Neuropsychological Assessment in Stroke

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Overview

• What is Neuropsychology

• Stroke Specific Neuropsychology

• Neuropsychological Domains

• Case Study
What is Neuropsychology?

• The study of brain-behavior relationships
• *Clinical* NP uses pencil and paper (and computer) measures to understand an individual’s cognition compared to a normative group
• *Cognitive* NP uses experimental psychology and neuroimaging to understand brain and cognitive function in healthy and diseased individuals
Why a Neuropsychologist

- Bedside testing can be extremely helpful, but it is important to remember that a raw score is not ‘diagnostic’
- ALL scores need to be placed in context
- NPs are also trained as clinical psychologists, and can integrate psychosocial dynamics into clinical picture (as well as address emotional issues)
How to make a referral

• The way pts learn about a referral to NP can affect cooperation, anxiety, effort, etc. that can affect performance

• With no preparation, they ONLY hear the word *psychologist* making them defensive and anxious

• APPROACH: possibility of changes in memory and thinking. Testing can help identify strengths and weaknesses, and help to develop strategies to cope with areas of deficit
Referral Questions

• Example of what not to do:
  – “Has brain, please evaluate”

• Example referral questions:
  – “Patient complaining of short-term memory problems, also possibly depressed”
  – “Patient late on bills, please evaluate ability to independently manage finances”
Approaches

• Screening
• Hierarchical
• Flexible
• Fixed
NP Testing in Stroke

- Originally – to examine cognitive function to identify neuroanatomical structures and functions that have been affected
- Presently – to identify strengths and weakness in cognition, to assess progress, and to assess behavioral and affective syndromes
- Cognitive rehab, address return to work/school issues, other psych issues
Type of Assessment

• 0 to 3 months post-stroke
  – Screening battery
  – Changing fairly rapidly
  – Identify strengths and weaknesses to aid in treatment and rehab planning
  – 60-90 min battery; quick turnaround on report
Type of Assessment

• 3 to 12 months post-stroke
  – Comprehensive battery
  – Change occurring in small increments
  – Identify strengths and weaknesses to aid in treatment and rehab planning
  – 1-6 hour battery
  – Core battery with additional tests to address specific concerns
Type of Assessment

• 12+ months post-stroke
  – Comprehensive battery
  – Change less likely to occur
  – Identify what areas are still impaired
  – 1-6 hour battery
  – Core battery with additional tests to address specific concerns
  – + examine psychological/psychiatric component
  – Assess potential underlying neurodegenerative condition
Cognition

• NP evaluation should assess the following domains after a stroke:
  – Attention
  – Executive Functioning
  – Language
  – Memory
  – Visuospatial Functioning
  – Psychomotor Speed
Attention
Attention

- Evaluations should always begin with a measure of attention
- Without basic attention, all other results are invalid
- NAAnatomical structure: ARAS, thalamus, multimodal prefrontal regions
- NT: Dopaminergic and Cholinergic pathways
Types of Attention

• Focused or Selective - capacity to highlight 1 or 2 important stimuli while ignoring others (concentration)
• Sustained - capacity to maintain attention over a period of time (vigilance)
• Divided - ability to respond to more than one task at a time
• Alternating - ability to shift focus
Bedside of Attention

• Digit Span is a measure of capacity of sustained attention
  – Forwards (below 5 cutoff; 4 borderline)

• Intubated and nonfluent patients can be examined by squeezing your hand when they hear a certain letter
Attention in the Clinic

- Trail Making Test Part A is also an easy way to measure sustained attention, concentration, and processing speed in the clinic.

- Requires subjects to connect numerical dots as quickly as possible (timed test); requires visual sequencing and attention.

- Generally tasked between 30 and 90 seconds.
Quick Measures of Attention

• Digits forward is an easy way to measure attention in the clinic
  ➡ Patients with movement problems
  ➡ Patients with significant deficits in processing speed

• Trails Part A is also an easy and quick way to measure attention and processing speed
  ➡ Patients with language problems
Attention Findings

- Digit span forward is resistant to many brain disorders, including aging.
- Attention tends to be more vulnerable to left hemisphere injury than to right or diffuse injury.
- Attention can be drastically affected by psychiatric reasons (anxiety and depression).
Executive Functioning
Executive functioning

• One of the most complex forms of behavior
• Thought to be governed by frontal lobes
• 4 main components:
  1. volition and awareness
  2. planning and execution
  3. monitoring, inhibition, and sequencing of actions
  4. problem solving, abstract thinking, mental flexibility
Volition

• Described as determining what one needs or wants, and what kind of action needs to occur to meet these needs (apathy, abulia, etc)

• Measured as the capacity and motivation for intentional behavior (caregiver report)

• Volition is affected by damage to the frontal-subcortical or frontolimbic circuitry, right hemisphere damage, or diffuse damage (e.g., Alzheimer’s disease)
Planning and Execution

- Tests of planning and execution tend to be highly correlated with functional impairment.

- Therefore, they are great bedside measures of overall cognitive and daily functioning.

- Easiest to administer is the Clock Drawing Test.
Clock Drawing Test

• “Draw a clock, put in all the numbers, and set the hands to ten after eleven”

• Usually scored out of 7:
  1. Drew circle
  2. Anchor 3, 6, 9, and 12
  3. Numbers in correct order
  4. Numbers spaced properly
  5. Two hands on clock
  6. Hands set to the correct time
  7. Size differentiation of hands
Monitoring, Sequencing, Inhibition of Actions

• Monitoring and inhibiting behavior is critical to daily functioning

• Cognitive and Motor

• Trails B and Go/No-Go is an easy way to ascertain this in the clinic

• Also in more advanced syndromes, frontal release signs can be tested using neurologic exam (e.g., palmar grasp*, palmomental, rooting, snout)
Trail Making Test Part B

• Trail Making Test Part B is an easy way to measure cognitive flexibility and set shifting in the clinic

• Highly correlated with ability to live independently

• Requires subjects to alternate b/w alphabetical and numerical dots (timed test)

• Generally tasked between 60 and 300 seconds
Problem Solving and Mental Flexibility

• Problem Solving and Mental Flexibility take longer to assess, but can also be helpful in understanding one’s ability to live independently

• Usually get examples from caregivers

• Bedside can incorporate testing such as proverbs, similarities, coin switching
Wisconsin Card Sorting
Executive control of Language

- Verbal Fluency
- Letter and Category (semantic) fluency
- Timed test, within 1 min, name as many items as possible
- F - A - S
- Animals, Fruits, Vegetables
Using Verbal Fluency in Differential

- Letter Fluency is more frontally based (retrieval with rules) [executive]
  - No proper nouns, no different forms of same word
- Category Fluency is more temporally based, measure of semantic network integrity [language]
Memory
STM in the clinic

- STM is tested using MMSE recall
- However, there is a critical piece of information missing to determine etiology of memory problem
- Recognition is important
Recognition

• Patients with impaired recall can have a true memory disorder, or they could have frontally based retrieval problems

• Recognition (even if in multiple-choice format) tells you whether the information got in and the pt is just having trouble retrieving it

• Examining false alarms is also important
Bedside testing Episodic Memory

• An easy way to test episodic memory in the clinic is asking Qs during interview
• Incorporate into rapport building, ask about favorite TV show, sports team, recent meals
• Patients with frontal subcortical syndromes tend to do well with cuing
• Patients with true memory problems tend to talk in generalities
Visuospatial Functioning
Visuospatial Functioning

• Helps us determine depth and distance
• Critical in navigation
• Interaction with attention (neglect syndromes with right parietal damage)
• Can correlate with difficulties driving and getting lost
Visuospatial Tasks

An example of an item from the Judgement of Line Orientation Test (Benton, Hamsher, Varney, & Spreen, 1983)
Language
Language

• Language functioning is fairly evident upon meeting with patient
• Conversation is the best evidence for problems with fluency, word-finding, comprehension, and paraphasic errors
• Should include some measure of confrontation naming (MMSE uses common nouns)
## Aphasic Syndromes

<table>
<thead>
<tr>
<th>Type</th>
<th>Fluency</th>
<th>Comprehension</th>
<th>Repetition</th>
<th>Naming</th>
<th>Other Names</th>
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<tr>
<td>Broca’s</td>
<td>poor</td>
<td>good</td>
<td>poor</td>
<td>poor</td>
<td>expressive, motor</td>
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<tr>
<td>Wernicke’s</td>
<td>good</td>
<td>poor</td>
<td>poor</td>
<td>poor</td>
<td>receptive, sensory</td>
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<td>poor</td>
<td>poor</td>
<td>poor</td>
<td>poor</td>
<td></td>
</tr>
<tr>
<td>Conduction</td>
<td>good</td>
<td>good</td>
<td>poor</td>
<td>good</td>
<td></td>
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<tr>
<td>Anomic</td>
<td>good</td>
<td>good</td>
<td>good</td>
<td>poor</td>
<td>amnesic, semantic</td>
</tr>
<tr>
<td>Transcortical motor</td>
<td>poor</td>
<td>good</td>
<td>good</td>
<td>poor</td>
<td></td>
</tr>
<tr>
<td>Transcortical</td>
<td>good</td>
<td>poor</td>
<td>good</td>
<td>poor</td>
<td></td>
</tr>
<tr>
<td>Subcortical</td>
<td>fair to good</td>
<td>variable</td>
<td>variable</td>
<td>variable</td>
<td>varibale</td>
</tr>
</tbody>
</table>
Motor Speech Disorders

• Apraxia of Speech - Motor speech disorder where parts of brain that control speech are affected

• Dysarthria - Motor speech disorder where muscles of the face become weak after CVA or head injury (cerebral palsy, muscular dystrophy)
Psychological Aspects of Stroke

• If untreated mood problems persist, they can interfere with rehab:
  – Patients not motivated to engage
  – Patients feel helpless
  – Patient can fear getting better, which means being sent home and coping on their own
  – Patients are scared to do too much in fear of having another stroke.
Psychological Aspects of Stroke

• Depression occurs in 30-50% of stroke patients
  – Feeling sad (verbally or body action)
  – Tearful
  – Not engaging
  – Not sleeping well
  – Loss of appetite
  – Constantly dwelling on ‘why’ and what happened
Psychological Aspects of Stroke

• Anxiety occurs in up to 25% of stroke patients
  – Unable to relax
  – Nervous
  – Scared
  – Fear of worst happening, loss of control
  – Fear of heart attack / heart racing
  – Panic
  – Quick and shallow breathing
Common behavioral problems

• Disinhibition/Impulsivity – controlling or restraining behavior
• Agitation – being fidgety, would up
• Aggression – verbal or physical
• Not sleeping
• Not eating
• Delirium / Dementia
Adding a Mood Measure

• Hospital & Depression Scale
• Geriatric Depression Scale
• Stroke Aphasia Depression Questionnaire
Thank You

• Questions?