Assessing Cog-Linguistic Skills in Aphasia

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Moderated by: Amy Natho, M.S., CCC-SLP, CEU Administrator, SpeechPathology.com

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Assessing Cog-Linguistic Skills in Aphasia

Heather Harris Wright, PhD CCC-SLP
East Carolina University

1. Cognitive and Linguistic Processes

• Attention
• Memory
  – Short term memory
  – Working memory
• Executive functions
• Cognitive impairments in aphasia
Language **Plays a role** to **Cognition**

**Cognition**

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**Attention**

- “Cognitive process that concentrates mental effort on an external stimulus or internal thought/representation” (Ashcraft & Radvansky, 2010)
- Overlaps with other aspects of cognition

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- If attention is weakened then language operations become less efficient
- Need attention to focus on communication partner’s speech, particularly when surrounded by competing stimuli
• Vigilance
  – Attention sustained over long periods of time
  – Necessary to hold a conversation
  – Critical for language production and comprehension

[Diagram showing relationships between Intention, Attention, Vigilance, and Arousal]

• Intention → Attention
  – I intend to carry on a conversation with you so I need to attend to what you say.

[Diagram showing relationships between Intention, Attention, Vigilance, and Arousal]

Attention and Aphasia

Symptoms of aphasia are due to impairments in attention mechanisms (Hula & McNeil)

Impaired linguistic & attention mechanisms contribute to symptoms present in aphasia (Crosson)
• Adults with aphasia have more difficulty with divided attention tasks →
  – Attention allocation inefficiency

• Damage to a diffusely-represented attentional network (frontal and posterior regions)
• Greatest decrements when linguistic processing demands are competing for verbal attentional resources
• Attention impairments negatively affect spoken language abilities in mild aphasia

Memory

• Retention beyond the “life” of the stimulus (Davis, 2012)
• Linking information from different parts of a sentence, different parts of a conversation, different parts of a story, etc... requires some type of memory
  – Short term memory
  – Working memory
  – Episodic & semantic memory
• Short-term memory
  – Static store
• Working memory
  – Active memory
  – Limited capacity
  – “Work space” for cognitive activity (Baddeley, 2009)

• WM and language comprehension
  – Discourse comprehension is WM demanding
  – Language comprehension breakdowns occur when WM capacity is “exhausted” by simultaneously holding and processing information
    • But... not always the case

• Declarative Memory
  – Semantic memory: Shared knowledge
    • E.g., knowledge that cream and sugar are often added to coffee
  – Episodic memory: Personal knowledge
    • E.g., knowledge that my Starbuck’s order is Grande Pike coffee with three Splendas and half-n-half
Memory and Aphasia

- Impaired on simple span tasks that involve word list recall
  - Normal: 7 digits, 5 words
  - Aphasia: 1-3 digits/words
  - Digits > words > nonwords

- Language-based approach to STM...
  - Phonological and semantic information support word list retention
- STM deficits on comprehension
  - Phonological STM deficit has few consequences
  - Semantic STM deficit negatively affects sentence comprehension and production

- Adults with aphasia present with a WM deficit
  - Contributes to their language processing impairments
- Across the severity continuum
  - Adults with mild aphasia present with impaired WM and verbal memory abilities (e.g., Ronberg et al., 1996; Ween et al., 1996)
- Discourse comprehension is WM demanding
Clinical implications for verbal memory impairments... consequences for functional communication
– c/o of language difficulty in day-to-day conversation

Executive Functions
“little person in the head to direct behavior” (Andrewes, 2001)

Elements of executive function include:
– Initiation
– Goal maintenance/task persistence
– Organization
– Awareness, self-monitoring, flexibility

Norman & Shallice (1986)
• Frontal lobe plays a role in executive functions

• Patients with left frontal lesions more likely to have impaired EF
  – Affects prognosis and recovery
  – Affects appropriateness of certain treatments
  – Affects prescribed amount of treatment
    • Typically patients with impaired EF take longer to reach treatment criterion levels

<table>
<thead>
<tr>
<th>Dorsolateral Syndrome</th>
<th>Mediodorsal Syndrome</th>
<th>Orbitofrontal Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>Mutism</td>
<td>Poor decision making</td>
</tr>
<tr>
<td>Rigidity</td>
<td>Apathy</td>
<td>Impulsiveness</td>
</tr>
<tr>
<td>Concreteness</td>
<td>Slowness</td>
<td>TOM deficits</td>
</tr>
<tr>
<td>Poor planning</td>
<td>Poor task maintenance</td>
<td>Disinhibition</td>
</tr>
<tr>
<td>WM deficits</td>
<td></td>
<td>Inappropriateness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impaired social judgment</td>
</tr>
</tbody>
</table>

Ardila (2012), p. 155, Box 7-1. Adapted from Chayer & Freedman (2001)

• Impaired cognitive flexibility
  – Resistant to using alternative modes to communicate
  – Affects functional communication
Cognitive Processes and Aphasia

- Adults with aphasia may present with:
  - Limited WM capacity
  - Impaired attention-control processes
  - Impaired inhibitory mechanisms
  - Impaired cognitive flexibility and executive functions

  Affects language comprehension & production, and functional communication

2. Evaluating Cognitive-Linguistic Abilities

- Attention
- Memory
- Executive functions

• Cognitive impairments in memory, attention, and executive functions can affect functional communication

• Negative effects on rehab process
  - Less likely to benefit from behavioral treatment
  - Slower recovery
  - Poorer functional outcomes
• Assessment of cognitive disorders and communication impairments
  (1) Interview, observation, informal assessment
  (2) Standardized tests of cognitive processes
  (3) Standardized tests of language and communication
  (4) Non-standardized tests of language and communication

• During the interview
  – Compare information obtained
• When possible, observe patient in informal/unstructured environment
  – See how cognitive deficits impact in “non-pristine” environment

Screenings for Cognitive Disorders

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognistat</td>
<td>Kiernan et al. (1995)</td>
</tr>
<tr>
<td>Cognitive-Linguistic Quick Test</td>
<td>Helm-Estabrooks (2001)</td>
</tr>
<tr>
<td>Frontal Behavioral Inventory</td>
<td>Kertesz et al., (1997)</td>
</tr>
<tr>
<td>Mini-mental State Examination</td>
<td>Folstein et al. (2001)</td>
</tr>
</tbody>
</table>
General Cognitive Function Tests

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuropsychological Assessment Battery</td>
<td>Stern &amp; White (2003)</td>
</tr>
<tr>
<td>Ross Information Processing Assessment - 2</td>
<td>Ross-Swain (1996)</td>
</tr>
</tbody>
</table>

Cognitive Domain Batteries

- Useful for evaluating a number of skills within one domain
- Provide detailed information
- Informative for identifying specific treatment goals

Attention

- Unstructured methods – interview and observational
- Structured methods – scales, standardized tests
- Potential challenge
  - Most attention measures are multifaceted
- Attention impairments are typical in most types of brain damage
- Criticisms of methods for assessing attention in aphasia
  - They use linguistic stimuli so may be confounded & invalid (Murray)
  - But... linguistic stimuli should be used to provide insight regarding influences of one process on another (McNeil & Hula)

- Attention span test
  - Forward digit span
- Hemi-attention/focused attention
  - Letter cancellation test (Lezak et al., 2004)
  - Behavioural inattention test (Wilson et al., 1987)

- Focused & sustained attention
  - Continuous performance test -II (Connors, 2004)
  - Comprehensive Trail Making Test (Reynolds, 2002)
  - STROOP test (Golden, 2002)
• Attention test batteries
  – Brief Test of Attention (Schretlen, 1997)
  – Test of Everyday Attention (Robertson et al., 1994)

• Ecological outcome measures
  – Rating Scale of Attentional Behaviour (Ponsford & Kinsella, 1991)
  – Cognitive Failures Questionnaire (Broadbent et al., 1982)


Memory

• Wechsler Memory Scale-III or IV (Wechsler, 1997; 2009)
  – Episodic memory
  – Working memory
  – Nonverbal & verbal memory

• Rivermead Behavioral Memory Test-II (Wilson et al., 2003)
  – Everyday memory activities
• Verbal working memory
  – Tompkins et al. (1994) Auditory-verbal working memory test

<table>
<thead>
<tr>
<th>2-sentences Set</th>
<th>3-sentences Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>You sit on a chair</td>
<td>True</td>
</tr>
<tr>
<td>Trains can fly</td>
<td>False</td>
</tr>
<tr>
<td>Sugar is sweet</td>
<td>True</td>
</tr>
<tr>
<td>Florida is next to Ohio</td>
<td>False</td>
</tr>
<tr>
<td>Horses run in the sky</td>
<td>False</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4-sentences Set</th>
<th>5-sentences Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twelve equals one dozed</td>
<td>True</td>
</tr>
<tr>
<td>Bicycles are slower than cars</td>
<td>False</td>
</tr>
<tr>
<td>A book can play</td>
<td>False</td>
</tr>
<tr>
<td>Feathers can tickle</td>
<td>True</td>
</tr>
<tr>
<td>Carrots can dance</td>
<td>False</td>
</tr>
<tr>
<td>Fish swim in water</td>
<td>True</td>
</tr>
<tr>
<td>You sleep on a bed</td>
<td>True</td>
</tr>
<tr>
<td>You eat breakfast at night</td>
<td>False</td>
</tr>
<tr>
<td>People have eyes</td>
<td>True</td>
</tr>
</tbody>
</table>

Sample stimuli from Tompkins et al's A/V WM Test

• Nonverbal Memory (visuospatial)
  – Continuous Visual Memory Test (Trahan & Larrabee, 1988)
    • Delayed recognition
  – Locations Learning Test (Bucks et al., 2000)
    • More functional tasks
    • Visuospatial learning and recall
    • Developed for people with suspected dementia

Executive Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Test</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Maze subtest (CLQT)</td>
<td>Helm-Estabrooks (2001)</td>
</tr>
<tr>
<td></td>
<td>Tower Tests</td>
<td>E.g., Simon (1975)</td>
</tr>
<tr>
<td>Organization</td>
<td>Wisconsin Card Sorting Test</td>
<td>Grant &amp; Berg (1993)</td>
</tr>
<tr>
<td>Inhibition</td>
<td>STROOP</td>
<td>Golden (2002)</td>
</tr>
<tr>
<td>Cog Flexibility</td>
<td>Comprehensive Trail Making</td>
<td>Reynolds (2002)</td>
</tr>
<tr>
<td></td>
<td>STROOP</td>
<td>Golden (2002)</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>TONI-3</td>
<td>Brown et al. (1997)</td>
</tr>
<tr>
<td></td>
<td>Ravens Progressive Matrices</td>
<td>Raven (1998)</td>
</tr>
</tbody>
</table>
Evaluating Cognitive Processes

- Adults with aphasia may present with concomitant cognitive deficits that negatively affect
  - Language abilities
  - Rehabilitation
  - Functional outcomes

Thank you!!

Questions?