Sentence Production and Working Memory in Aphasia: Investigation of Free and Elicited Sentence Production

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INTRODUCTION

- Individuals with aphasia (IWA) produce syntactically simplified sentences due to difficulty with the underlying structures representing relations between elements in a sentence (Saffran et al., 1980)
- The production of non-canonical sentences is particularly demanding for IWA (Burchert et al., 2008; Harun, 2020)
  - Difficulties with the derived word order (Bastiaanse & van Zonnefeld, 2005)
  - Disrupted timing of processing mechanisms, impairing the formation of syntactic structures (Kolk et al., 1995)
- Sentence production in diagnostics, therapy and research can prompted using various tasks
  - Sentence elicitiation (e.g., Cho-Reyes & Thompson, 2012)
  - Free sentence production with or without additional use of cues (e.g., Harun, 2020)
- Sentence production performance of IWA has been associated with Working Memory abilities (Sung et al., 2018)

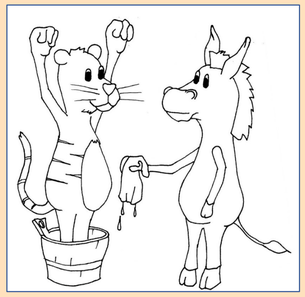
Research Questions:

- **RQ1**: Do people with and without aphasia demonstrate differences in their production of canonical and non-canonical sentences?
- **RQ2**: How does sentence production performance in these groups differ between two different tasks?
- **RQ3**: What is the role of Working Memory and processing speed in sentence production?

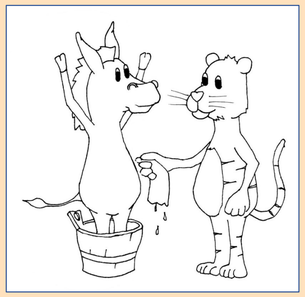
METHODS & MATERIALS

Participants: 10 IWA & 21 age-matched neurotypical control participants (CP)

Sentence elicitation

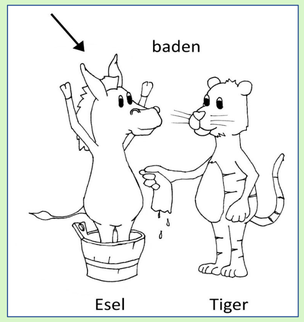


„Den Tiger badet der Esel."
The$_{ACC}$ tiger bathes the$_{NOM}$ donkey.



„Den Esel badet der Tiger."
The$_{ACC}$ donkey bathes the$_{NOM}$ lion.

Free (cue-based) sentence production



„Der Esel wird vom Tiger gebadet."
The$_{NOM}$ donkey is being bathed by the$_{ACC}$ tiger.

Target sentences:

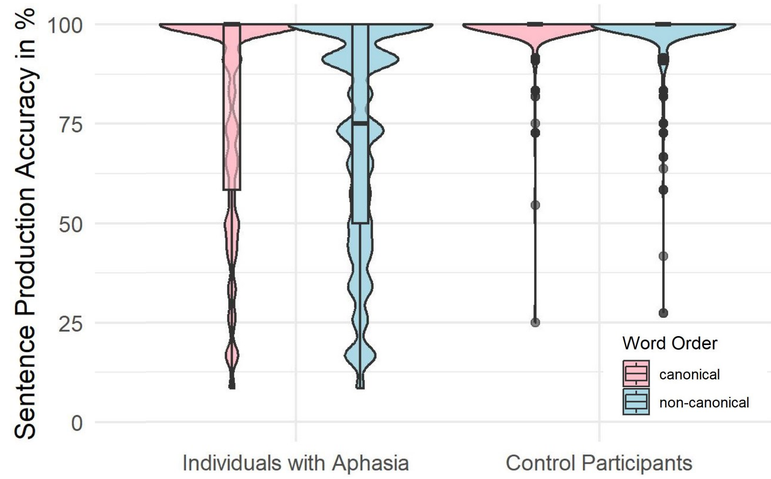
Canonicity	Structure	Elicit	Free prod
canonical			20
	SVO	10	
	SRC	10	
non-canon			20
	OVS	10	
	ORC	10	
	Passive decl	10	
	Passive rel	10	

Working Memory assessment:
Digit Span & Block Span (WMS-R)

Speed of processing assessment:
Digit Symbol Substitution Test (WAIS-IV)

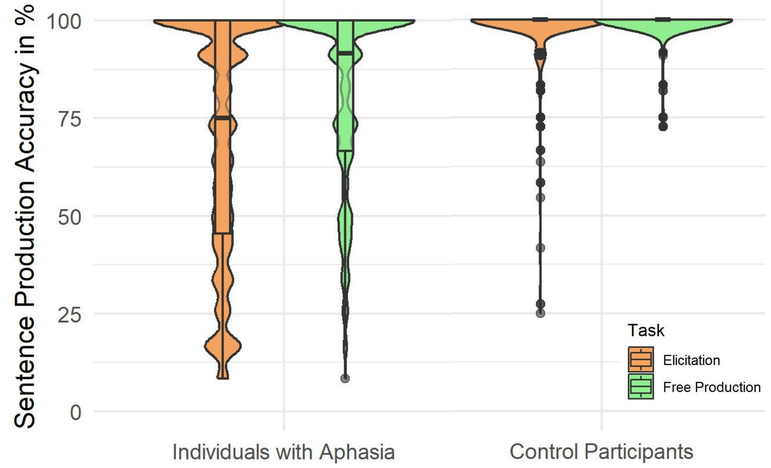
RESULTS

RQ1: Effect of canonicity on sentence production performance



- Main effect of group: IWA performed significantly less accurately than CP across sentence types ($p < .001$)
- IWA: significantly better performance in canonical ($M = 79.4\%$, $SD = 28.3$) than non-canonical ($M = 71.5\%$, $SD = 28.1$) sentences ($p = .025$)
- CP: performance at ceiling

RQ2: Effect of task on sentence production performance



- IWA: significantly more accurate in Free production ($M = 82.5\%$, $SD = 23.2$) compared to Elicitation ($M = 69.6\%$, $SD = 30.4$) ($p = .049$)
- CP: performance at ceiling

RQ3: Effect of WM and processing speed on sentence production performance

- IWA: facilitatory effect of processing speed on sentence production ($p = .025$) but no effect of working memory measure
- CP: no influence of processing speed or Working Memory measure on performance

CONCLUSION

- IWA's performance for canonical vs. non-canonical sentences was better, in line with Burchert et al. (2008) and Harun (2020)
  - Disrupted timing of processing mechanisms (Kolk et al., 1995) and/or difficulty with the production of sentences deviating from the canonical word order (Bastiaanse & van Zonnefeld, 2005)
- IWA's performance on the Free production task was better than on the Elicitation task
  - Elicitation task is more complex: to accomplish the reversal of thematic roles required for the target sentence, participants have keep in mind the structure of the elicitation sentence and inhibit information from the elicitation picture and sentence
- IWA's sentence production performance was associated with processing speed: IWA with higher processing speed may have processed lexical and/or syntactic cues faster and more efficiently, resulting in higher accuracy rates

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