SCI severity or level.
- SCI+ group more likely MVA.
- SCI – group more likely sports or assault.
No significant group differences
(T scores; \( M = 50, SD = 10 \))
Importance of prior history: ADHD

(Donders et al., *JNP*, 2010, 4, 197-209)

- In 100 adolescents with TBI, injury severity + prior history explained 24% of the variance on the BRIEF.
- Premorbid ADHD had a stronger impact than diffuse lesion on imaging.
Can you tell the groups apart?
How do you differentiate?

• You cannot rely only on tests for this.
• Do a thorough history, including review of developmental progression.
• Unlikely for TBI to result in LD but severe TBI can cause “secondary” ADHD.
• Do not forget about comorbidities (e.g., ODD with ADHD, or PTSD with mTBI).
## TBI in the military

- Often mentioned as a ‘signature’ injury of OEF / OIF.
- Significant overlap with symptoms of PTSD.
- Screening measures may be sensitive but not specific.
- Complicated by response style, which may range from defensiveness to over-reporting.
Pathophysiology of blast injury

- Primary: over-pressurized air wave; affects air-filled organs and fluid-filled cavities.
- Secondary: blunt force trauma & acceleration / deceleration injuries from body displacement.
- Tertiary: shrapnel fragments causing penetrating injury.
- Quaternary: significant blood loss due to amputation or inhalation of toxic gases.
Different from civilian mTBI

• Service members go into combat theatre with a very different mind-set than most of us do in the civilian world.
• High rate of repetitive injuries.
• Continuously stressful environment.
• Difficult to get accurate data on injury circumstances and severity.
• Early intervention is often not feasible.
Post-traumatic stress disorder
(old DSM-IV criteria)

- Exposure to an event that is life-threatening.
- Sense of horror, helplessness, or expectancy to die at the time of exposure.
- Leads to anxiety disorder, characterized by:
  - Hypervigilance.
  - Re-experiences of the event.
  - Avoidance tendencies.
  - Emotional blunting and social withdrawal.
DSM-5 changes

• Exposure or even witnessing is no longer necessary: learning that it happened to a family member or close friend is sufficient.
• The criterion of an immediate, extreme reaction at the scene is gone.
• More emphasis on cognitive distortions and dissociative symptoms.
A note of caution

• Diagnoses of both uncomplicated mTBI and PTSD are based on subjective self report.
• Symptoms overlap: e.g., person with PTSD may complain of headache or distractibility.
• Military culture ≠ conducive to seeking help.
• Some PTSD symptoms are desirable in combat.
• Suicide is a serious risk.
Suicide

- Over the course of OIF and OEF we lost more service members to suicide than to hostile fire; still almost 1 per day 2012 – 2013.
- Suicide risk is primarily related to PTSD and depression, not to TBI per se.
- More than a quarter of these suicides occurred in service members who were never deployed.
Percentages

Mild TBI

PTSD

PTSD in those with mild TBI

Low-ball

High-ball
Relative importance

• Flashbacks and nightmares are more common with blast than non-blast mTBI (Kennedy et al., NeuroRehabil, 2010, vol. 26, pp. 223-231).

• Only PTSD symptoms predict deficit in attention, 1 year post deployment (Marx et al., Arch Gen Psychiatry, 2009, vol. 66,, pp. 996-1004).

• “PCS” symptoms are common in those with other, non-blast in-theater exposures (Fear et al., Psychol Med, 2009, vol. 39, pp. 1379-1389).
After accounting for PTSD, mild TBI no longer predicts depressive or somatic symptoms, social functioning, or quality of life (Polusny et al., *Arch Gen Psychiatry*, 2011, vol. 68, pp. 79-89).

After accounting for PTSD and depression, even the presence of brief loss of consciousness no longer contributes to subjective outcomes (Verfaellie et al., *J Internat Neuropsychol Soc*, 2013, vol. 19, pp. 1-10).
Study with the MMPI-2-RF

Treatment options: mTBI

- Education, normalization, gradual activation, and avoidance of harmful behaviors.
- Correct retroactive attribution errors or false beliefs about recovery potential.
- Be mindful of stressors on the family, related to prolonged separation.
- Address pain, sleep disturbance, ETOH use.
- Focus on pragmatic compensatory strategies.
Treatment options: PTSD

• Always assess depression and suicide risk.
• Allow discussion of moral dilemmas.
• Hyperarousal and survivor shame may mask as anger or result in social withdrawal.
• Empirical support for SSRI in general, Prazosin for nightmares, and CBT + variants in therapy (e.g., cognitive processing, image rehearsal).
• Community re-integration focus needed.
Conclusions about mTBI & PTSD

• Uncomplicated mild TBI and PTSD are common in veterans of OEF / OIF.
• A single, uncomplicated mild TBI may not be concerning, but those with repetitive injuries and especially those with comorbid PTSD are at high risk for long-term adverse outcomes.
• Also important to assess for premorbid and unrelated psychosocial complicating factors.
Things that may help

• *If anything*, obtain a comprehensive premorbid & comorbid history.
• If at all possible, review premorbid academic, medical and/or military records.
• When feasible, include collateral informants.
• Understand the influence of both base rates and performance / symptom validity.
What do low scores mean, really?
Some things to remember*

- Scatter is the norm, not uncommon.
- Having some low scores is common.
- # of low scores depends on the:
  - cut-off used to define impairment,
  - # of tests that were administered,
  - characteristics of the examinee.
- *credit to Brooks & Iverson, chapter # 4 in Sherman & Brooks’ 2012 *Pediatric Forensic Neuropsychology*.
Yes, scatter is indeed common

Cumulative percentage

Degree of scatter on the WISC-IV
Having at least 1 low score is common (with “low” defined as \( \leq 5^{\text{th}} \) percentile).
Influence of the cut-off used
(WRAML-II data; having at least 1 score below the cut-off)
The more scores you consider...

(WISC-IV data; having at least 1 score ≤ 5th %ile)
Examinee background matters too

(WISC-IV data; having at least 1 score ≤ 5th %ile)
So, do we just ignore low scores?

• No. Instead we:
  – just don’t over-interpret them,
  – keep base rates into account,
  – understand the difference between a single event and multiple comparisons,
  – appreciate that there is a difference between univariate and multivariate base rates,
  – and also consider validity of the findings.
The question of validity

• Not all people do their best / are truthful on our tests, for a wide range of reasons.
• Difference between performance validity and symptom validity.
• Formal assessment of validity is now considered standard of care by AACN & NAN.
• Stand-alone v. embedded measures.
TOMM: Performance validity

% Correct

- Coma 3 days
- VP shunt
- Early Alzheimer
- mTBI with lawsuit
MMPI-2-RF: Inclusion of symptom validity measures

- Symptom Validity
- Response Bias
- Demoralization

- Plaintiff with mTBI
- Solier with mTBI & PTSD
- Patient with severe TBI
Injury severity & validity: both matter
(Donders & Strong, 2011, TCN, 25, 173-184)

• 100 consecutive referred patients with TBI who took both the CVLT–II and Green’s WMT.
• 60 had uncomplicated mild TBI.
• 24 cases were identified by the WMT as providing poor effort.
• Mean composite CVLT–II T score in complete sample was 46.48 (SD = 11.67).
Regression model for CVLT–II T score

\[ F(1, 98) = 12.35, p < .0007 \]

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<th>( p &lt; )</th>
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<td>Length of coma</td>
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<td>0.33</td>
<td>3.60</td>
<td>.0005</td>
<td>1.05</td>
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<tr>
<td>Prior complicating history</td>
<td>−0.02</td>
<td>0.22</td>
<td>.83</td>
<td>1.04</td>
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In general, it is advisable to:

- Use both PVTs and SVTs in evaluations.
- Do so consistently and not ad hoc.
- Use a combination of stand-alone and embedded measures.
- Do not automatically equate failure of any SVT with malingering.
- Understand other forms of psychopathology.
Malingering and related concerns
Things that make you wonder...

- Impairment out of proportion to severity.
- Symptoms inconsistent with neuroanatomy.
- Inconsistent assessment findings.
- Incongruency between test and observation.
- Different stories to different doctors.
- Records contradict patient report.
Differential Diagnosis

- Atypical presentation of a “real” disorder.
- Conversion Disorder (now a.k.a. *functional neurological symptom disorder*).
- Factitious Disorder.
- Malingering – hard to find in DSM-5 (“other conditions that may be a focus of clinical attention”).
- Inadvertent psychogenic factors.
Conversion Disorder

- One or more sensory or motor deficits.
- Psychosocial factors initiate or exacerbate.
- Cannot be directly explained by general medical condition, substance, or culture.
- Causes significant distress / impairment.
- DSM-IV criterion of “not intentional” was dropped from DSM-5.
Faked Disorders

- Factitious Disorder (formerly known as Baron Munchhausen Syndrome)
- Factitious Disorder by Proxy (a.k.a. imposed on another)
- Malingering
Factitious Disorder

- Falsification / deception of physical or psychological symptoms.
- DSM-5 dropped “intentional” and presumed motivation to assume the sick role.
- External incentives are typically absent.
- Often chronic and very likely to remit (even after blunt confrontation).
- Can be reinforced by iatrogenic factors.
Malingering

• Intentional production of false or grossly exaggerated symptoms.
• Motivated typically by *external* incentives.
• Relatively more common in medicolegal and criminal contexts, and if there is a prior history of antisocial behavior.
Atypical performance / recovery is *not* synonymous with malingering

- Atypical effort is estimated to be >30% in cases of mTBI that continue to be symptomatic > 3 months.
- Also occurs with no external incentives.
- Even with pediatric mTBI, 17% fail standard performance validity measures, often without any financial contingencies.
Alternative explanations

- Good old days bias.
- Diagnosis threat.
- Cogniform disorder.
- Reattribution to socially more acceptable (mTBI related) causes.
- Inadvertent reinforcement of the sick role.
- Learned helplessness / dependency.
Assessment Techniques

• Provoke symptom during objective testing, then use distraction.

• Elicit responses that are incompatible with subjective complaints.

• Neuropsychological assessment to determine veracity of objective cognitive performance and subjective emotional symptoms.
Case study: longitudinal development

• Passenger in a MVA at age of 11 years.
• GCS 4-6 within first 24 hours.
• CT + for cerebral edema, diffuse axonal injury and scattered subcortical punctate lesions.
• Duration of coma 6 days.
• Premorbid developmental and academic history largely unremarkable.
• Maternal family Hx + for dysthymic disorder.
### Initial NP eval @ age 12

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOMM (raw score)</td>
<td>Trial 1 = 44, Trial 2 = 50</td>
<td>Normal effort</td>
</tr>
<tr>
<td>WASI</td>
<td>VIQ = 74, PIQ = 78, FSIQ - 76</td>
<td>Slightly below expectation</td>
</tr>
<tr>
<td>CVLT-C</td>
<td>Composite $T = 20$</td>
<td>Impairment</td>
</tr>
<tr>
<td>Tower of London</td>
<td>Correct SS = 60, Moves SS = 68</td>
<td>Impairment</td>
</tr>
<tr>
<td>BRIEF (note: no validity elevations)</td>
<td>Behavioral Regulation $T = 84$ Metacognition $T = 80$</td>
<td>Impairment</td>
</tr>
<tr>
<td>Vineland-II</td>
<td>Adaptive Composite SS = 62</td>
<td>Impairment</td>
</tr>
</tbody>
</table>
Recommendations @ age 12

• Supervision during all waking hours + alarm on door during the night.
• Special education support under the TBI qualification.
• Combination of behavior therapeutic and psychopharmacological interventions to address impulsivity and mood instability.
<table>
<thead>
<tr>
<th>When approaching age 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Still under the care of a psychiatrist; taking Abilify, Lamictal and Prozac.</td>
</tr>
<tr>
<td>• Completing 12\textsuperscript{th} grade with community-based instruction, with plan for 1 additional year of transitional training.</td>
</tr>
<tr>
<td>• Expressing strong desire to live on her own.</td>
</tr>
<tr>
<td>• Question about legal capacity to function as her own legal guardian / conservator.</td>
</tr>
</tbody>
</table>
Before we pile on the tests...

- Understands that she would have to pay rent but has no income or budgetary experience.
- Claims independence with medications and use of stove but mother reports need for reminders / supervision.
- Independent report (from counselor) about some episodes of sex with young adult individuals she has met online.
NP eval when nearing age 18  
*(note: norms of 18-year-olds used)*

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOMM (raw score)</td>
<td>Trial 1 = 48, Trial 2 = 50</td>
<td>Normal effort</td>
</tr>
<tr>
<td>WASI-II</td>
<td>VIQ = 75, PIQ = 80, FSIQ = 77</td>
<td>Not “mental retardation”</td>
</tr>
<tr>
<td>CVLT-II</td>
<td>Composite $T = 21$</td>
<td>Impairment</td>
</tr>
<tr>
<td>NAB</td>
<td>Judgement $T = 48$</td>
<td>Normal</td>
</tr>
<tr>
<td>Tower of London</td>
<td>Correct SS = 60, Moves SS = 74</td>
<td>Impairment Impairment</td>
</tr>
</tbody>
</table>
NP eval when nearing age 18
(*more details*)

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRIEF-A Self</td>
<td>Behavioral Regulation $T = 57$</td>
<td>Normal Normal</td>
</tr>
<tr>
<td></td>
<td>Metacognition $T = 55$</td>
<td>Normal Normal</td>
</tr>
<tr>
<td></td>
<td>Executive Composite $T = 57$</td>
<td>Normal Normal</td>
</tr>
<tr>
<td>BRIEF-A Parent</td>
<td>Behavioral Regulation $T = 81$</td>
<td>Impairment Impairment</td>
</tr>
<tr>
<td></td>
<td>Metacognition $T = 76$</td>
<td>Impairment Impairment</td>
</tr>
<tr>
<td></td>
<td>Executive Composite $T = 80$</td>
<td>Impairment Impairment</td>
</tr>
</tbody>
</table>
The problem

- BRIEF-A Negativity index is elevated on parent’s report, making it of doubtful validity.
- Parent is also getting paid for attendant care, raising a potential conflict of interest.
- Patient still shows impairment in several domains but this is not consistent across tests.
- So what do we do now?
The solution

- “Jane” is still doing worse than 99% of her peers in many areas and there are reports of questionable behaviors.
- However, I am hampered by the fact that the parent’s report on a standardized rating scale about her daily functioning is invalid.
- It would be very helpful to have standardized input from an independent person.
## Input from job coach

### BRIEF-A

| • Behavioral Regulation $T = 75$ |
| • Metacognition $T = 65$ |
| • Executive Composite $T = 70$ |
| • No elevations on any of the validity indices |

### Comments

| • Had to limit contact with younger male adolescents because of unsolicited sexual advances. |
| • Repeated problems with cleanliness while dealing with food products. |
Final conclusion in this case

• Based on this additional information, considered in concert with neuropsychological test results, I can now state with a high degree of clinical and scientific certainty that “Jane” has severe deficits in her memory and executive functioning. She lacks sufficient mental capacity to make informed and reliable decisions about her financial, medical, residential, and other personal affairs.
General conclusions

- Uncomplicated mTBI is not associated with persistent deficits in the absence of premorbid or comorbid complicating factors.
- Prior psychiatric history and financial compensation-seeking are associated with higher risk for poor outcomes.
- Competent NP eval must include detailed history but not rely only on self report.
• Complicated mild TBI tends to have a recovery that is more like moderate TBI, particularly if there is parenchymal involvement.
• Formal evaluation of performance and symptom validity is now standard of care in the field of clinical neuropsychology.
• Often more important to treat comorbid psychiatric / psychosocial issues.
"For cryin' out loud, will you get back into your body?! It's just a concussion."