Anatomical Distinction and Intervention-Driven Changes of Frontal Language Regions in Struggling Readers

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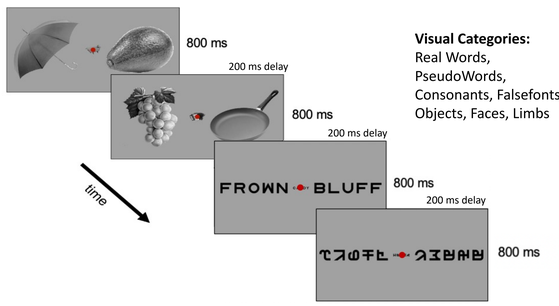
Introduction

- The left inferior frontal cortex (IFC) has been associated with a variety of language functions including semantic and phonological processing
- Studies have indicated distinctive, yet partially overlapping subregions in IFC which have different responses profiles to phonological text[1]
- Previous research has shown different IFC activation in struggling readers compared to typical readers in real word and pseudoword tasks[2,3]
- **This study investigates the effect of intensive reading instruction on frontal language regions in struggling young readers**

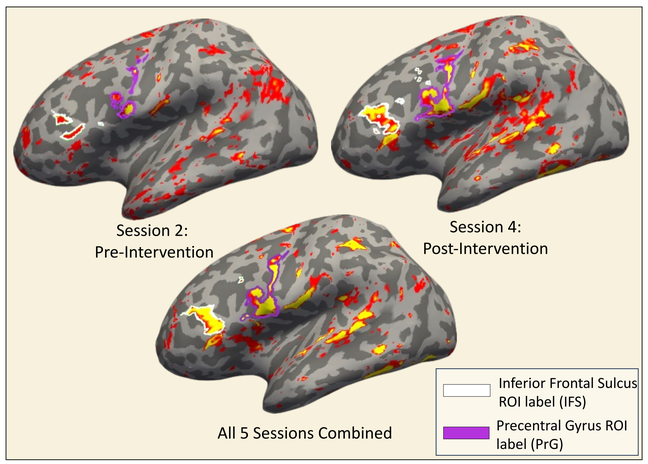
Methods

- **Participants**: 27 children 8-13yrs who struggle with reading were enrolled in an 8-week intensive summer reading instruction program
- A functional localizer paradigm[4] was administered at 5 timepoints (sessions) over the course of the year:
  - **Pre-Intervention:** Immediately before intervention
  - **Post-Intervention:** 6 Months after intervention
- **Tasks**: One-back (image repetition) and Fixation (color change)
- Visual Categories were grouped into 3 categories for analyses:
  - **Pronounceable Text**: Real Words and PseudoWords
  - **Unpronounceable Text**: Consonants and Falsefonts
  - **Other:** Objects, Faces and Limbs

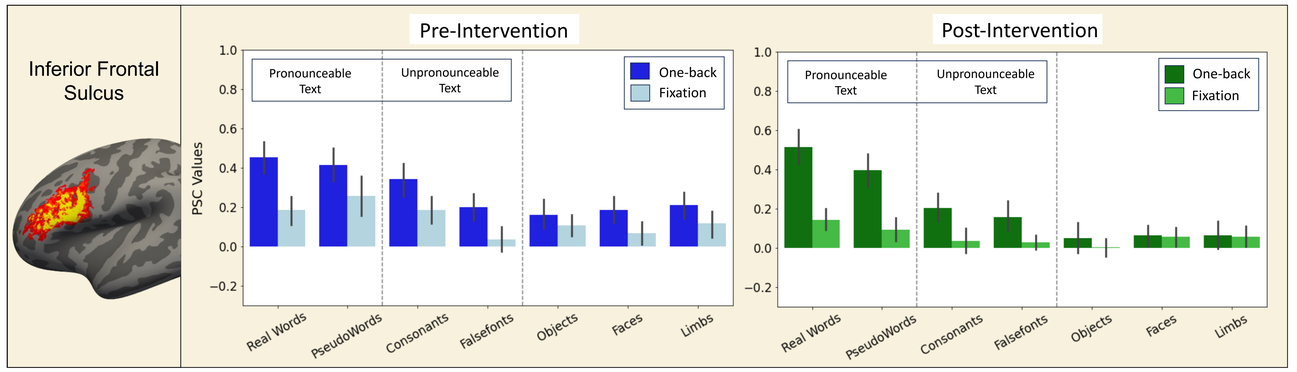
Experimental Design

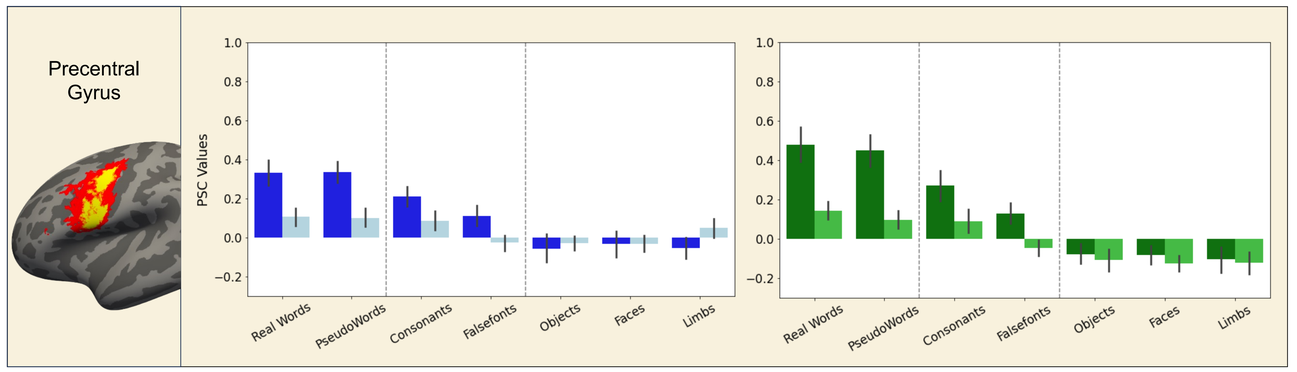


Visual Categories:
Real Words, PseudoWords, Consonants, Falsefonts, Objects, Faces, Limbs

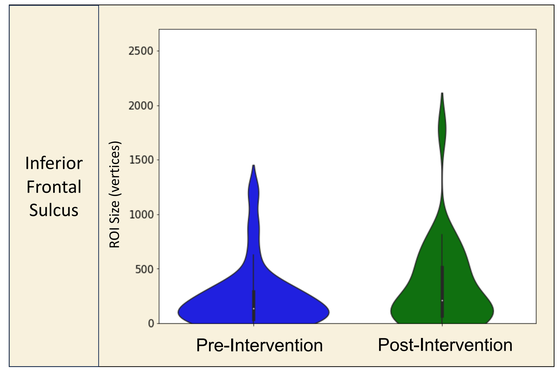


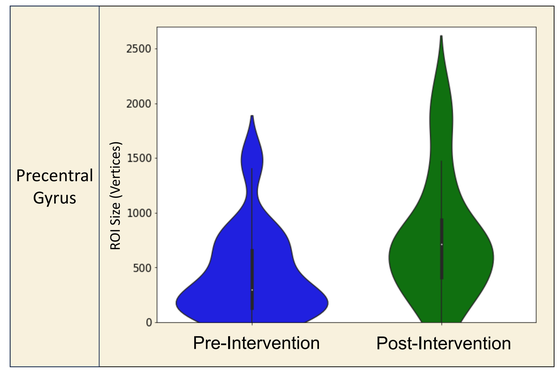
Activation Changes Pre and Post Intervention



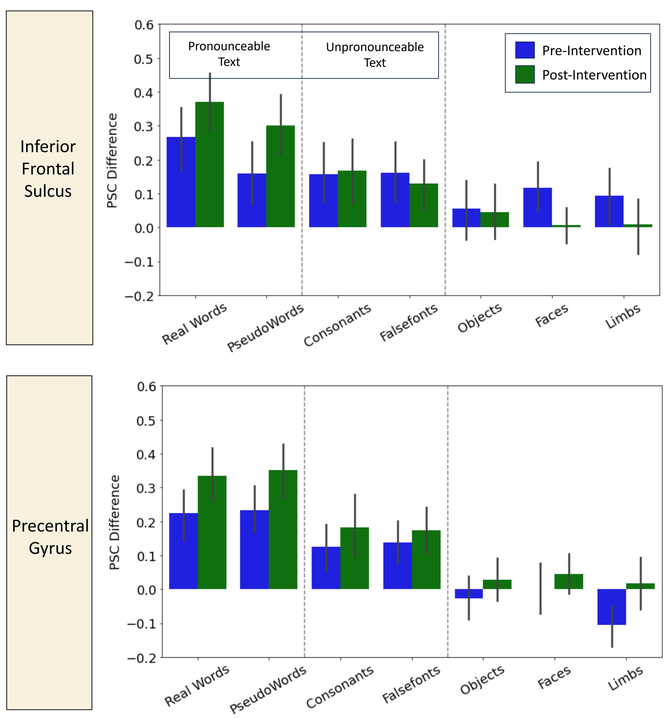


PrG Text Region Increases in Size

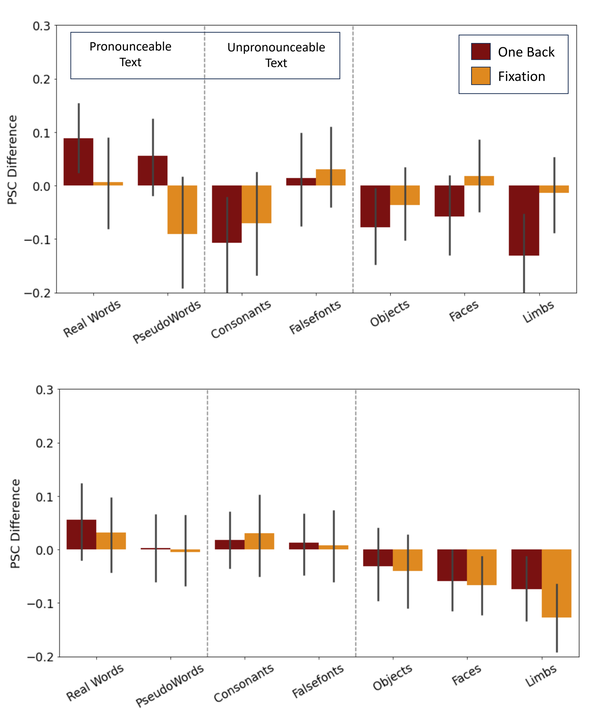




Task Effects Increase for Pronounceable Text over Intervention



Intervention Drives Suppression of Non-Text



Conclusion

- An analysis of struggling young readers found that frontal language regions respond more strongly to tasks that demand attention
  - This task preference is strongest for phonological (pronounceable) text compared to unpronounceable text and text-like symbols
  - This task effect magnitude increases in IFS following intervention
- Reading Intervention drives increased suppression for non-text in frontal language regions
- Text selective regions in the precentral gyrus increase in size following intervention

Acknowledgements

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References

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