



Age-related differences in resting state network connectivity and language

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1 Introduction

Although aging is often associated with cognitive decline, there is considerable variability in age-related performance across cognitive domains. In addition to behavioral variability, there are well documented neurological changes associated with age, (e.g., Madden et al., 2012; Madden et al., 2009; Sullivan and Pfefferbaum, 2006, 2011). One measure of particular interest is resting state functional MRI (rsfMRI). rsfMRI is a non-invasive measure of brain function in which connectivity between regions and within and between networks can be assessed. Although this measure typically does not involve performing a task, measures of rsfMRI have been linked to cognitive performance, cognitive decline, and clinical status (e.g., Baldassare et al., 2012). Thus, rsfMRI connectivity may provide important information about age-related differences. To better understand the behavioral and neural variables contributing to age-related differences in language, we conducted a functional magnetic resonance imaging (fMRI) experiment with younger and older adults in which both task and resting state data were collected. Specifically we were interested in the relationships among age, connectivity within the default mode and language networks, and behavioral performance on a language task in which participants made semantic and phonological decisions about pictures. We hypothesized that age-related differences in rsfMRI connectivity would reduce the age-related variance in behavioral performance.

2 Participants

	Younger	Older
N	16	16
Age*	23.5 (4.6)	68.57 (3.5)
Education	15.88 (2.4)	16.29 (2.2)
MMSE	29.44 (0.7)	28.93 (1.2)
BDI	1.38 (2.1)	1.14 (1.9)
Vocabulary*	55 (4.3)	62.36 (4.8)
Verbal Fluency*	77.56 (20.5)	63.07 (17.9)
Digit Symbol RT*	1169.7 (154.8)	1938.2 (352.7)
Stroop RT*	432.11 (63.7)	634.52 (82.7)
Speed RT*	268.27 (29.2)	375.40 (69.3)
Immediate Recall*	12.50 (2.0)	9.64 (2.4)
Delayed Recall*	11.31 (2.1)	7.64 (2.1)

Data are mean (sd) * = p < .05

3 Methods

fMRI Parameters

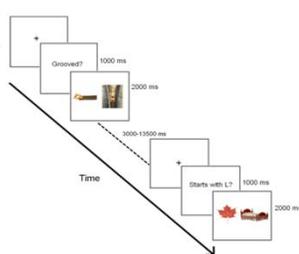
- 3T GE Excite HD scanner, 8-channel head coil
- resting functional images: inverse spiral (TR=1.5s; 4x4x4mm, 30 slices)

rsfMRI Analyses

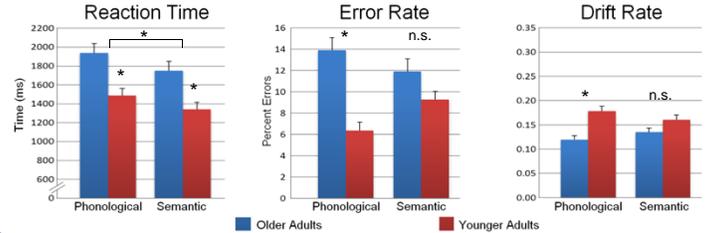
- Data were slice-time corrected, normalized, low pass filtered (.08 Hz), and smoothed using FSL.
- Motion parameters, CSF, and WM signals were treated as nuisance covariates.
- rsfMRI data were scrubbed for motion (time points with > 0.5mm motion or > 0.5% signal change and 2 neighbors were removed).

Task & Stimuli

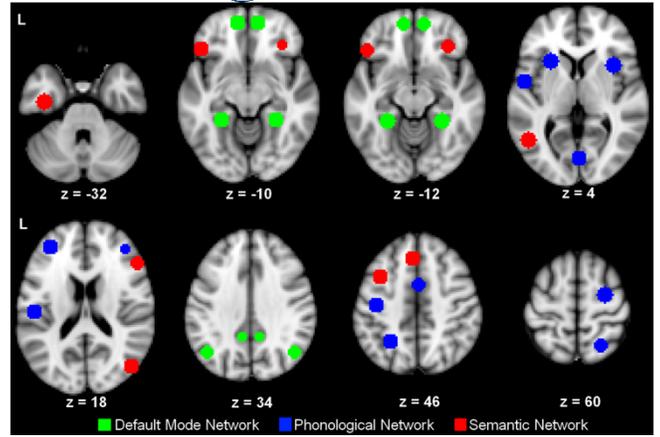
- rsfMRI: participants viewed a fixation cross for a 5 minute run.
- behavioral task: participants made semantic and phonological decisions about pictures.



4 Behavioral Results

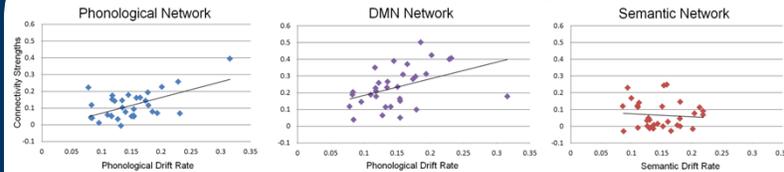


5 Resting State Networks

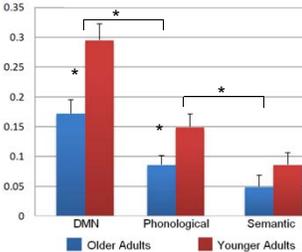


6 rsfMRI Results

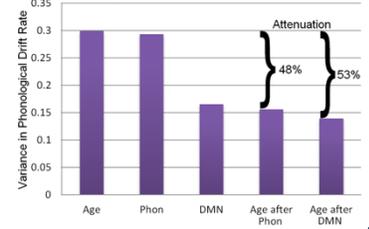
Correlations Between Behavior and Connectivity Across Networks



Age-Related Differences in rsfMRI



Attenuation of Age-Related Variance



7 Conclusions

- Age-related differences in default mode and phonological networks, but not the semantic network, suggest a differential decline across networks.
- The relations between DMN and phonological network connectivity and behavior suggest that the integrity of resting-state networks influence cognition and behavior.

