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Inter- and Intra-Individual Variability in Non-Linguistic Attention in Aphasia

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**INTRODUCTION**

Attention is a prerequisite to other cognitive skills and processes. A number of studies have identified impairment in one or more types of attention processing in persons with aphasia (PWA) relative to healthy controls; variability among PWA has also been noted (e.g., Tseng, McNeil, & Mikulski, 1993; Huntington-Pompton, Randall, & Moore, 2011; Murray, 2012). Many studies on aphasia in medicine have used linguistic tasks and have found PWA as a group to have poorer attention than controls on this task (e.g., Murray, 2000; Hula, McNeil, & Sung, 2007). Several studies have used purely non-linguistic tasks and have also found PWA as a group to have poorer attention and/or attention allocation than controls (Rabin & Rizzo, 1989; Erickson, Goldinger, & Laphonte, 1996). It has also been suggested that an impairment in attention allocation may underlie or influence language impairment in aphasia (McNeil, Odell, & Tseng, 1995; Hula & McNeil, 2008).

**PARTICIPANTS**

- 18 individuals with chronic aphasia from a unilateral stroke (66, mean age = 63.4, sd = 7.5) - 5 age-matched controls (36, mean age = 65.3, sd = 5.9)

**METHODS**

**Experimental Task**

- Five conditions, each assessing a different type of non-linguistic attention. Participants were instructed to press a key to indicate whether the target was on the left, on the right, or absent. For Condition 5, the target was left/right congruency between the two stimuli.

**RESULTS**

- **Condition 1**: Standardized visual attention
  - Condition 2: Standardized auditory attention
  - Condition 3: Selective visual attention
  - Condition 4: Selective auditory attention
  - Condition 5: Auditory-visual integral attention

**DATA ANALYSIS**

**RESULTS QUESTION 1**: Effect of task difficulty/complexity on reaction time

- 1 x 5 ANOVA for each Session determining the effect of Condition on RTs

**RESULTS QUESTION 2**: Effect of task difficulty/complexity on between-session intra-individual variability in reaction time

- A 2 x 5 (Group x Condition) ANOVA revealed a significant main effect of Group (F[1, 105] = 5.084, p < .05), such that PWA COVs > controls COVs. The effect of Condition on COV was then analyzed separately for each group:

**RESULTS QUESTION 3**: Effect of task difficulty/complexity on within-session intra-individual variability in reaction time

- 1 x 5 ANOVA for each Session determining the effect of Condition on RTs

**DATA ANALYSIS**

**RESEARCH QUESTION 1**: How does task complexity/difficulty on a non-linguistic attention task impact reaction time in PWA and in age-matched control participants?

**RESEARCH QUESTION 2**: How does task complexity/difficulty on a non-linguistic attention task impact between-session intra-individual variability (BS-IV) in reaction time in PWA and in age-matched control participants?

**RESEARCH QUESTION 3**: What kinds of inter-individual variability in BS-IV are present within the PWA group?

**OBSERVATIONS**

- For RQ1: raw RTs for correct E/R responses → RTs
  - For RQ2 and RQ3: raw RTs for correct E/R responses → COV (tdb/mean)

**CONCLUSIONS**

- On a non-linguistic attention task, increased task complexity elicits slower response times for both PWA and age-matched controls.

- Increased task complexity also elicits a higher degree of between-session intra-individual variability for PWA (but not for controls).

- This suggests that PWA may have difficulty maintaining consistent attention levels from day to day, particularly in situations that require more complex types of attention (e.g., when asked to attend to auditory information while visual information is also present), a finding which could have implications for prognosis in therapy.

- Additionally, PWA were found to exhibit a higher degree of between-session intra-individual variability than controls overall.

- Within the PWA group, different patterns of intra-individual variability were found, suggesting inter-individual variability within this group.

- One sub-group was characterized by high variability on both selective auditory and auditory/visual/integral attention, another sub-group was characterized by high variability on selective visual attention, and a third sub-group exhibited generally lower variability.

- This is the first demonstration of between-session intra-individual variability in PWA on a purely non-linguistic task.

- Future studies should directly investigate the link between intra-individual variability in non-linguistic attention and treatment outcomes.

**SELECTED REFERENCES**

- Erickson, K. J., Call, A. G., & Stine-Morrow, L. A. (1998). Auditory agnosia in aphasic individuals: Variability within sentence, suggesting inter-individual variability within this group. One sub-group was characterized by high variability on both selective auditory and auditory/visual/integral attention, another sub-group was characterized by high variability on selective visual attention, and a third sub-group exhibited generally lower variability.

- This is the first demonstration of between-session intra-individual variability in PWA on a purely non-linguistic task.

- Future studies should directly investigate the link between intra-individual variability in non-linguistic attention and treatment outcomes.

- Associations between COV and performance on standardized measures. A linear Pearson correlation matrix was conducted on Condition 1 COV, Condition 5 COV, WAB Aphasia Quotient, BNT score, and CLQT score. An association approaching significance was found between WAB AQ and Condition 5 COV (r = -.44, p = .07).
