

Predicting Age And Novel Word Learning Ability Using Diffusion Weighted Imaging

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Introduction

- While episodic memory deficits are most commonly associated with Alzheimer's disease (AD), other forms of learning and memory also decline.
- Numerous studies have demonstrated broader language deficits, including impairments in semantic (word-meaning) and lexical learning.^{1,2}
- It remains unclear whether these deficits are partially driven by deficits in episodic memory itself, since learning meanings for novel words requires associative memory.³
- Additionally, the relationship between these cognitive changes and gray-matter diffusion-weighted imaging (DWI) measures has not been well characterized.⁴

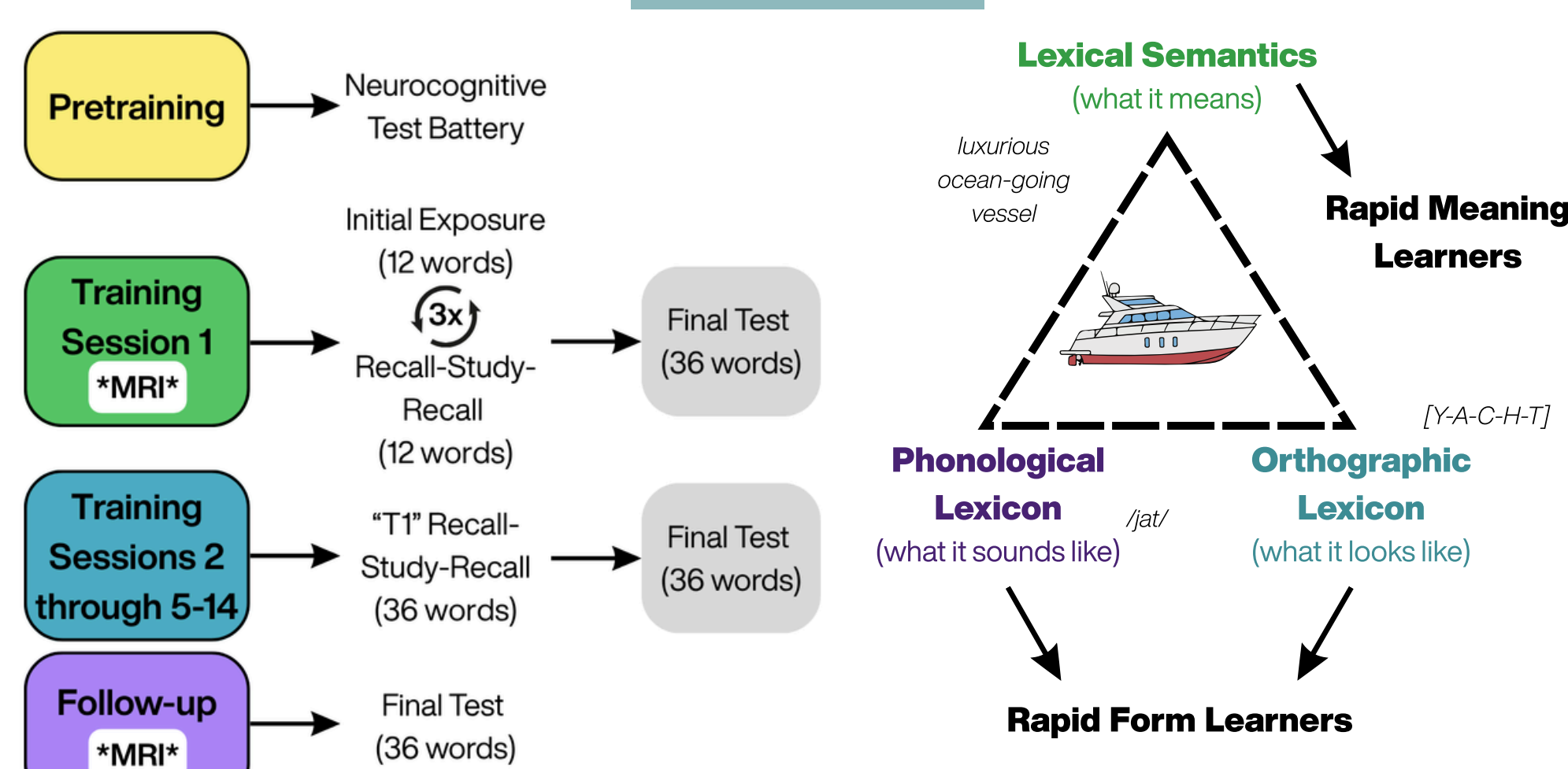
Objective: To analyze how healthy aging influences the encoding and retention of new word forms and meanings.

Methods

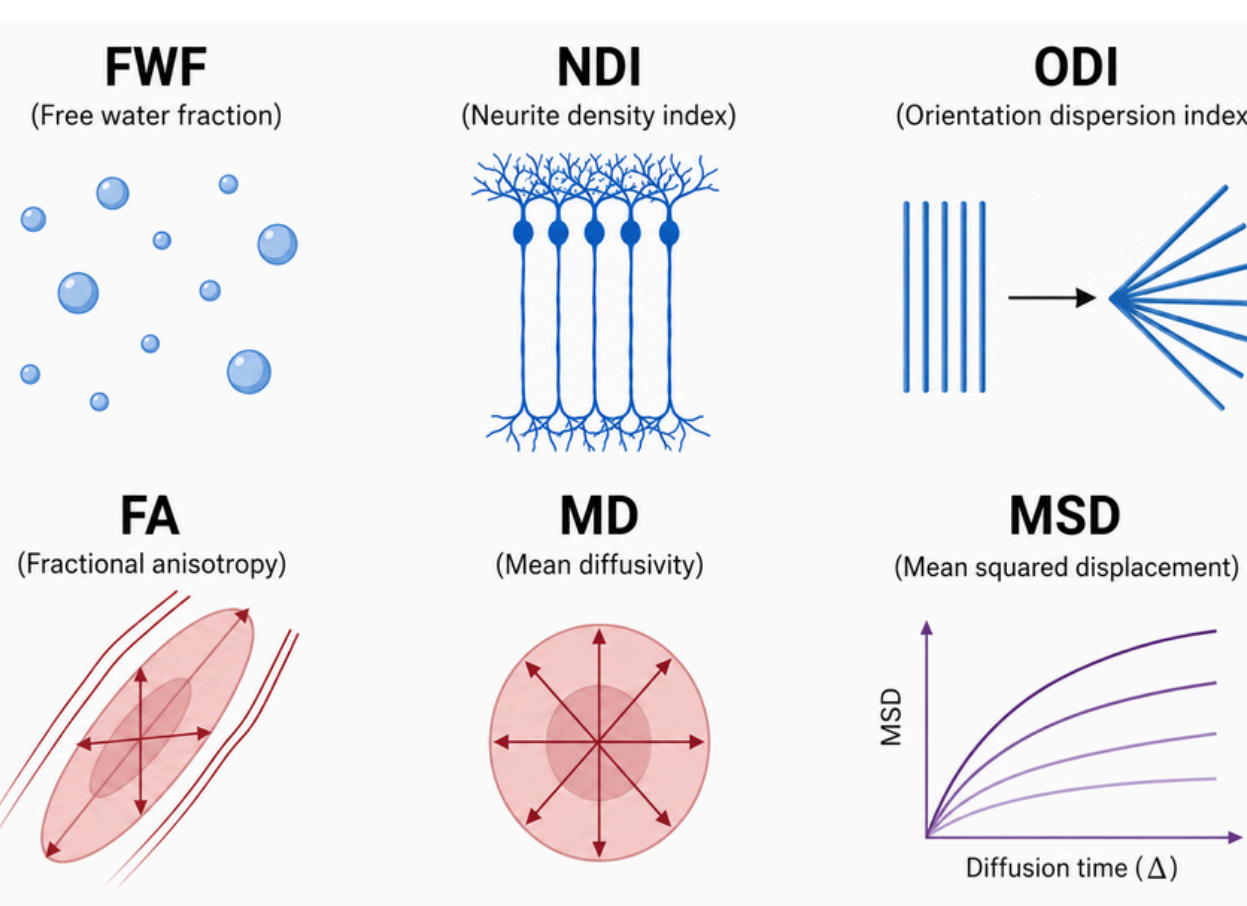
Demographics

	Young Adults (n=23)	Older Adults (n=22)
Age (years)	21.5 ± 3.9	67.22 ± 5.4
Sex	14 F, 8 M	12 F, 11 M
Education (years)	15.73 ± 1.8	18.48 ± 3

Study Design

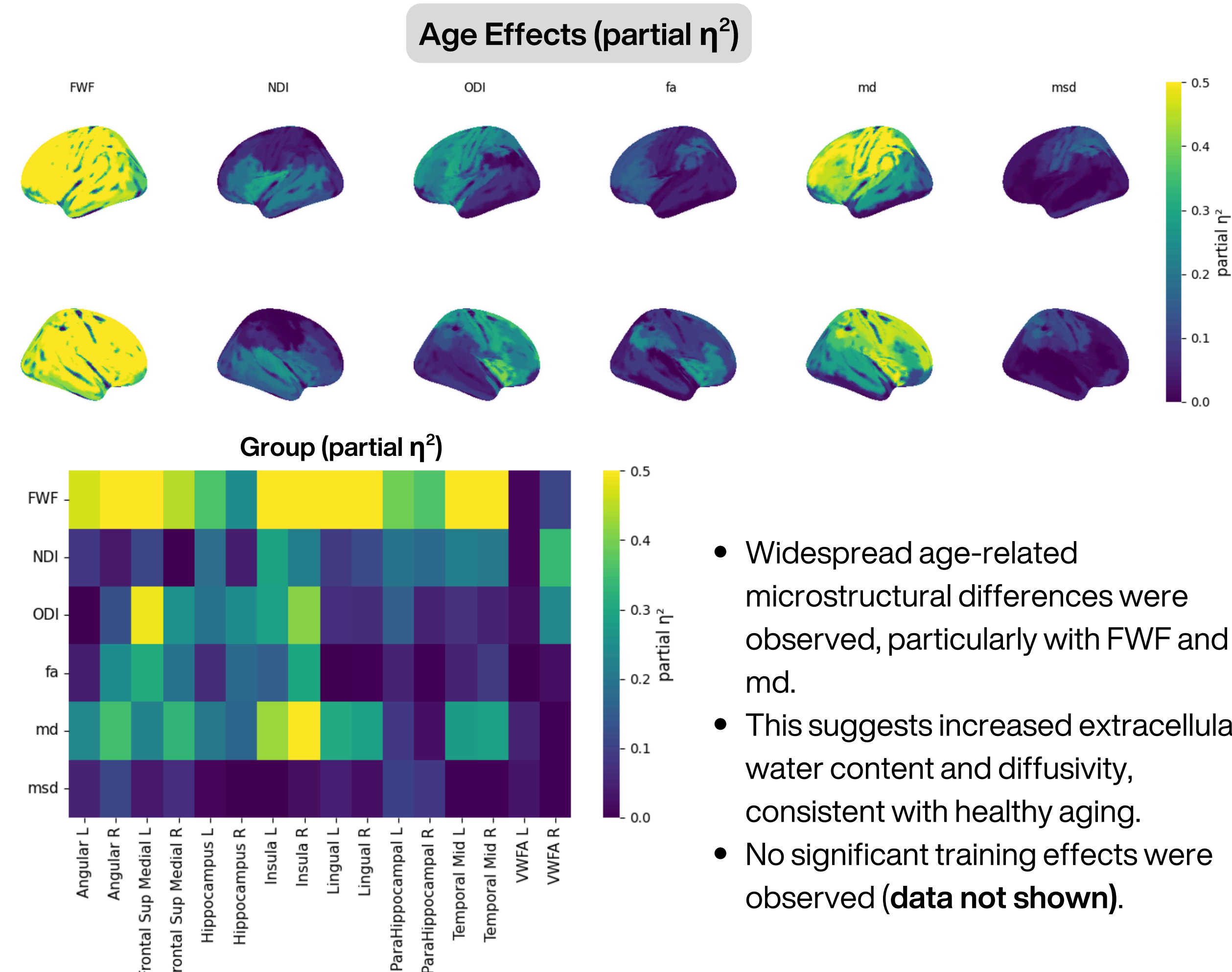


Processing/Analysis

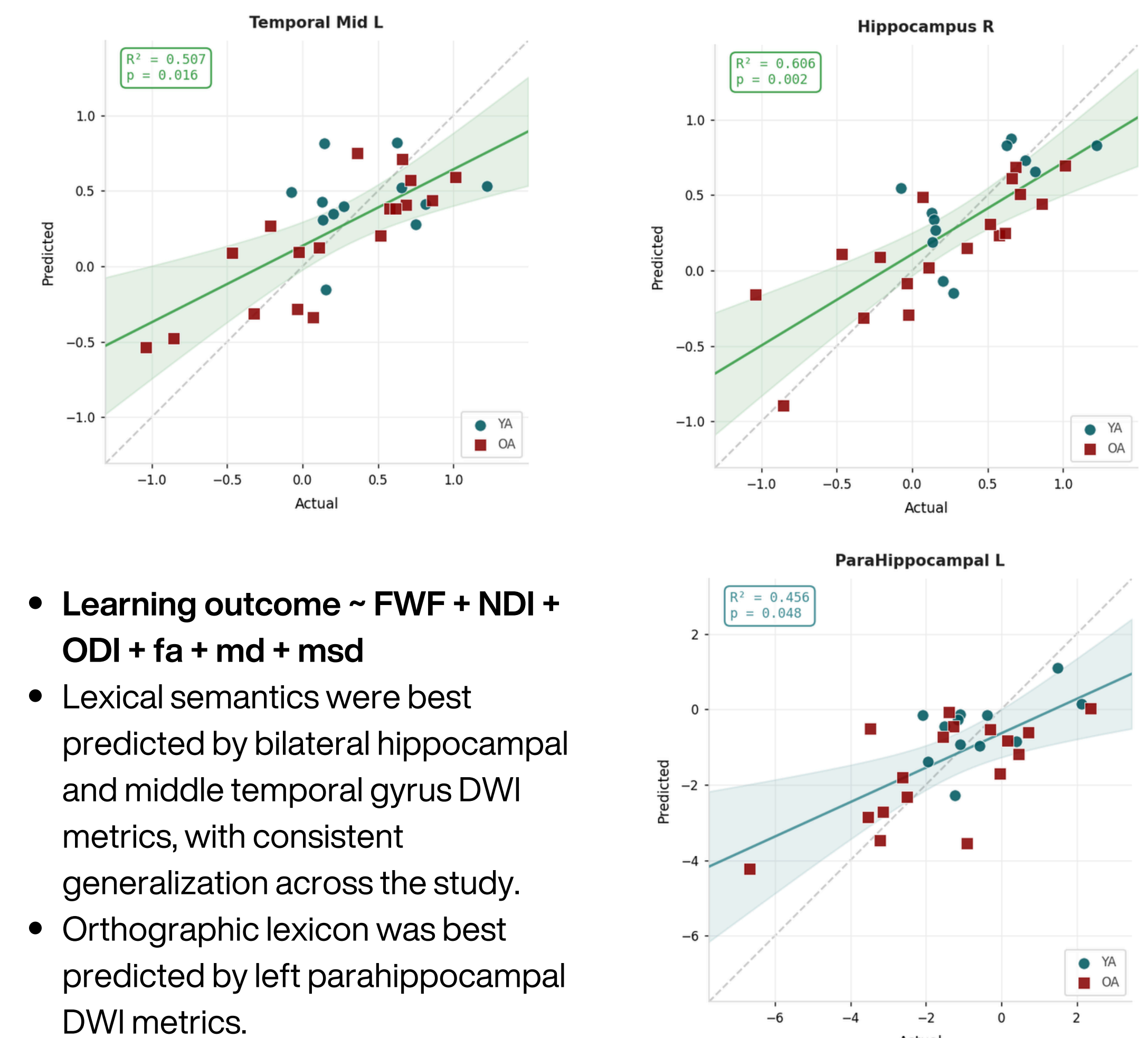


- A priori selection of memory and language related ROIs
- Age and session effects on DWI metrics assessed using ANOVA
- Learning outcomes predicted using regional DWI metrics
- Rapid learners classified using regional DWI metrics

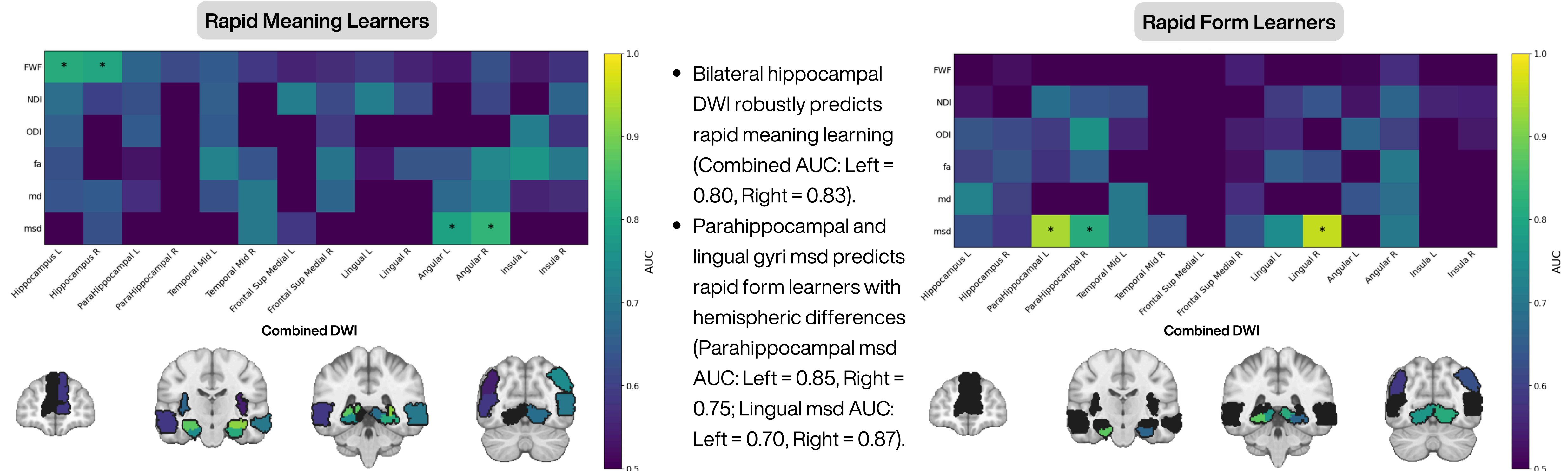
Widespread Age-Related Microstructural Differences



DWI Predictors of Learning Outcomes



Medial Temporal DWI Metrics are Strong Predictors of Rapid Learning



Discussion

- DWI metrics show strong differences consistent with microstructural changes in healthy aging.
- However, there were no training effects with DWI observed across the course of the study.
- Results are consistent across predicting continuous and binary learning outcomes: hippocampal DWI predicted word meaning learning, while parahippocampal DWI predicted word form learning.
 - This suggests that individual differences in temporal lobe microstructure contribute to the ability to learn and retain novel word forms.
- These findings provide insight into the neural mechanisms underlying word learning in healthy aging, and may offer a baseline for comparison with neurodegenerative disease populations.

References

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