

Scientific Principles of Neuropsychological Assessment

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Assessment Protocol

Comprehensive Neuropsychological Intake



Neuropsychological Assessment Questionnaire



Medical Records Review



Review of History

- Birth trauma
- Neurodevelopmental
- Vision
- Auditory
- Vestibular
- Balance
- Seizure history
- Episodes of LOC
- Closed head injuries
- Neuroblast trauma
- Syncope episodes
- Hypoxia
- Subconcussive episodes
- Sports Concussions
- Cumulative concussive events
- Second impact syndrome
- Substance abuse
- Chronic Pain
- Neurotoxins

Six types of Concussions

1. Cognitive/ Fatigue
2. Vestibular (balance issues)

3. Ocular (vision problems)
4. Anxiety/ Mood
5. Post- Traumatic Migraine
6. Cervical (problems with neck)



Trajectory of treatment is different with each subtype



Neurology Consult

- Valuable medical data on injury
- Coordinate Services



Neuropsych Screening Tests

- Proper Test Environment
- Executive functioning (impulse control, intellectual processes)
- Language (word-finding, verbal fluency)
- Memory (immediate, delayed)
- Spatial
- Coding/ symbol search
- Digit Span
- California Verbal Learning Test



If positive screen findings



Larger battery of neuropsychological modules

Analysis of Neurobehavioral Change

- Irritability and depression and magnified.
- Comorbid Disorders
- Dyscontrol Syndrome

Some Applications of Neuropsychology to Forensic Issues

Intermittent Explosive Disorder → rage out of proportion to stimulus

TBI + Neurobehavioral changes (hyperirritability, ↓control) → Specific Intent Crimes

Cumulative Concussive Events → unexplained rage, dyscontrol, failure to maintain set (compulsive behaviors)

Syncope Episodes → episodes of transient global amnesia- can be further evaluated with paired-associates: difficulty with “difficult” pairs and new learning → enables retrospective analysis, digit span, preserved  $\geq 6$  digits; shows fragility of memory.

Frontal Lobe Dysfunction → executive function/decision making/diminished control

Partial Complex seizures → Focal onset impaired awareness seizures may affect awareness of surroundings and may cause LOC

PTSD (neurobiological) → Dissociative psychosis and trauma, hypervigilance, irritability

Neuropsychological assessment → Issues of competency to participate in legal proceedings

#### Swerdlow's Pioneering Research at University of Virginia

Frontal Lobe mass → Sexually Deviant Behavior (SDB)

Removal of mass → ↓ SDB

Re-emergence of mass → re-emergence of SDB

Removal of mass → ↓ SDB

- First study to show direct link between frontal lobe lesions and Pedophilia
- Positive findings on neuropsych tests - unable to write, poor figure copy, clock drawing

#### Frequent Findings with Sex Offender Population

- Neuropsychological deficits
- Social skills deficits

#### Selection of Neuropsych Instrument

- Ability to capture cognitive processing + processing speed disorder
- Embedded + stand alone tests of effort and malingering is critical
- Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)
- Dementia Screening Scale (DSS)
- Often with head injuries there is PTSD - Clinician administered semi-structured interview is Gold Standard for assessment of PTSD
- Test of Memory Malingering (TOMMS)

## WAIS IV

- High frequency of use in neuropsych assessments by psychologists
- Generates useful cognitive profiles
- Useful data from WAIS-IV subtests:
  - Coding and Symbol Search → Processing Speed + Cognitive Processing
  - Comprehension → Judgement
  - Matrix Reasoning and Figure Weights → Perceptual Reasoning

## Brain Imaging

### Volumetric MRI

- Useful for measuring volume and structure of specific regions of the brain
- Can be used to discover atrophy and measure its progression

### FDG PET

- FDG → Fluorodeoxyglucose
- A sugar (glucose) labelled with a small amount of radioactivity; large portion of brain function related to glucose

### SPECT

- Single Photon Emission Computerized Tomography
- Useful in measuring microscopic blood flow in brain
- Brain injury results in hypoperfusion, decreased blood flow to brain areas

### Diffuse Tensor Imaging (DTI)

- Indicated with Torsion/ Flexion Injuries
- Uses diffusion of H<sub>2</sub>O molecules to generate contrast to MRI images
- May detect axonal injury after concussion (Neurology Reviews, 2013, June 21 (6) 18)

↓ fractional anisotropy

→ suggests axon loss

↑ H<sub>2</sub>O diffusion

### Limitations

- Alignment of Brain Atlas and Pathways configuration in DTI imagery is not always aligned exactly

### Gradient Imaging

- Useful for establishing timeline of new and old injuries and damage associated with brain regions.

