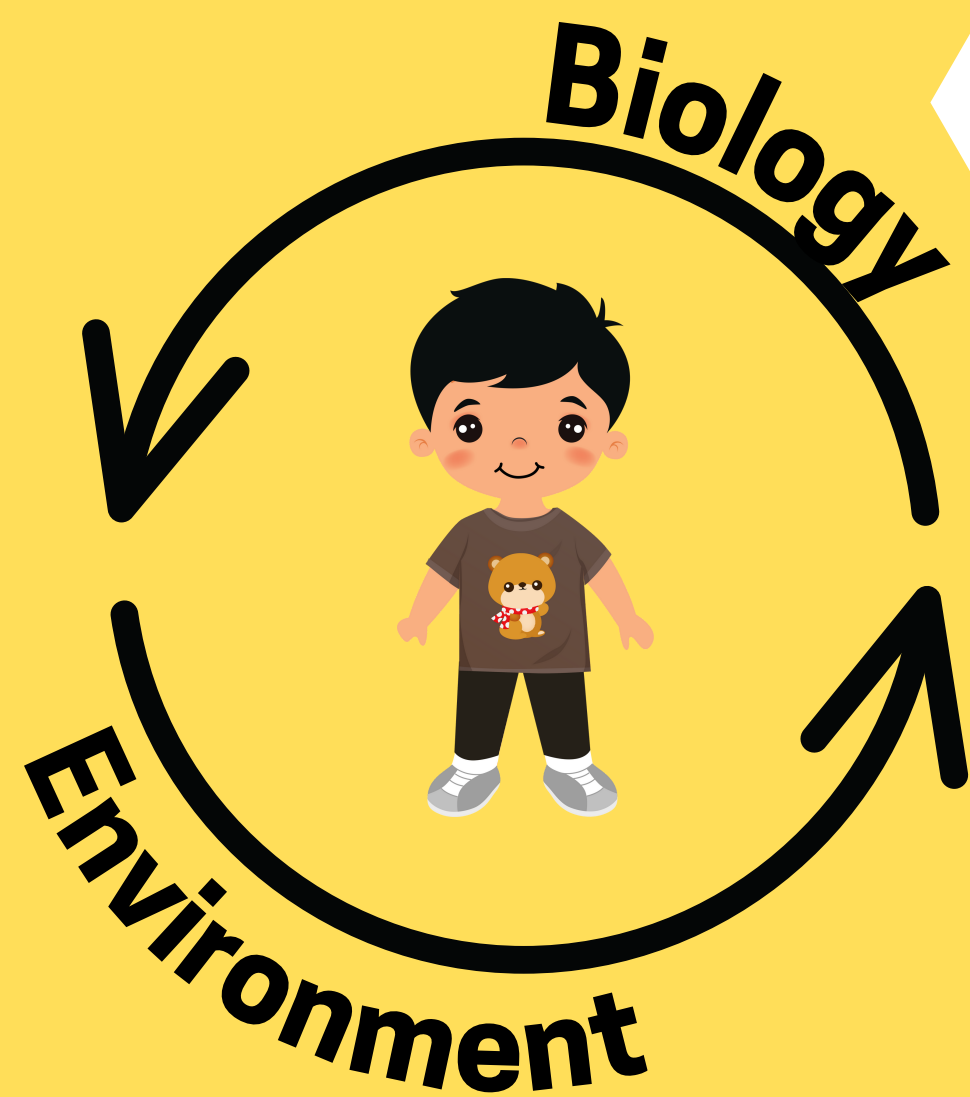


Structural integrity of the brain underlies associations between maternal language input and child vocabulary knowledge

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Background



Environmental & biological factors shape children's vocabulary development^{1,2}

Language input is associated with greater cortical surface area³ & functional activity in language-related regions.⁴

These brain differences exert their influence on vocabulary development.

Goal

To establish how environmental influences alter the mechanical integrity of neural tissue health, which precedes functional/structural differences, and in turn promotes vocabulary knowledge.

Methods

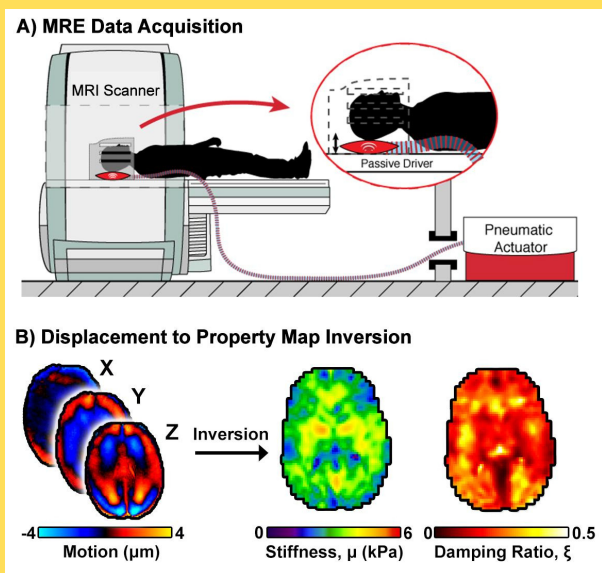
- 25 children, ages 5-7 years old ($M = 6.5$, $SD = 1.03$, females = 14)
- 20 minute play session with parent was recorded & transcribed
- NIH Toolbox Picture Vocabulary Task
- MRI, including magnetic resonance elastography (MRE) and anatomical images

Analysis

- Systematic Analysis of Language Transcripts (SALT) software program:
 - Mean Length of Utterance (MLU)
 - Number of Different Words (NDW)

- MRE data processed through a nonlinear inversion algorithm (NLI):⁵

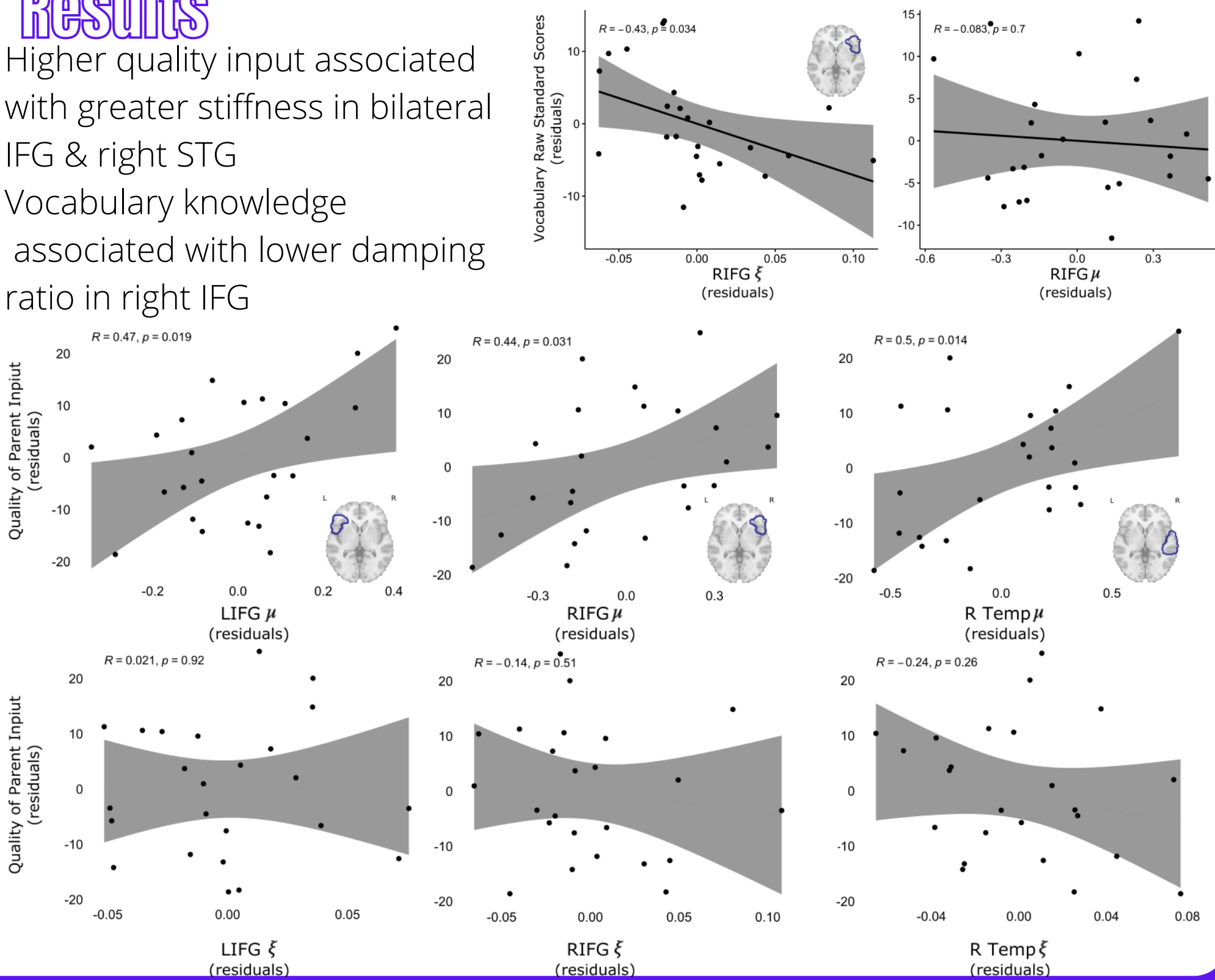
Damping Ratio ~ ξ Organization
Shear Stiffness ~ μ Composition



- T1-weighted image used to extract average mechanical property values in (ROIs):
 - Inferior frontal gyrus (IFG),
 - Superior marginal gyrus (SMG)
 - Superior temporal gyrus (STG)
- Raw scores from the PVT included, with age and maternal education as covariates

Results

- Higher quality input associated with greater stiffness in bilateral IFG & right STG
- Vocabulary knowledge associated with lower damping ratio in right IFG



Take Home Message

Proximal measures in a child's environment may be the source of differences in neural tissue which support vocabulary outcomes.

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