Dissociating reading and auditory comprehension in persons with aphasia

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Introduction

- Post-stroke reading and language impairment offer insight into the relationship between the reading and language networks.
- Dissociating clinical reading deficits via distinct neurobiology can improve early identification of chronic reading deficits and improve targeted therapy.

Hypotheses

- Reading comprehension deficits in aphasia are partly, but not fully, explained by auditory comprehension deficits.
- Unique neuroanatomical regions at the intersection of visual association areas and language comprehension regions are linked with reading deficits when accounting for auditory comprehension.

Methods

Auditory Comprehension Measures:
WAB-R Sentence Completion (A-SC) subtest: participants are asked to orally complete 5 sentences (e.g., “complete what I say. For example, ice is _____”)
WAB-R Sequential Commands (A-FC) subtest of the WAB-R: patients are asked to follow one-step and multi-step commands by performing physical actions.

Reading Comprehension Measures:
WAB-R Supplement Comprehension of Sentences (R-SC) subtest: participants are asked to read a sentence and choose the best word to complete the sentence from 4 options.
WAB-R Supplement Reading Sequential Commands (R-FC) subtest: participants are asked to read a sentence aloud and perform the one-step to multi-step actions in the sentence.

Lesion-Symptom Mapping
- Hand-drawn normalized lesion maps analyzed using NiiStat
- Specifications: Left hemisphere JHU gray and white matter atlas (JHU) ROIs controlling for lesion volume (Faria et al., 2012).

Demographics

<table>
<thead>
<tr>
<th>Demographic Variables (N = 70)</th>
<th>Mean (SD)/Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test age</td>
<td>61.14 (10.66)</td>
</tr>
<tr>
<td>Education</td>
<td>15.56 (2.39)</td>
</tr>
<tr>
<td>Months post-stroke</td>
<td>54.53 (53.00)</td>
</tr>
<tr>
<td>Stroke age</td>
<td>56.57 (11.50)</td>
</tr>
<tr>
<td>Lesion Volume (cubic mms)</td>
<td>119.90 (82.72)</td>
</tr>
<tr>
<td>Sex (males:females)</td>
<td>43:27</td>
</tr>
<tr>
<td>Handedness (left:right)</td>
<td>5:65</td>
</tr>
<tr>
<td>WAB AQ</td>
<td>62.05 (25.76)</td>
</tr>
<tr>
<td>Stroke (isch:hem:other)</td>
<td>48:20:2</td>
</tr>
</tbody>
</table>

Discussion

- This is the first study to directly dissociate lesion correlates of auditory from reading comprehension deficits in persons with aphasia and to examine lesion correlates of both traditional sentence reading and functional reading.
- Reading deficits, controlling for auditory impairments, are independently associated with damage to the ventral temporal regions, namely the inferior temporal gyrus (including its posterior aspect) and the fusiform gyrus for sentence completion, and the inferior occipital gyrus and lingual gyrus for reading tasks.
- These results can help inform potential treatment predictors for chronic reading impairment after stroke.

Acknowledgments

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