<table>
<thead>
<tr>
<th>Task</th>
<th>Response</th>
<th>Response</th>
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<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Match</td>
<td>ruk-dup-nid ruk-dup-nid</td>
<td>ruk-dup-nid ruk-nid-dup</td>
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<td>Syllables</td>
<td>ruk-dup-nid</td>
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<tr>
<td></td>
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<tr>
<td>Reverse</td>
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<td>vam-mip-saf</td>
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<td>Delete</td>
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<tr>
<td></td>
<td>zot-fif</td>
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</tbody>
</table>

Gelfand and Bookheimer, Neuron 2002
Results: Normal Children
Sentence Judgement Task
Frontal regions
44 inf
44/6
9/6 Exners area
46
45
47
6 medial
Temporal regions
41/42
22
21/20
37
Parietal: 40 39
Stimulated region

Tumor

Stimulated region

Sentence Comprehension

Object naming
Language 2

• Reading system and reading disorders
• Right hemisphere contributions to language
  – Prosody
  – context
Anatomy of Reading

Inferior Frontal Gyrus

Supramarginal Gyrus (40)

Angular Gyrus (39)

Superior Temporal Gyrus (posterior) 42, 41, 22

Temporal/Occipital Junction 21/20/37
Reading System

- Major issue in reading: 1 or 2 pathways
- Call this the Dual Route model
- Was controversial before functional imaging- now its pretty well accepted
- Based on differences in acquired alexia errors
Types of Alexia

• Phonologica, literal or Surface
  – Patients read in a letter-by-letter fashion
  – They sound out each word
  – Errors: they can read pronounceable nonsense words “migbus”; cannot read irregular words like “yacht”
  – Damage likely to the visual recognition system in the LH: cant recognize whole words
Alexia cont.

- Alexia type 2: visual, semantic alexia
  - Can read whole words
  - Can read irregulars like yacht and pharoah
  - Cannot read nonsense words
  - Strong frequency effect- more likely to read common than uncommon words; better at concrete nouns
  - Make visual or regularization errors: lit = light; groal=goal, etc.
  - Apparently have damage to phonological to orthographic conversion system or to phonological system
Rarer alexias

- Global alexia: affects all reading. AG lesions or WM exiting visual cortex in LH
- Deep dyslexia: associated with large LH lesions-characterized by global dyslexia with:
  - Visual errors: gird="girl"
  - Derivational errors: architecture= architect
  - Semantic errors: orchestra=symphony
  - Superior at reading concrete nouns
  - Suggested to represent some primitive RH whole word recognition capabilities
Rarer alexias, cont.

• Alexia without agraphia or occipital alexia:
  – Most other acquired alexics have impaired writing similar to reading
  – Alexia without agraphia associated with 2 lesions: one in the left occipital cortex and one in the posterior callosum
  – Disruption of visual information into the LH reading system. Usually accompanied by a field or quadrant cut
  – Can write, but cant read what they write
Developmental dyslexia

• Most are similar to the surface alexic
  – Difficulty with auditory processing
  – Poor at grapheme to phoneme conversion
  – Lousy at reading nonwords
  – Slow readers; often learn by whole-word approach

• Rarer, there are visual types and often some with general language difficulties
Dual Routes

• Inferior Route:
  – Occipital V1-V2-V3-IT-insula/44/47

• Superior Route
  – V1-V2- AG-ST- IFG 44/6

• Interaction through AG

• Writing: includes SMG and Exner’s area
  (46/6 anterior to M1 hand)
Right hemisphere contributions to language

- Some evidence that early right brain lesions can be more detrimental to language development than LH lesions
- LH may process more rapid information. RH may maintain a context and provide emotional cues to global meaning
- Some evidence that the ear itself is tuned for more rapid auditory information in LH or infants (Sininger 2004 Science).
Prosody Paradigm

• Selective attention/stimulus matched paradigm
• For the 2 prosody conditions:
  – “Do the sentences sound alike” regardless of literal meaning
• For the SC condition:
  – “Do the sentences mean the same thing” regardless of the sound
Affective prosody vs. others
Linguistic vs. Affective
Making Sense of Conversation  
(R. Caplan and M. Dapretto, 2003)

• **Logical Reasoning**
  – Q: Do you like having fun?
  – A: Yes, because it makes me happy.

• **Illogical**
  – Q: Do you like having fun?
  – A: No, because it makes me happy.

• **On-topic**
  – Q: Do you believe in angels?
  – A: Yeh, I have my own special angel

• **Off-topic (LA)**
  – Q: Do you believe in angels?
  – A: Yeh, I like to go to camp
Reasoning vs Topic

Normal Adults
Topic vs Reasoning in Normal Adults
Reorganized language in early lesions

- Can see individual patterns using fMRI
- Appears to follow a principle of minimal energetics: only move what is essential to move
Initiates speech on the right; language is on the left
Auditory Naming Task

Patient: LH tumor; R handed, R Brain Speech, Wada confirmed
Rasmussen’s Disease, age 12

Right

Left

T.S. Pre-op, Rasmussen’s
Six months post left hemispherectomy