

Working Memory in Monolingual Broca's Aphasia

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Abstract

A preserved working memory system is crucial for language processing and complex cognitive activities. Working memory ability of adults with aphasia has received a lot of attention in the literature in recent years. The purpose of this study was to measure the performance of adults with Broca's aphasia on listening span test in comparison with healthy elderly individuals. Ten (5 Male; 5 Female) monolingual (Kannada speakers) adults with Broca's aphasia and ten (5 Male; 5 Female) monolingual (Kannada speakers) healthy elderly individuals participated in this study. Participants completed the test tapping linguistic information measuring working memory ability. The findings highlighted the working memory in adults with Broca's aphasia.

Keywords: Broca's aphasia, monolingual, Kannada speakers, working memory.

Introduction

Working memory (WM) is "a multicomponent system responsible for active maintenance of information in the face of ongoing processing and/or distraction" (Conway et al., 2005) which facilitates goal-directed behavior. Intact working memory (WM) effects have been found across a range of complex cognitive processes and language processing (Engle, 2002; Wright & Shisler, 2005).

Theories of working memory have been proposed to account for linguistic presentations exhibited by adults with aphasia (e.g., Baddeley, 1986; Caplan & Waters, 1999a). Some researchers have explored the integrity of working memory in adults with aphasia. Caspari et al., (1998) administered a simplified version of the reading span task to 23 individuals spanning a

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broad range of aphasia types and severity levels. The authors concluded that "the ability of aphasic individuals to comprehend language is predictable from their working memory capacities." Friedmann and Gvion (2003) studied the relationship between verbal working memory and sentence comprehension in adults with conduction aphasia and agrammatic aphasia, and a normal group. Measures of working memory included several span measures: digit, word, nonword, a listening span task, and a 2-back task. The results of the study indicated that both aphasia groups presented with limited working memory abilities and performed poorly on sentence comprehension task. Wright et al. (2003) investigated working memory performance in adults with aphasia using Tompkins et al.'s (1994) listening span task. Participants included ten adults with fluent aphasia, ten adults with nonfluent aphasia, and 10 NI adults. All participants presented with good auditory comprehension ability, and aphasia severity was mild to moderate. The participants with aphasia made significantly more errors on the measure as compared to their normal counterparts.

Need

Results of the previous investigations indicate that individuals with aphasia have impaired working memory systems. Further, the working memory capacity deficit may contribute to the language processing difficulties of adults with aphasia. Evidence of improved language performance in individuals with aphasia given WM support is reported (Francis et al., 2003). Importantly, early identification of such deficits could play a crucial role in treatment for adults with aphasia. It has been suggested that there may be separate working memory abilities for different types of linguistic information. Understanding the theoretical basis of working memory is necessary for the measurement and treatment of working memory.

Aim

The purposes of this study were:

1. To measure working memory ability in Kannada speaking adults with Broca's Aphasia.
2. To compare the performance of adults with Broca's Aphasia with healthy elderly individuals on working memory.
3. To find gender differences if any.

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Method

Participants

Group-1 (G1) Reference group: Ten monolingual Kannada speaking healthy elderly individuals (5 Male; 5 Female) in the age range of 45 – 60 years (Mean age - 52.5) participated in this study. Participants were screened for speech, language, hearing, cognition, medical or neurological problem and vision by qualified professionals in the respective field. All participants completed 10th standard education.

Group-2 (G2) Clinical group: Ten monolingual Kannada speaking adults with Broca's aphasia (5 Male; 5 Female) in the age range of 45 – 60 (Mean age - 54.2) at the time of testing participated in this study. Years of education completed were 10th standard. All participants presented with unilateral left hemisphere damage subsequent to cerebrovascular accident (CVA). All participants presented with Broca's aphasia (mild form) as confirmed by clinical diagnosis and performance on the Western Aphasia Battery (Kannada version). Clinical criteria for participation included (a) no more than one stroke located in the left hemisphere, (b) at least 6 months post onset of the stroke, (c) pre-morbid right-handedness, and (d) no history of dementia or other neurological illness, (e) Hearing acuity within normal limits, and (f) normal or corrected visual acuity.

Research Design

A Standard group comparison design was used.

Materials

Working memory was assessed for listening span. The test composed of 10 syntactically correct simple five-word sentence each. Final words for each sentence were nouns.

Procedure

During the assessment phase, informed consent was obtained. Each participant was tested individually in a noise free room. The participants were instructed to listen to the sentences and

to remember the final word in each sentence and to repeat back the word after the whole set was read.

Scoring

A score of '1' was assigned for each correct response, a score of '0' for each incorrect and no response.

Results and Discussion

The data obtained were subjected to statistical analysis using the SPSS-17 software. The statistical test used were Mann-Whitney U test and Independent sample t-test.

I. To check for the presence of gender effect on listening span test, Mann-Whitney U test was carried out. The analyses revealed that no significant differences at .05 level of significance were present among the genders in both the group. Hence, in the final analysis, data was combined.

Table 1: Performance of adults with Broca's aphasia and healthy elderly individuals on listening span test

Group	N	Mean	SD	Sig
<i>Reference group</i>	10	8.6	.85	2.02
<i>Clinical group</i>	10	2.0	.96	

Results in Table 1 indicates that normal elderly individuals had a mean value of 8.6, SD=.85. The performance of adults with Broca's aphasia showed mean=2.0, SD=.96. The performance between the two groups indicated significant differences at 0.05 level of significance. Adults with Broca's aphasia performed poorly on listening span in comparison with normal elderly individuals.

The results of the present study indicated that adults with Broca's aphasia performed poorly on listening span test of working memory as compared with healthy elderly individuals. These results are in support with the literature indicating that adults with aphasia present with a working memory deficit (Friedmann and Gvion, 2003; Wright et al. 2003). Results also indicated

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that there was no significant difference in performance among the genders in both the group. Thus, highlighting the importance of measurement of working memory and incorporating these parameters in clinical rehabilitation strategies for adults with aphasia.

Conclusion

Working memory (WM) is a concept that has proven extremely useful in the analysis of both normal and impaired memory functioning. Theories of working memory are evolving in response to empirical findings of working memory ability in adults with and without aphasia. Different type of processing can be differently be affected by WM. These studies are a step forward in addressing the treatment of working memory ability in clinical populations. The present study adds on to the existing research on the limitation of working memory in adults with aphasia.

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