Introduction

When investigating language processing and linguistic representations, it is often difficult to separate these skills from other cognitive processes. One such cognitive process that appears to be linked with language is short-term memory (STM), or the ability to maintain a piece of information in one’s mind for a short period of time (Martin & Reilly, 2012). A subtype of STM is working memory (WM), in which a person has to both maintain a piece of information in cognitive storage and manipulate it. Various models of WM have been used to explain how people process linguistic information. One model includes a phonological loop, in which auditory information is stored and rehearsed in order to be remembered and manipulated (Wright & Fergadiotis, 2012). Following this mental rehearsal, the information can be encoded, which is a necessary step for comprehension. Some argue that auditory comprehension deficits in aphasia are influenced by the person’s STM or WM deficits (Martin & Saffran, 1997).

Auditory comprehension and repetition abilities are two skills that are often impaired in persons with aphasia (PWAs), but limited research has been conducted investigating the relation between these two language skills. Wright et al. (2007) investigated ways to measure WM in PWAs for different types of linguistic information (phonological, semantic, and syntactic), as well as examining the relation between performance on WM tasks and auditory comprehension. They found that different WM tasks could be used to measure different types of WM. Results also indicated that there was a connection between different types of WM and different types of linguistic processing.

Eom and Sung (2016) examined the effect of WM intervention on sentence comprehension in PWAs. Intervention consisted of treating repetition of sentences. Results indicated that there were improvements in sentence repetition and WM, as well as generalization to other language tasks, including auditory comprehension tasks. No studies were found in the literature investigating a correlation between auditory comprehension and repetition abilities except in the context of intervention. If there is a correlation between these two, there are clinical implications regarding the potential use of STM and WM models to guide intervention in PWAs.

Research Question

Is there a strong positive correlation between auditory comprehension and repetition abilities in PWAs?

Subjects

Data from 110 participants were selected from the AphasiaBank online database (www.talkbank.org). Aphasia types were based on Western Aphasia Battery – Revised (WAB-R) scores.

Participation Inclusion/Exclusion Criteria:

- Diagnosis of aphasia
- Left hemisphere damage due to stroke
- Aphasia duration of at least 6 months
- Adequate vision and hearing
- No history of other neurological conditions
- English-speaking monolinguals
- Completed all relevant assessment tasks
- No missing data scores

<table>
<thead>
<tr>
<th>Anomic</th>
<th>Broca’s</th>
<th>Conduction</th>
<th>Wernicke’s</th>
<th>Transcortical Motor</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>36</td>
<td>37</td>
<td>24</td>
<td>12</td>
<td>1</td>
<td>110</td>
</tr>
</tbody>
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Time Post-Onset

- M = 5.4 years (SD = 5.11)
- Years of Education
  - M = 15.1 years (SD = 2.6)
- Age
  - M = 61.8 years (SD = 11.4)

Gender

- 47 Female, 63 Male

Ethnicity

- 95 Caucasian; 14 African American; 1 Asian

Handedness

- 101 Right, 8 Left, 1 Ambidextrous

Procedure

AphasiaBank participants completed a variety of standardized and non-standardized tests. For this study, scores from two sentence-length auditory comprehension subtests of the WAB-R were extracted for analysis:

- Yes/No Questions (max. score of 60)
- Sequential Commands (max. score of 80)

In addition, four AphasiaBank Repetition Test sub-scores were extracted for analysis:

- 1. B. Open Word Lists – Increasing Length, Serial Order (word span; max. score of 7)
- 1. B. Open Word Lists – Increasing Length, Any Order (word span; max. score of 7)
- 2. A. Sentences – Increasing Length (repetition of sentences of increasing length; max score of 65 (total # of words correct))
- 2. B. Sentences – No Errors, Semantic Errors, Interference Effect (repetition of sentences of varying linguistic complexity; max. score of 88 (total # of words correct))

Table: Results

<table>
<thead>
<tr>
<th>WAB-R</th>
<th>AphasiaBank Repetition Test</th>
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</thead>
<tbody>
<tr>
<td>WAB-R Yes/No Questions</td>
<td>AphasiaBank Repetition Test</td>
</tr>
<tr>
<td>WAB-R Sequential Commands</td>
<td>AphasiaBank Repetition Test</td>
</tr>
<tr>
<td>WAB-R Fluency</td>
<td>AphasiaBank Repetition Test</td>
</tr>
<tr>
<td>Span Score – Serial Order</td>
<td>.368</td>
</tr>
<tr>
<td>Span Score – Any Order</td>
<td>.385</td>
</tr>
<tr>
<td>Sentence Repetition – Increasing Length</td>
<td>.416</td>
</tr>
<tr>
<td>Sentence Repetition – Varying Complexity</td>
<td>.381</td>
</tr>
</tbody>
</table>

A bivariate correlation function in SPSS revealed positive and significant correlations between all variables at p<0.01.

Discussion

Sentence-length auditory comprehension is weakly to moderately correlated with repetition span and sentence repetition in PWAs; thus, other variables also must be accounting for the variability in repetition ability. Our post-hoc analysis of the relation between fluency and repetition revealed that fluency also was weakly to moderately correlated with repetition ability. The fluency of a person’s speech often has a large impact on scores on various tasks, even if other underlying linguistic or cognitive skill remains intact. In other words, PWAs may have some of the skills necessary to repeat a sentence (e.g., good short-term memory), but nonfluent oral expression may prevent the person from being able to verbalize the utterance to be repeated. It is clear that auditory comprehension bears some relation to repetition in PWAs; however, auditory comprehension is not the only factor that should be considered when treating repetition deficits. Results of this study imply the need for further research to determine the relation between various impairments and abilities in PWAs in order to assess and treat speech and language skills.

References


Disclosure

Financial Relationships: Susan Jackson was an employee at the University of Kansas when we analyzed the linguistic demographics of persons with aphasia from the AphasiaBank database. She has been an employee of the University of Kansas since 2016. Non-financial Relationships: Susan Jackson is an AphasiaBank consortium member. The test results of persons with aphasia from the AphasiaBank database were analyzed as part of a research practicum experience for Amanda Platt and Shaina Xiasi while they were graduate students in speech-language pathology at the University of Kansas under the supervision of Susan Jackson.