

Structural Brain Differences in Good and Poor Comprehenders Identified Through a Regression-Based Quantitative Method

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Introduction

Specific Reading Comprehension Deficit (S-RCD): poor reading comprehension despite intact word reading ability

- Associated with language-specific and domain-general deficits.
- Less functional connectivity between IFG and hippocampus for low-frequency words in S-RCD relative to TD (Cutting et al., 2013)
- Reduced gray matter volume in right prefrontal cortex for S-RCD relative to TD (Bailey et al., 2016)

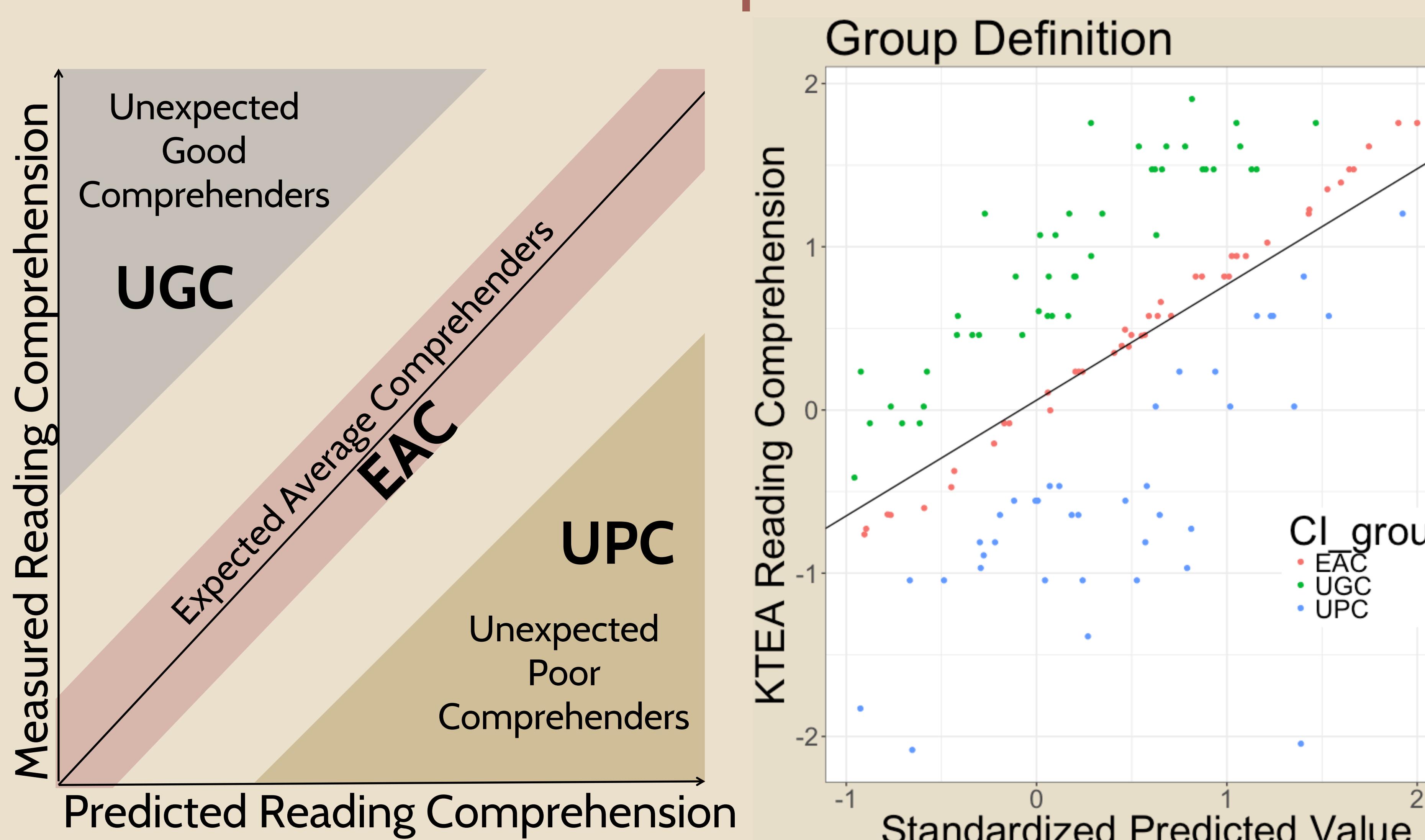
Typical approach for S-RCD classification involves cutoffs

- E.g., comprehension < 90, decoding > 100
- Individuals with quantitatively different scores treated as qualitatively different

New approach for defining S-RCD: regression-based

- Reading comprehension ability is predicted from low-level skills (nonverbal IQ, decoding, vocabulary, etc.)
- Predicted reading comprehension is compared to measured reading comprehension

Participants



Current Model:

Reading Comprehension ~ Age + Decoding + Performance IQ + Vocabulary

EAC: within 15% CI; UGC/UPC: outside of 65% CI

Results

Whole-Brain Analysis

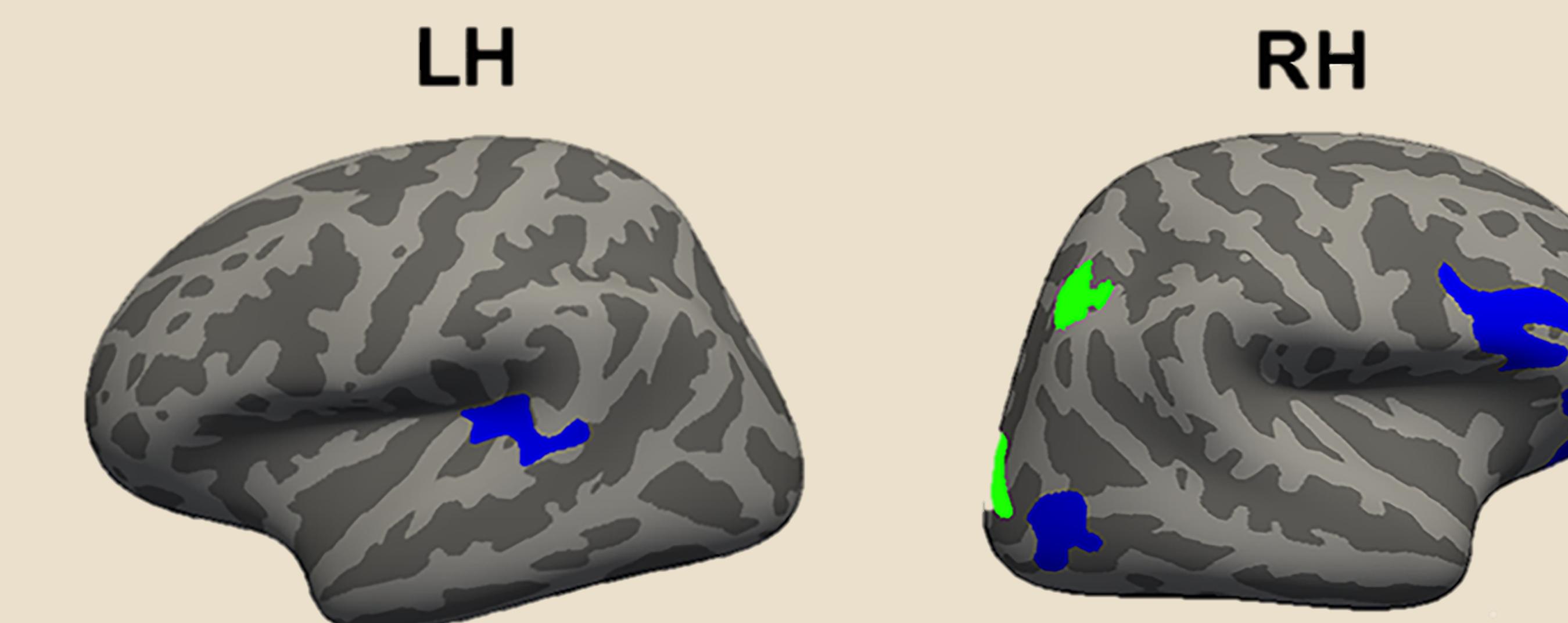
Covariates: Sex, Age

Gray Matter Volume

Green indicates UPC > EAC:

- Right lateral occipital gyrus
- Right superior parietal lobule

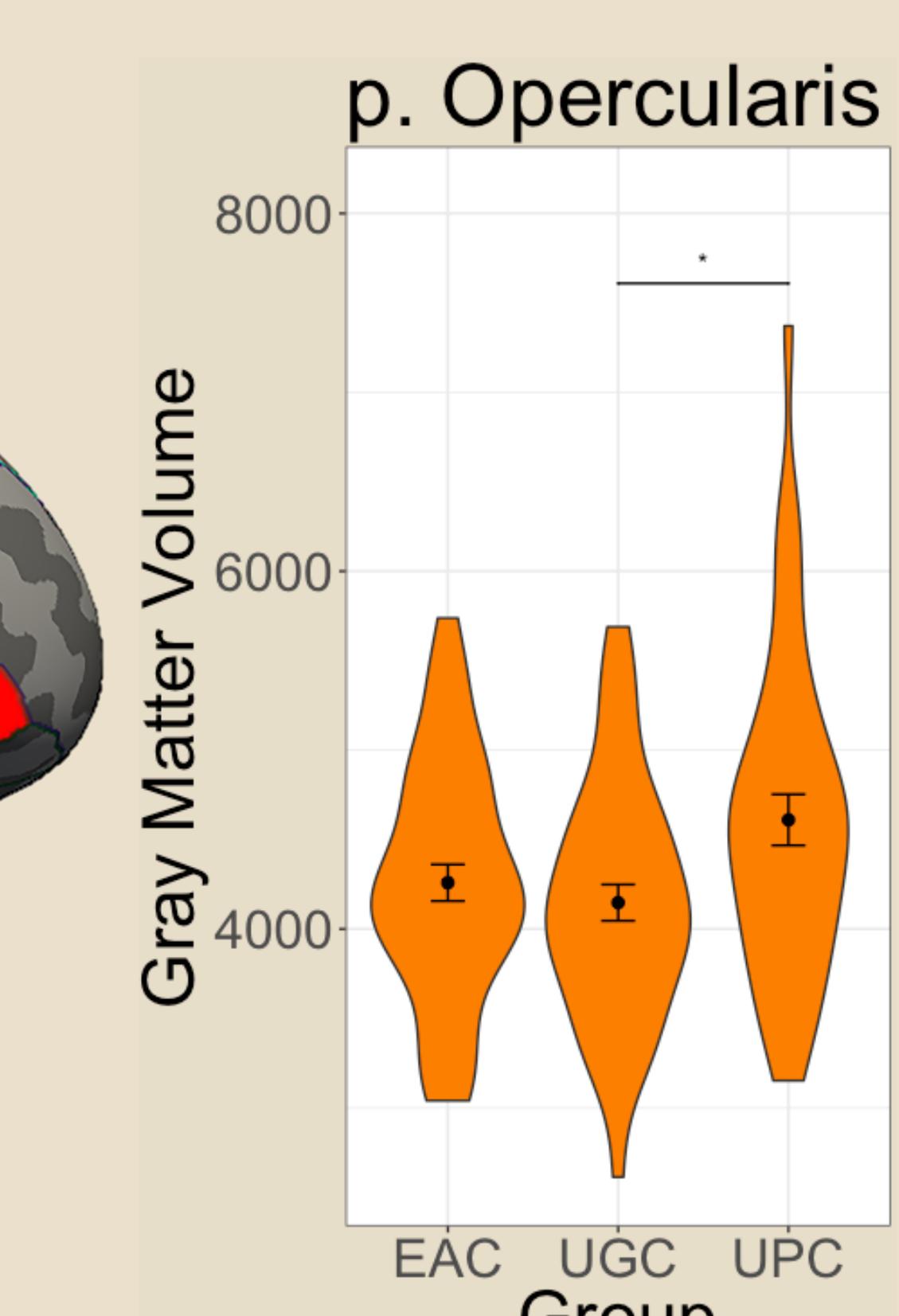
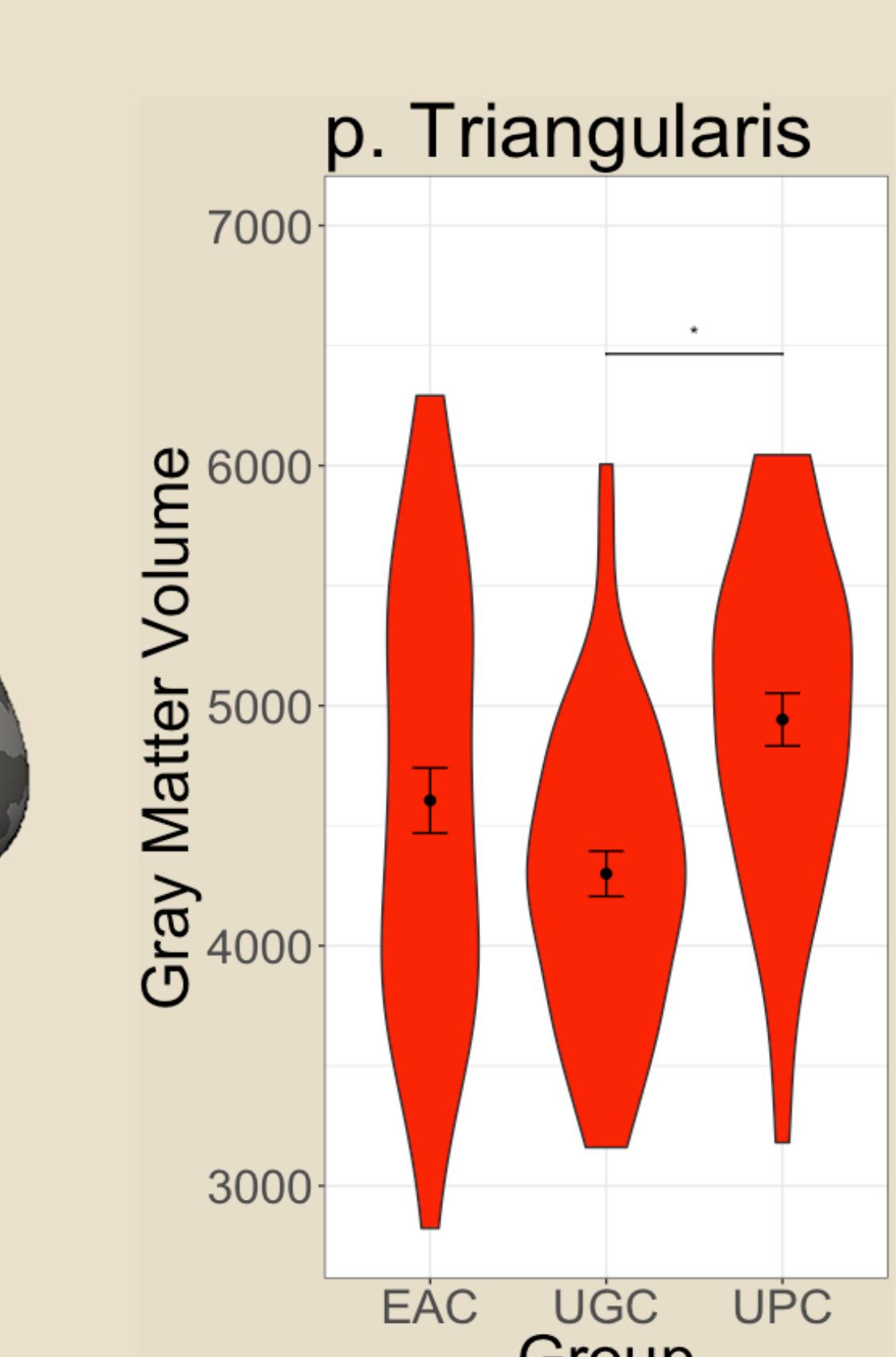
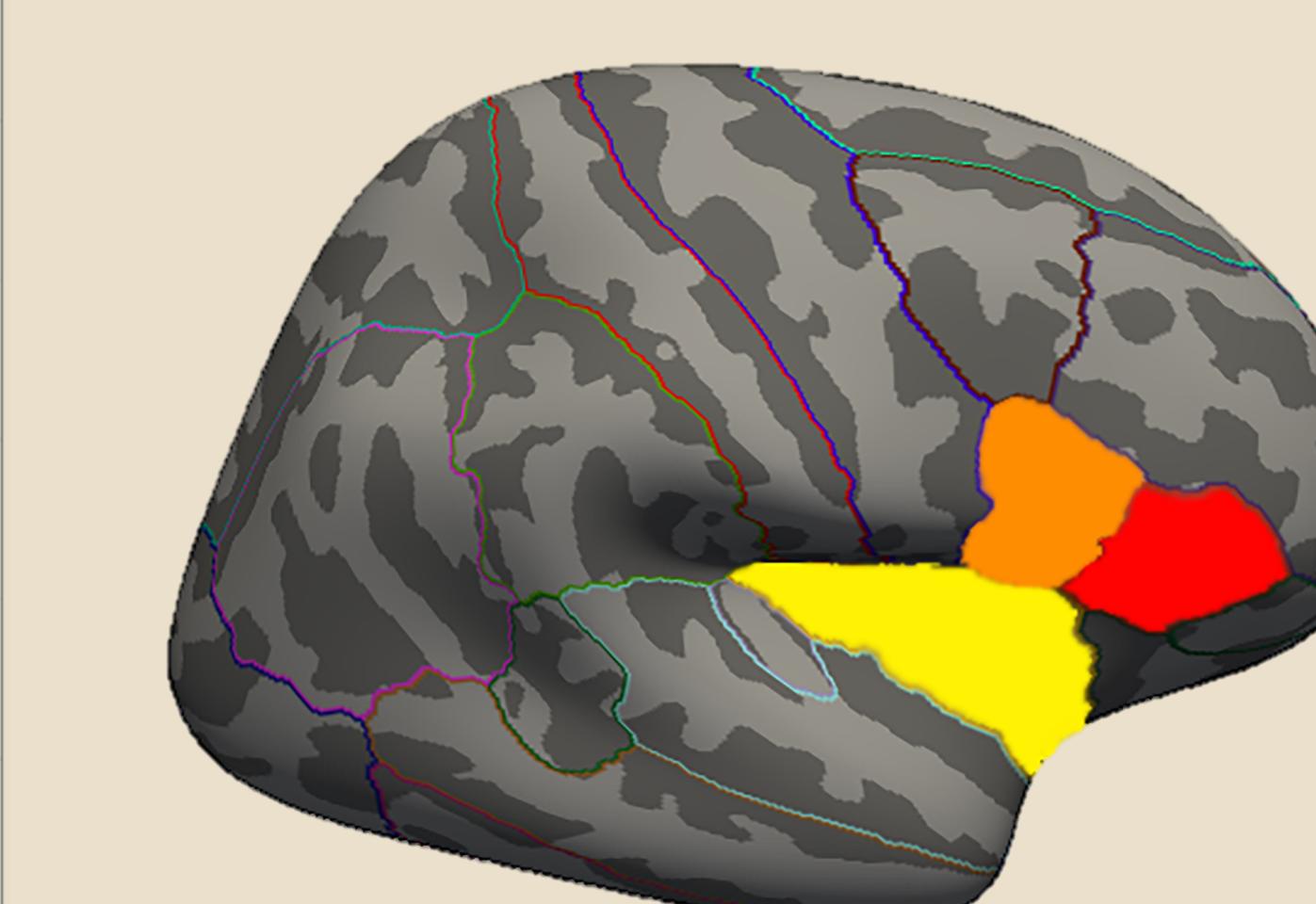
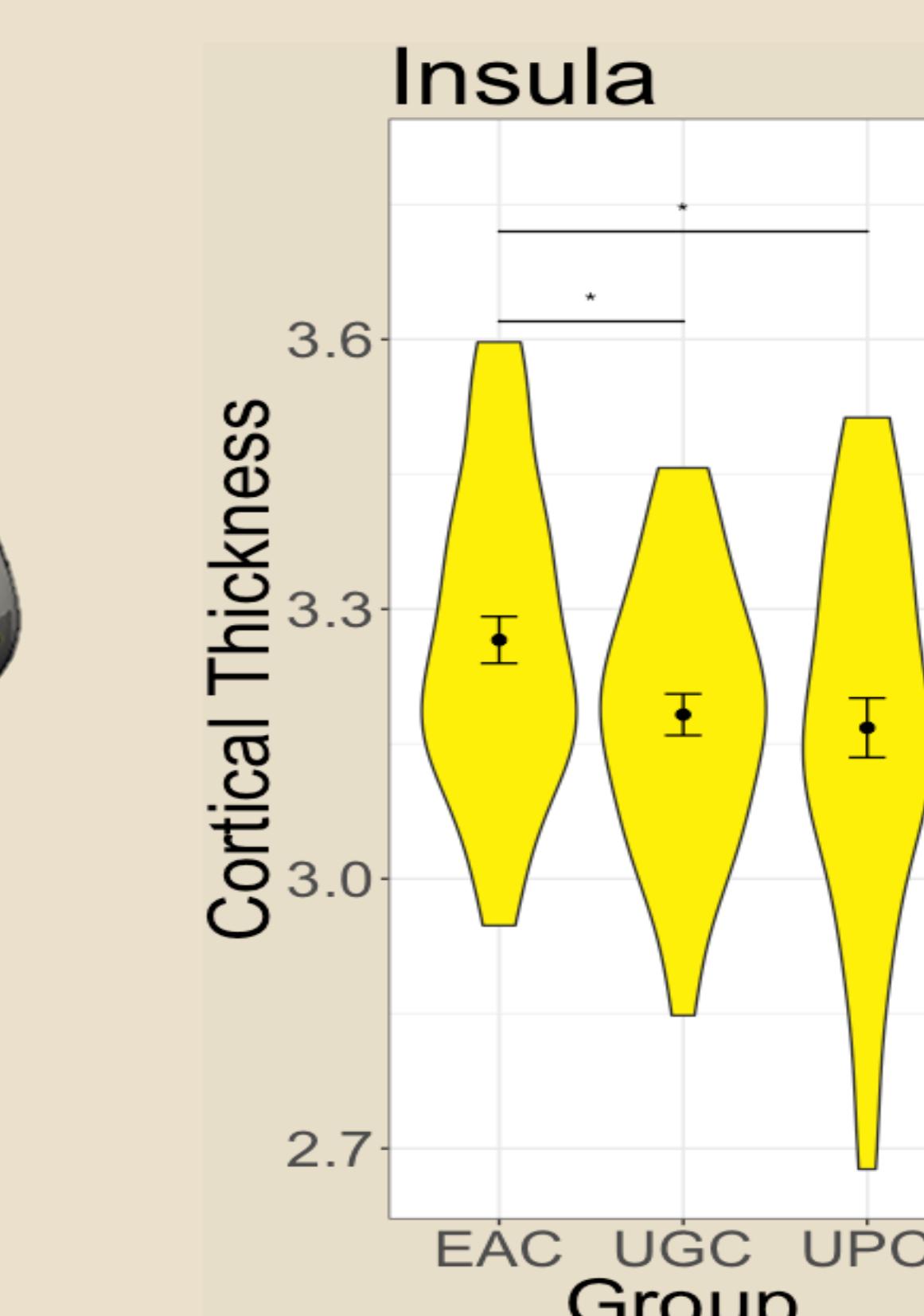
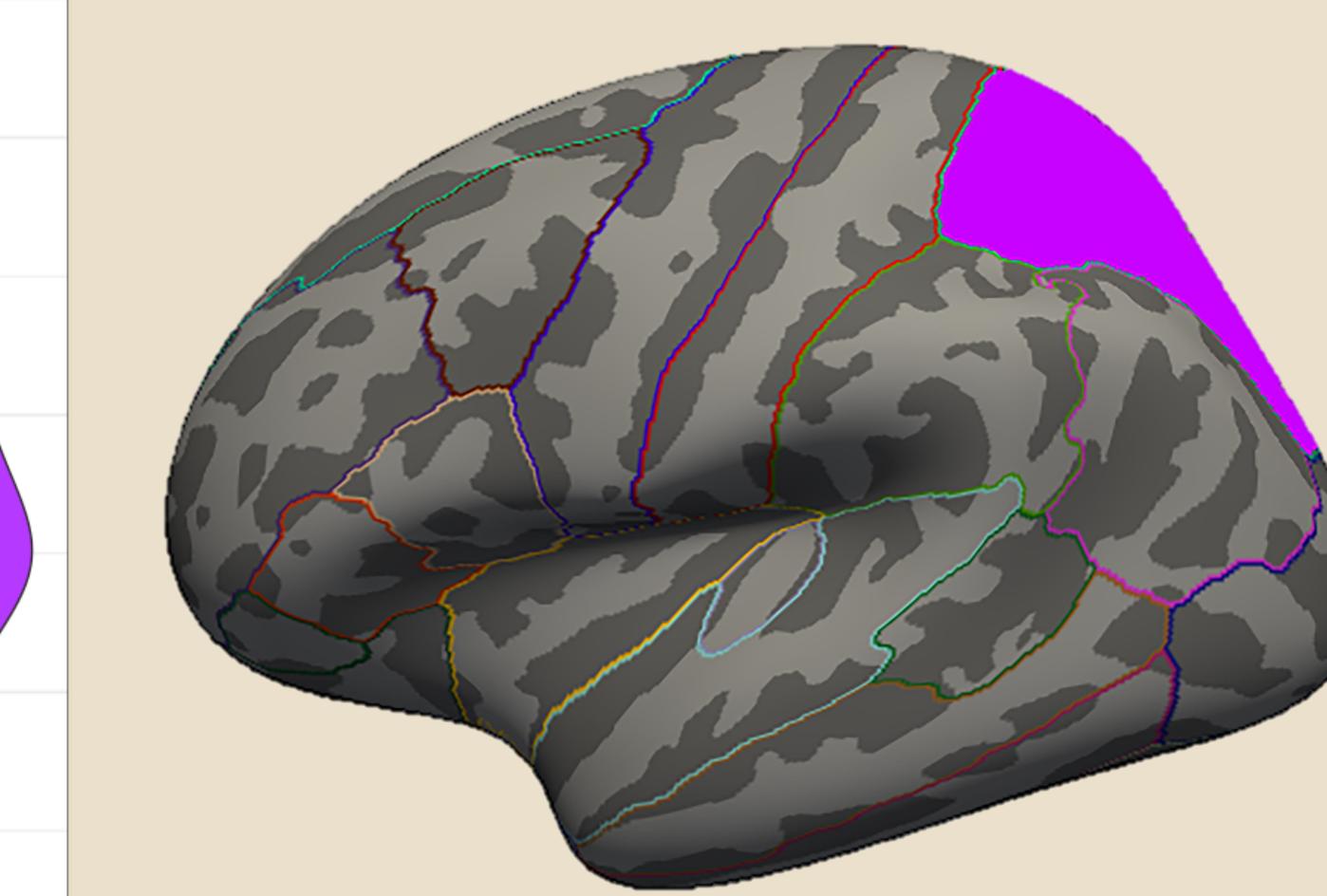
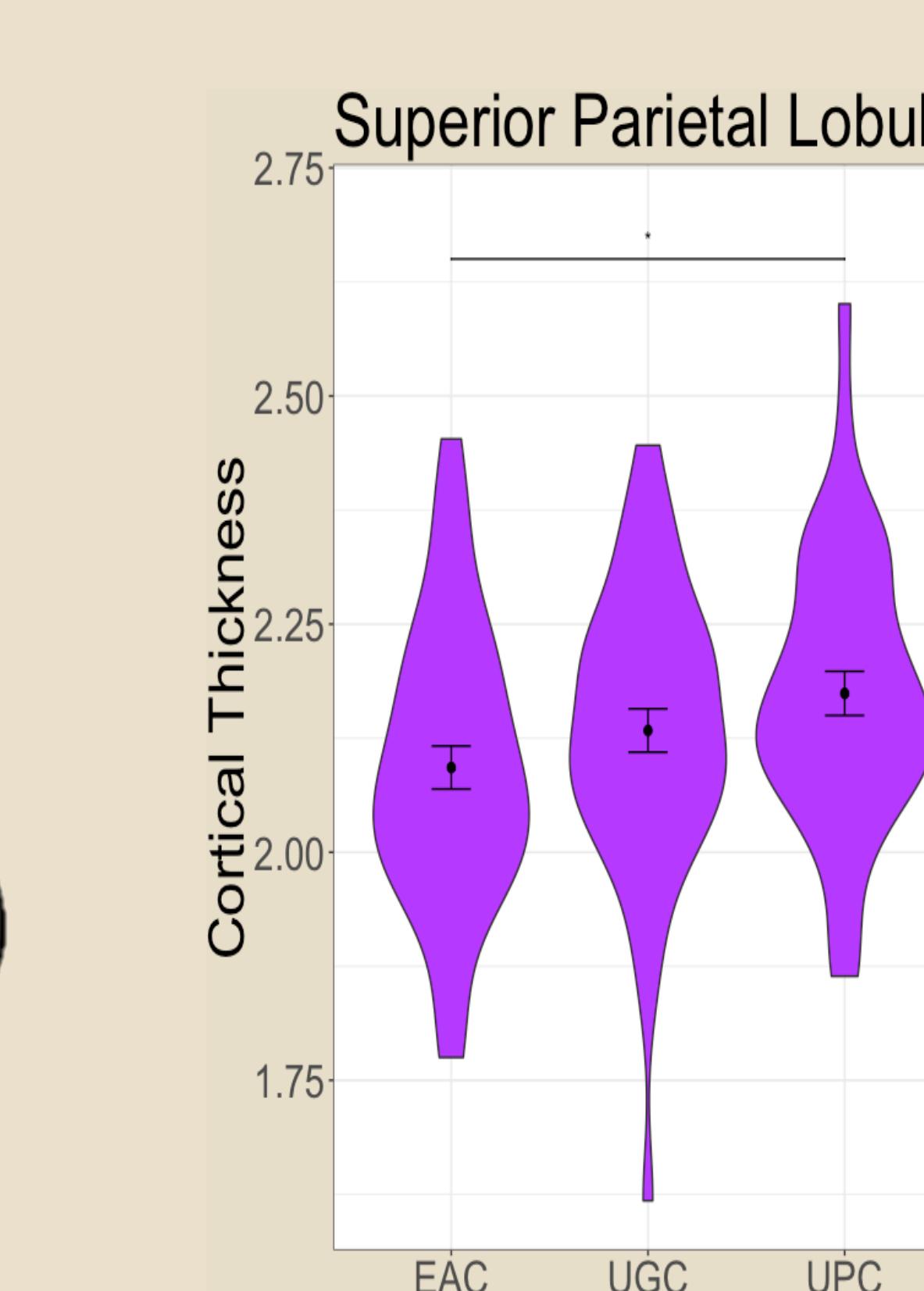
LH



RH



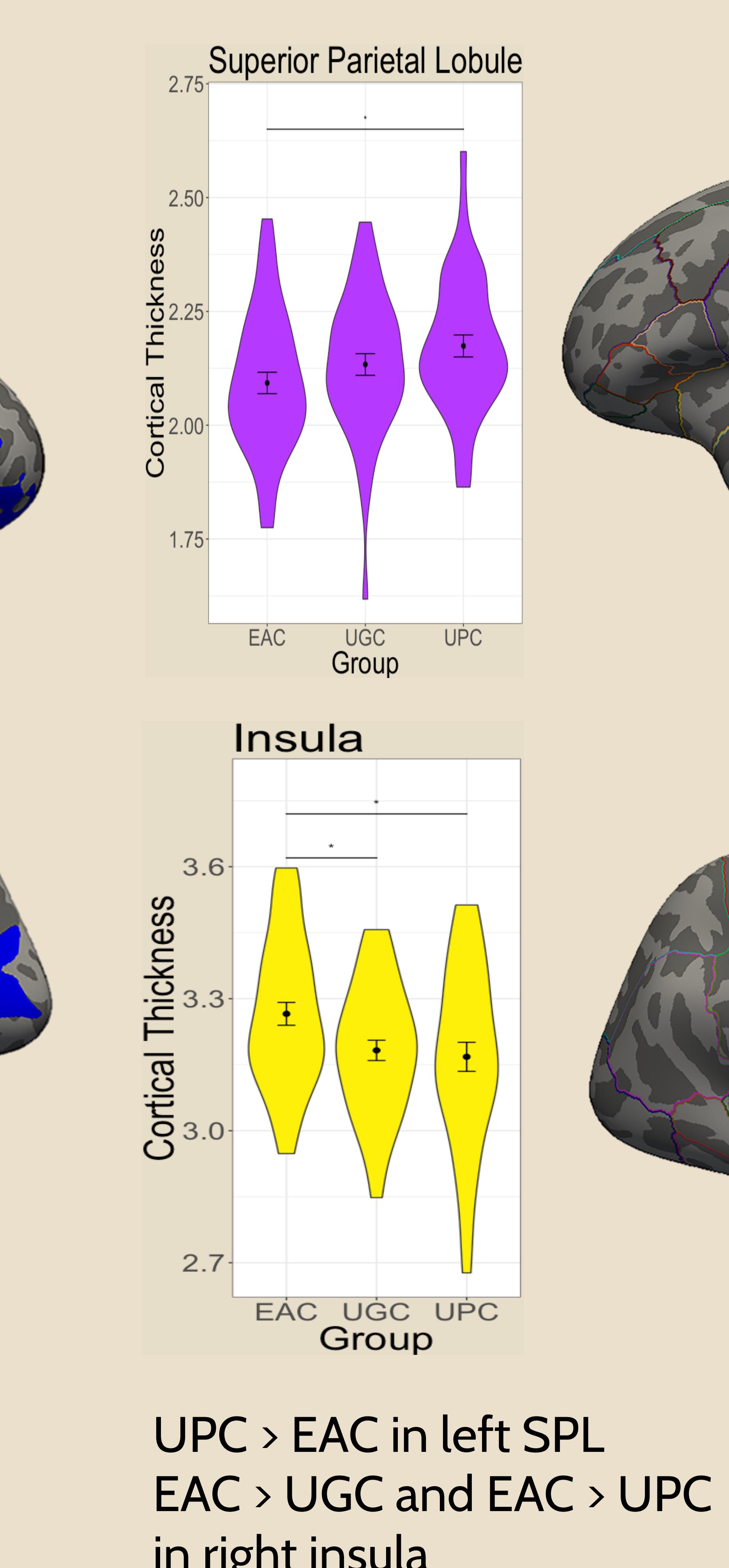
Cortical Thickness



ROI Analysis

Covariates: Sex, Age; standard ROIs from Freesurfer

Gray Matter Volume



Discussion

UPC have greater volume & thickness in language-related regions – especially RH

- May indicate less automaticity for UPC
- Right lateralization of results may be related to more complicated processing (e.g., comprehension)
- Negative relationship between volume and skill
- Consistent with Bailey et al. (2016) – S-RCD mostly found to have more GMV than TD

UPC differ from both EAC and UGC in various regions; EAC differ from both UPC and UGC in RH insula

- Regression-based approach may give more information about how brain structure is related to skill discrepancies