Speech Deficits in Patients with Stroke Related Aphasia  
Alexis Morrison⁰, Leah Rice MA*, Sara Mohr BA*, Aneta Kielar Ph.D.**

*Speech, Language, and Hearing Sciences, GIDP Cognitive Sciences*, University of Arizona  
**Department of Linguistics, University of Arizona  
*Department of Neuroscience, University of Arizona

Introduction

What can stroke induced aphasia tell us about how language is localized in the brain? Aphasia is the condition in which language production or comprehension is impaired, usually due to stroke in the left hemisphere perisylvian regions. In this study we measured the language and cognitive ability of 10 stroke patients with aphasia compared to 18 healthy, aged matched controls.

- Identified stroke lesion locations and extent with MRI
- Measured language and cognitive skills
- Focused on the stroke patients ability to produce main concepts for the Cinderella story and how these correlated to scores on different cognitive tasks and the presence of various morphosyntactic features.

Methods

Participants

<table>
<thead>
<tr>
<th></th>
<th>Total N</th>
<th>Males</th>
<th>Age: Mean (range)</th>
<th>Post Onset Time: Mean (range in yrs)</th>
<th>Years Educ: Mean (range)</th>
<th>WAB-R Bedside Aphasia %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke Patients</td>
<td>10</td>
<td>8</td>
<td>58.7 (27-80)</td>
<td>6.31 (3.2-11.6)</td>
<td>15.8 (12-19)</td>
<td>71.8 (47.5-89.2)</td>
</tr>
<tr>
<td>Controls</td>
<td>18</td>
<td>6</td>
<td>65.3 (48-80)</td>
<td>N/A</td>
<td>16.9 (12-20)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Cognitive and Language Tests

- Participants completed a neuropsychological battery
- Semantic Skills: Camel and Cactus, PALPA 48 (Word-Picture match) PALPA 49 (Auditory Synonym Judgment) Verb Synonym Judgment

Past tense Inflection Task

- Susan walks daily. Yesterday she ___.
- John often sings. Yesterday he ___.
- Mary likes to think. Yesterday they ___.

Narrative Story Collection and Analysis

- Participants told the story of Cinderella as best they could remember in as much detail as desired (using Aphasia Bank Protocol, https://aphasia.talkbank.org/)
- The stories were digitally recorded, transcribed, and coded for morphology, syntax, pause length, sentence grammaticality, and errors present
- The transcripts were analyzed for the presence, accuracy, and completeness of the main concepts of the Cinderella Story (Richardson and Dalton, 2015)

Results

Between Group Differences: Patients vs Controls

<table>
<thead>
<tr>
<th></th>
<th>Noun-Verb Ratio **</th>
<th>Mean Length Utterance **</th>
<th># of Well Formed Sentences</th>
<th>Open Class Words *</th>
<th>Closed Class Words *</th>
<th>Sentences without Clauses</th>
<th>Sentences with 3 clause **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke Patients</td>
<td>0.69</td>
<td>10.10</td>
<td>17.90</td>
<td>87.60</td>
<td>52.70</td>
<td>24.60</td>
<td>3.10</td>
</tr>
<tr>
<td>Controls</td>
<td>1.03</td>
<td>14.23</td>
<td>40.89</td>
<td>198.06</td>
<td>124.61</td>
<td>30.39</td>
<td>10.94</td>
</tr>
</tbody>
</table>

Past tense Inflection Task

- **Correlation Between Main Concept Scores and Past Tense Pseudo Words**: Composite Scores for Patients with Stroke Related Aphasia

Discussion

- Narrative production for patients with aphasia contained more nouns than verbs.
- Compared to controls, patients produce shorter utterances, with fewer well formed sentences, which lacked embedded clauses.
- Patient’s speech was characterized by reduced proportion of closed class words (e.g., inflectional morphemes, determiners, and complementizers).
- There was a positive relationship between the number of Cinderella Story main concepts produced and semantic skills, as well as past tense inflection ability.
- The results suggest that the multidimensional analysis of narrative production can give insight into the types of language deficits in aphasia.

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