Consistency of Sustained and Selective Non-Linguistic Attention in Aphasia

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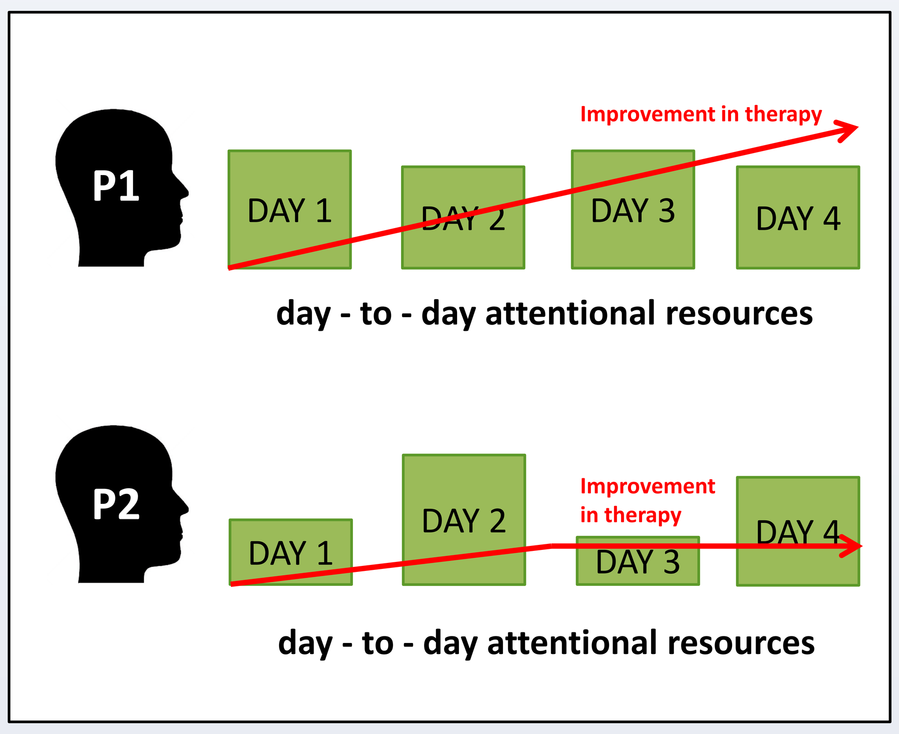
INTRODUCTION

We know that persons with aphasia (PWA) respond differently to language therapy. Factors such as age, education, months post onset, lesion size/location, and baseline language ability may play some role in a PWA's response to therapy but cannot account for all the observed differences in improvement between individuals (e.g. Lazar & Antoniello, 2008).

→ ***What other factors may be at play?***

In order to show improvement over time in a therapy program, an individual must be able to **attend** to stimuli consistently from session to session. Attention has been found to be impaired in PWA (e.g. Murray, 2012), and it has in fact been theorized that attentional impairment is central to language deficits (Hula & McNeil, 2008). Our goal in this study was to measure day-to-day variability in attentional resources by using repeated sampling. We chose to measure attention in as pure a form as possible by using simple visual and auditory nonlinguistic stimuli.



RESEARCH QUESTIONS

RQ1. Reaction Times

A. How well do PWA and age-matched controls perform on a non-linguistic attention task, and how is this related to task complexity? ***Hypothesis*: PWA will show relatively longer reaction times on more complex tasks. Controls will also show relatively longer reaction times on more complex tasks.**

RQ2. Variability

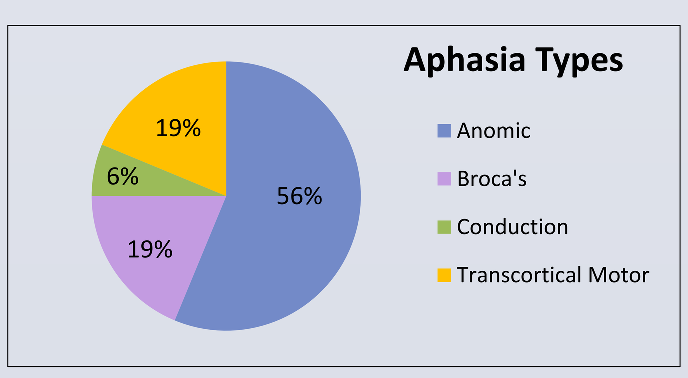
A. How much day-to-day intra-individual variability (IIV) do PWA show on this task, and how is this related to task complexity? ***Hypothesis*: PWA will show more IIV on more complex tasks.**

B. How does IIV in PWA on this task differ from IIV in age-matched controls? ***Hypothesis*: PWA will show more IIV than controls on any given task.**

METHODS

Participants:

- 16 individuals with chronic aphasia from a unilateral stroke (5F, mean age = 61.3, sd = 8.2)
- 4 age-matched controls (2F, mean age = 64.5, sd = 8.2)



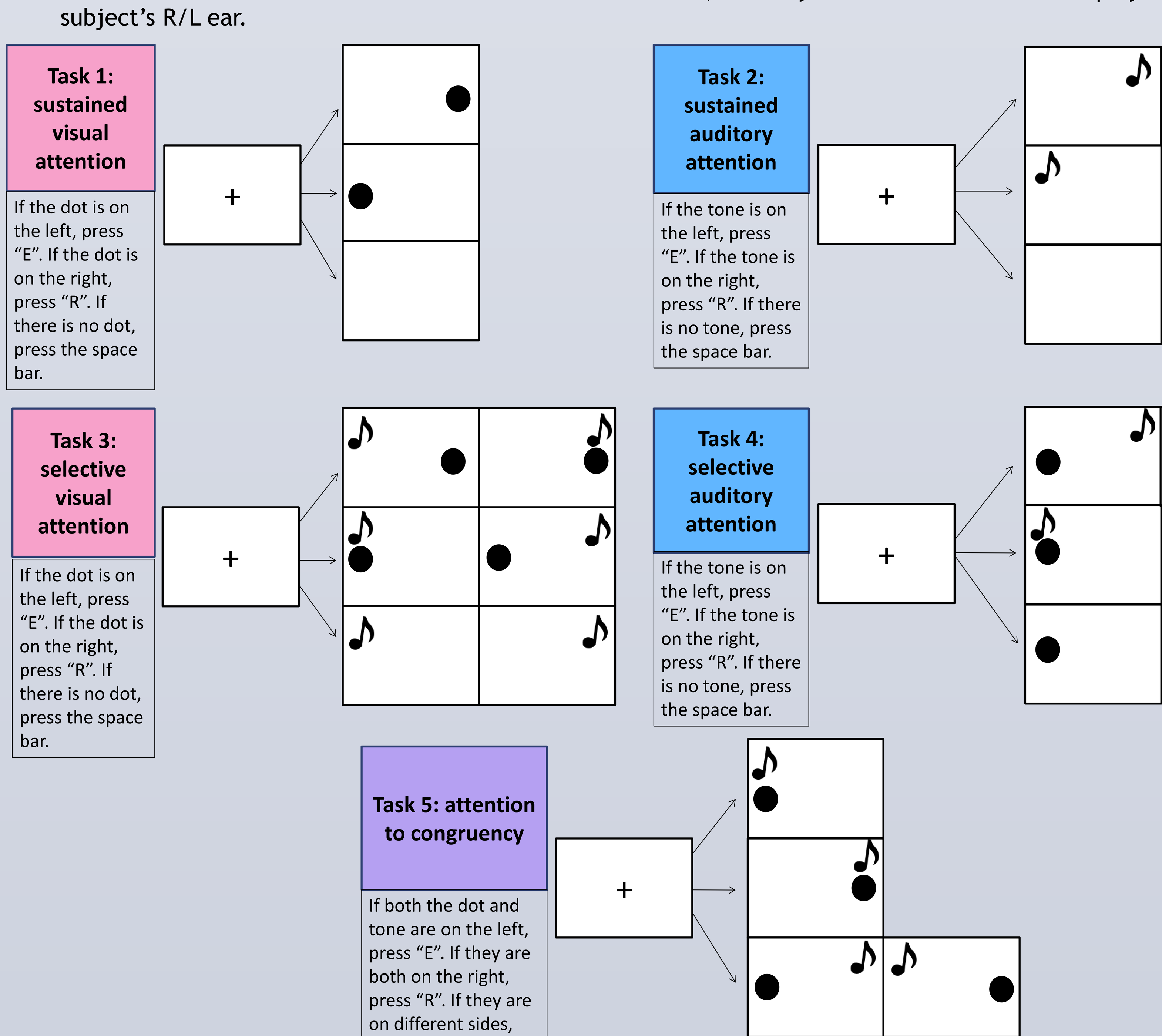
PWA: Additional Info

	mean age	mean MPO	mean AQ*	mean BNT*	mean CLQT*
mean	61.3	55.8	80.1	39.0	84%
range	47 - 74	9 - 186	50 - 98.9	6 - 60	55% - 100%

*AQ = Aphasia Quotient from the Western Aphasia Battery
*BNT = Boston Naming Test
*CLQT = Composite score from Cognitive Linguistic Quick Test

Tasks:

- Each task ran about 4 minutes, and each was administered 4 times on non-consecutive days.
- Visual stimuli consisted of dots on the R/L side of the screen; auditory stimuli consisted of tones played in the subject's R/L ear.

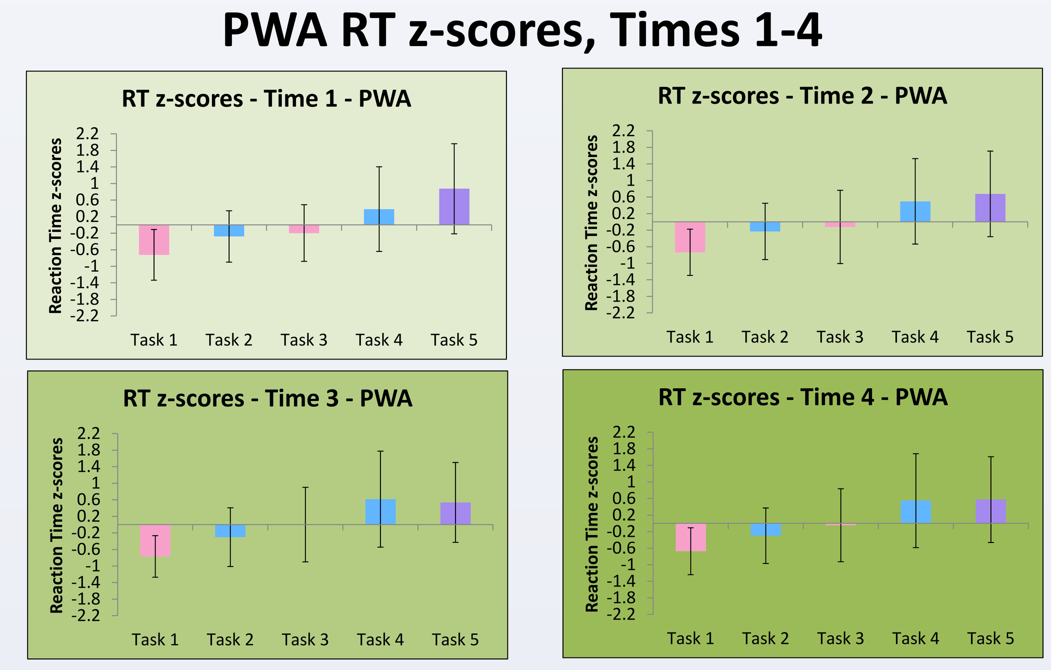


RESULTS

Accuracy on the tasks was generally high; our analyses are based on reaction times for correct R/L responses.

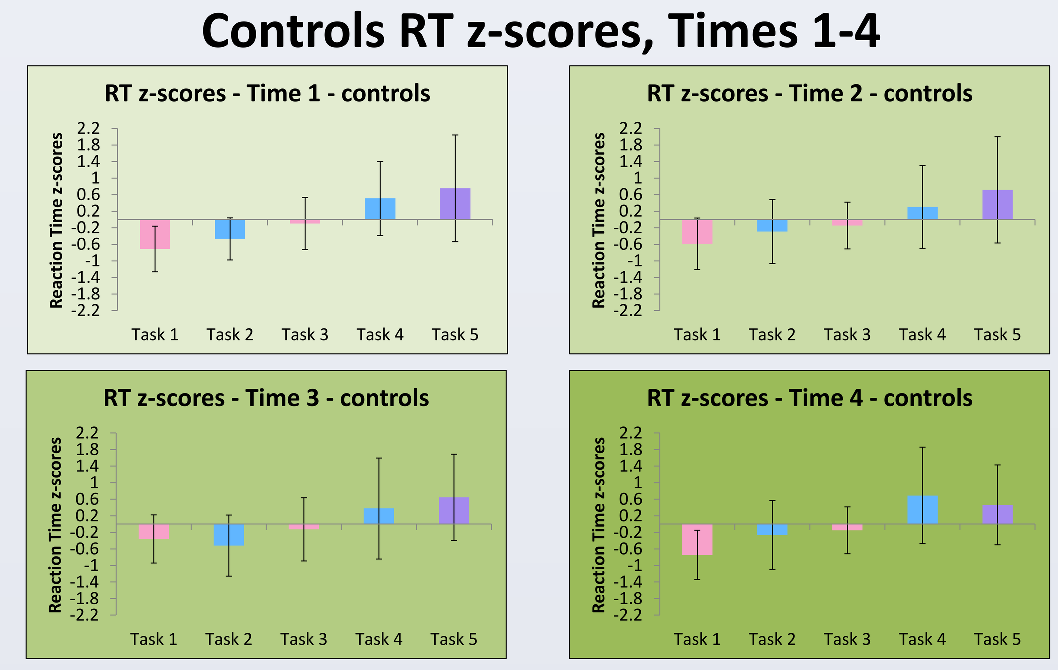
LOOKING AT RT Z-SCORES

PWA RT z-scores, Times 1-4



RQ1. RT z-scores were longer on more complex tasks across PWA. Additionally, PWA showed longer RTs on auditory tasks than on visual tasks of corresponding complexity.

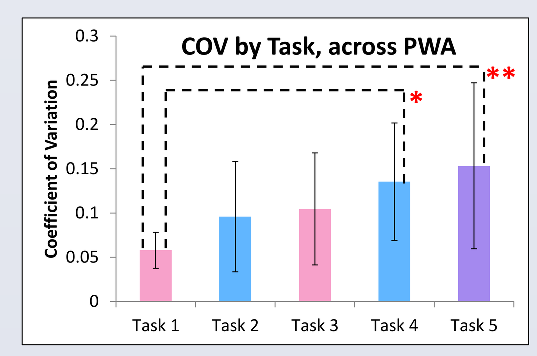
Controls RT z-scores, Times 1-4



Controls showed a similar pattern to that of PWA: generally, RTs were longer on more complex tasks, as well as longer on auditory tasks than visual tasks of similar complexity.

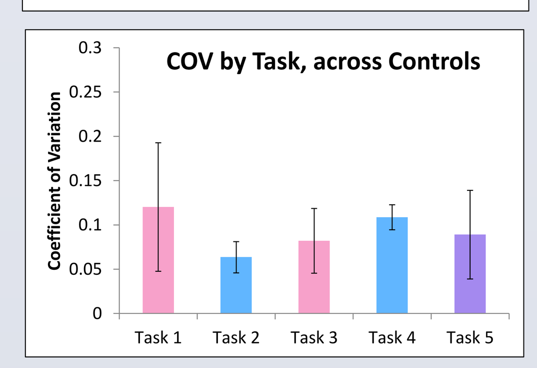
LOOKING AT VARIABILITY

To examine intra-individual variability, a coefficient of variation (COV, or sd/mean) was calculated for each subject, each task (13 pts x 5 tasks = 65 COVs total. A higher COV indicates a higher degree of day-to-day variability.



***Task 1 and Task 4 COVs differ significantly (p = .011).**
****Task 1 and Task 5 COVs differ significantly (p = .001).**

RQ2A. A one-way ANOVA revealed a significant effect of Task on COV across PWA, F(4,80) = 5.08, p = .001. A Tukey post-hoc analysis revealed that the COV for Task 1 differed significantly both from the COV of Task 4 and from the COV of Task 5, suggesting that day-to-day IIV in PWA is associated with task complexity. No complexity effect was observed for control subjects.



No apparent link between complexity and COV for control subjects.

RQ2B. Next, we compared each patient's COV for a given Task with the control mean COV + 1sd for that Task.

	COV on Task 1	COV on Task 2	COV on Task 3	COV on Task 4	COV on Task 5
BUMA20	0.066	0.082	0.100	0.159	0.172
BUMA98	0.058	0.233	0.202	0.170	0.079
BUMA93	0.035	0.066	0.049	0.017	0.045
BUMA96	0.060	0.076	0.102	0.106	0.142
BUMA69	0.062	0.120	0.089	0.164	0.170
BUMA05	0.066	0.060	0.056	0.059	0.116
BUMA15	0.091	0.047	0.147	0.047	0.293
BUMA32	0.068	0.245	0.079	0.232	0.402
BUMA92	0.061	0.027	0.245	0.203	0.117
BUMA97	0.063	0.121	0.088	0.175	0.144
BUMA86	0.023	0.022	0.051	0.166	0.078
BUMA08	0.061	0.076	0.081	0.179	0.143
BUMA50	0.014	0.100	0.055	0.072	0.066
BUMA23	0.088	0.094	0.131	0.161	0.074
BUMA115	0.045	0.076	0.188	0.052	0.162
BUMA62	0.063	0.091	0.010	0.207	0.252
Control mean	0.120	0.063	0.082	0.109	0.089
Control standard deviation	0.073	0.018	0.037	0.014	0.050
Number of pts whose COV was more than 1sd above the mean control COV for that Task	0	8	5	10	9
Percentage of pts whose COV was more than 1sd above the mean control COV for that Task	0%	50%	31%	63%	56%

Findings:

- In general, PWA were likely to perform more variably than controls on Task 2, Task 4, and Task 5.
- In general, PWA were likely to exhibit a level of variability similar to that of controls on Task 1 and, to some extent, Task 3.
- PWA also differed from each other, with some performing similarly to controls across tasks and some exhibiting higher variability on multiple tasks.

CONCLUSIONS

RT Z-SCORES

- On a non-linguistic attention task, RTs are associated with task complexity for both PWA and controls, such that both groups show relatively longer RTs on more complex tasks.
- Both PWA and controls also show longer RTs on tasks requiring them to attend to auditory stimuli than on tasks of corresponding complexity that require them to attend to visual stimuli.

VARIABILITY

- PWA show more day-to-day variability on most non-linguistic attention tasks than do age-matched controls, particularly on more complex tasks and/or tasks requiring auditory/visual integration.
- These results have implications for PWAs' performance in both testing and treatment situations. Since therapy requires an individual to attend to and integrate auditory and visual information during each session, as well as to build on the progress made from session to session, we believe that there may be an association between variability on more complex tasks (particularly Task 5, which requires auditory/visual integration) and ability to improve in therapy, such that individuals exhibiting high day-to-day attentional variability may progress more slowly in a therapy program.

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