

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

Bailey Malnak, Hana Kim, & Heather Harris Wright

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 (Farooqi-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

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

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

Contact: kimha15@students.ecu.edu

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

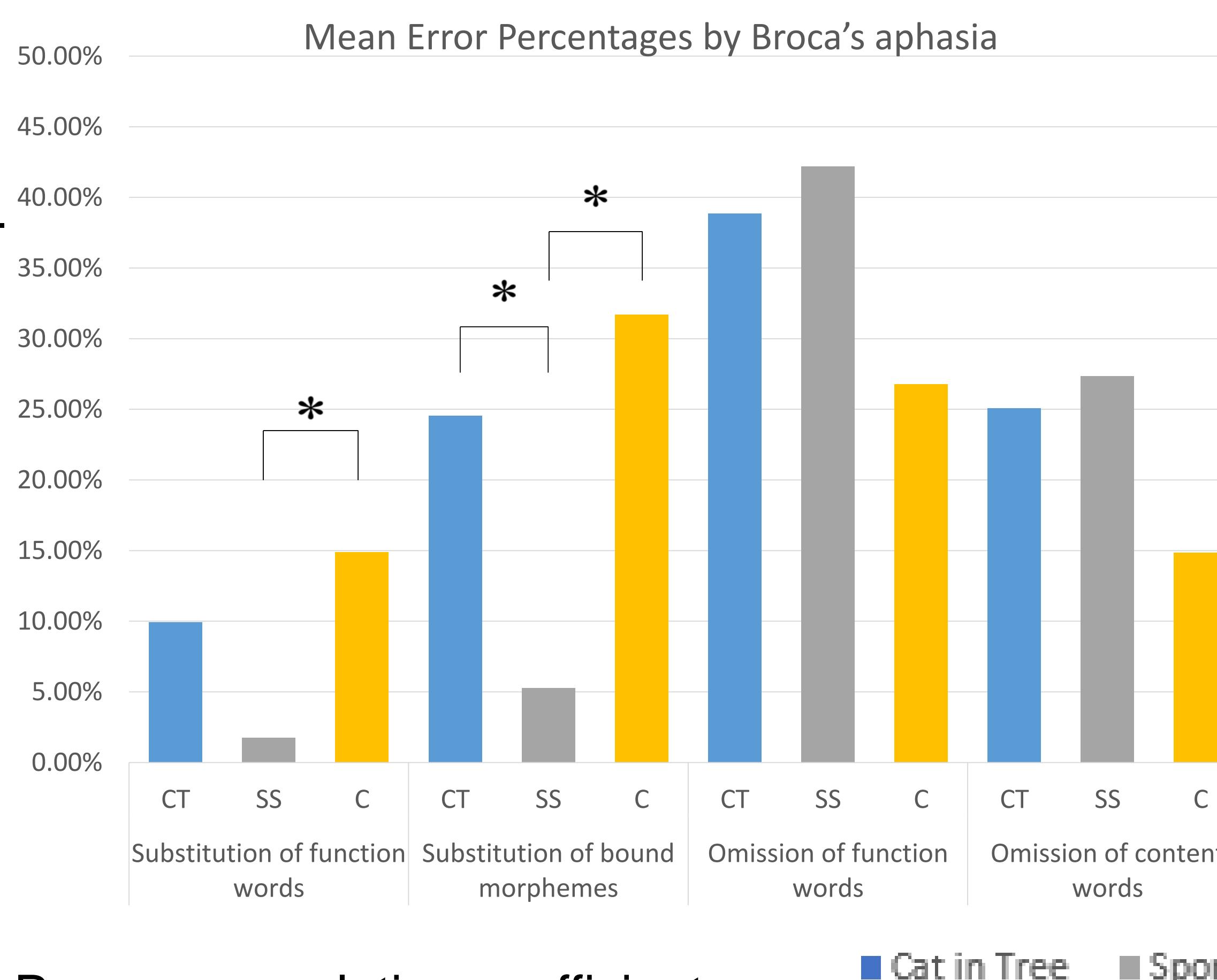
Examples:

- 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
Cat in Tree	9.94	24.56	38.85	25.08
Spontaneous Speech	1.75	5.26	42.21	27.37
Cinderella	14.91	31.70	26.77	14.85

Results

Analysis of variance (ANOVA)



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 ($R = -.410$, $p = .001$)

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 ($p = .001$)

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)