



# Function Word Deficits in Broca's Aphasia and Its Relation to Working Memory Capacity

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## Introduction

- Persons with Broca's aphasia (PWBA) often exhibit effortful verbal output with numerous semantic and syntactic errors with difficulty in word retrieval abilities
  - Fragmented speech productions are manifested differentially by task and computational demands, and are readily attested in the performance of narrative-based tasks (Faroqi-Shah & Baker, 2017)
- Discourse involves higher-level planning to combine units of information in a coherent manner to convey a meaningful message (Wright et al., 2011)
- When producing utterances, persons with Broca's aphasia may adopt a strategy based on the adaptation theory (Kolk & Heeschen, 1992), to avoid using their impaired grammar due to their limited capacity (Hartsuiker & Kolk, 1998)
  - the result is simplified utterance structures with omission and/or substitution of function words (Salis & Edwards, 2004)

## Purpose

- Examine grammatical and morpho-syntactical errors across narrative discourse tasks
- Examine the relationship among working memory and grammatical and morpho-syntactical errors across narrative discourse tasks

## Participants

- Broca's Aphasia (n=69) from AphasiaBank

<b>Age:</b>	M= 58.9, SD= 12.8 (range: 25.6 – 85.4)
<b>Years of Education:</b>	M= 15.1, SD=2.8 (range: 8-23)
<b>WAB-R AQ:</b>	M=51.4, SD= 15.2 (range: 10.8 – 77.7)

**Acknowledgements:** We would like to thank AphasiaBank developers and contributors.

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## Assessment and Measures

### Marini Analysis:

- An extensive, multilevel assessment procedure for analyzing discourse
- “Traditional standardized aphasia tests may not be sensitive enough to adequately assess linguistic deficits and recovery in persons with aphasia” (Marini, et al., 2011; p. 1373)

### Discourse & Working Memory Tasks:

*Discourse:* three narrative discourse tasks:

- Describing current speech skills
- Single picture description task - “cat in the tree picture” (Nicholas & Brookshire, 1993)
- Telling the “Cinderella” story

*Working Memory:* AphasiaBank Repetition Test (Martin & Gupta, 2004):

- Word string (increasing length), Span score (any order), Span score (serial order)

### Grammatical and Morpho-syntactic Analyses

- Substitution of a Function Word: when a function word is changed for another function word
- Substitution of a Bound Morpheme: typically the incorrect tense or plurality
- Omission of Function Word: the missing of a closed class word (he, she, it, the, etc.)
- Content Omission: the missing of any content

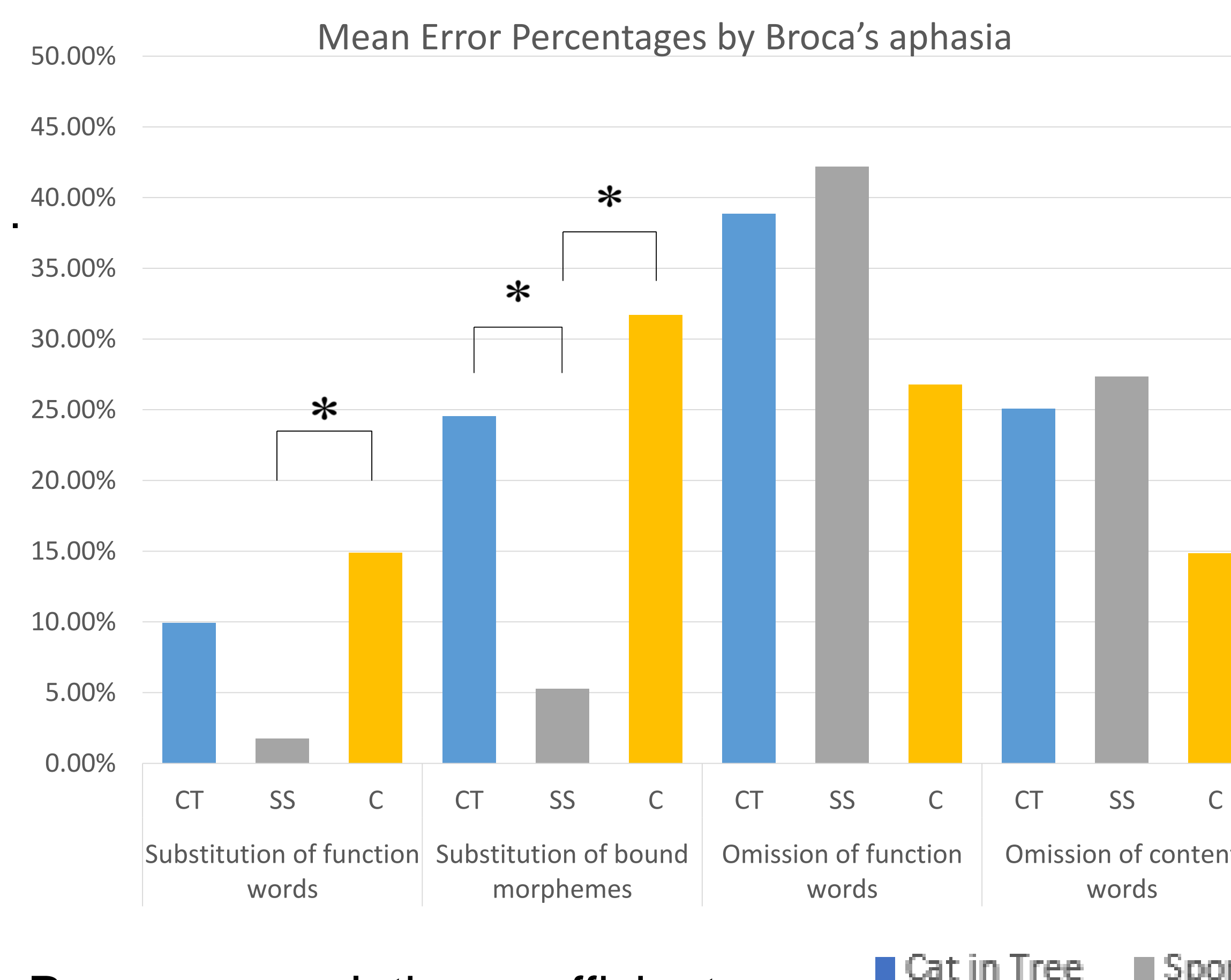
### Examples:

- The girl fall <into> [\* f] the truck
- They will <eats> [\* m] the sandwiches
- [\* ofw] cat ran down [\* ofw] hallway
- [\* oc] ran into the attic

(%)	Substitution of Function Words	Substitution of Bound Morphemes	Omission of Function Words	Omission of Content Words
<b>Cat in Tree</b>	9.94	24.56	38.85	25.08
<b>Spontaneous Speech</b>	1.75	5.26	42.21	27.37
<b>Cinderella</b>	14.91	31.70	26.77	14.85

## Results

- Analysis of variance (ANOVA)



### Significant differences were found:

- In proportion of function word substitutions; with more errors in the Cinderella story than the spontaneous speech task, ( $p < .05$ )
- In substitution of bound morphemes between the picture description task, the spontaneous speech task ( $p < .01$ ), and the Cinderella story ( $p = .001$ )

- Pearson correlation coefficients

A significant correlation was found only between the proportion of function word substitutions and the working memory score (word string task) during the Cinderella task ( $R = -.410, p = .001$ )

## Discussion

- Findings support previous research (De Roo, Kolk, & Hofstede, 2003; Indefrey et al., 2001; Kolk, 1995; Salis & Edwards, 2004)
  - Task variation affects function word production in narratives produced by PWBA
- We found significant correlations between working memory and proportion of function word substitutions; thus adding empirical support that working memory ability contribute to function word production (Hartsuiker & Kolk 1998; Kolk & Weijts, 1996)
- Omissions were the most common error; adding support for the Adaptation theory (Kolk & Heeschen, 1990)