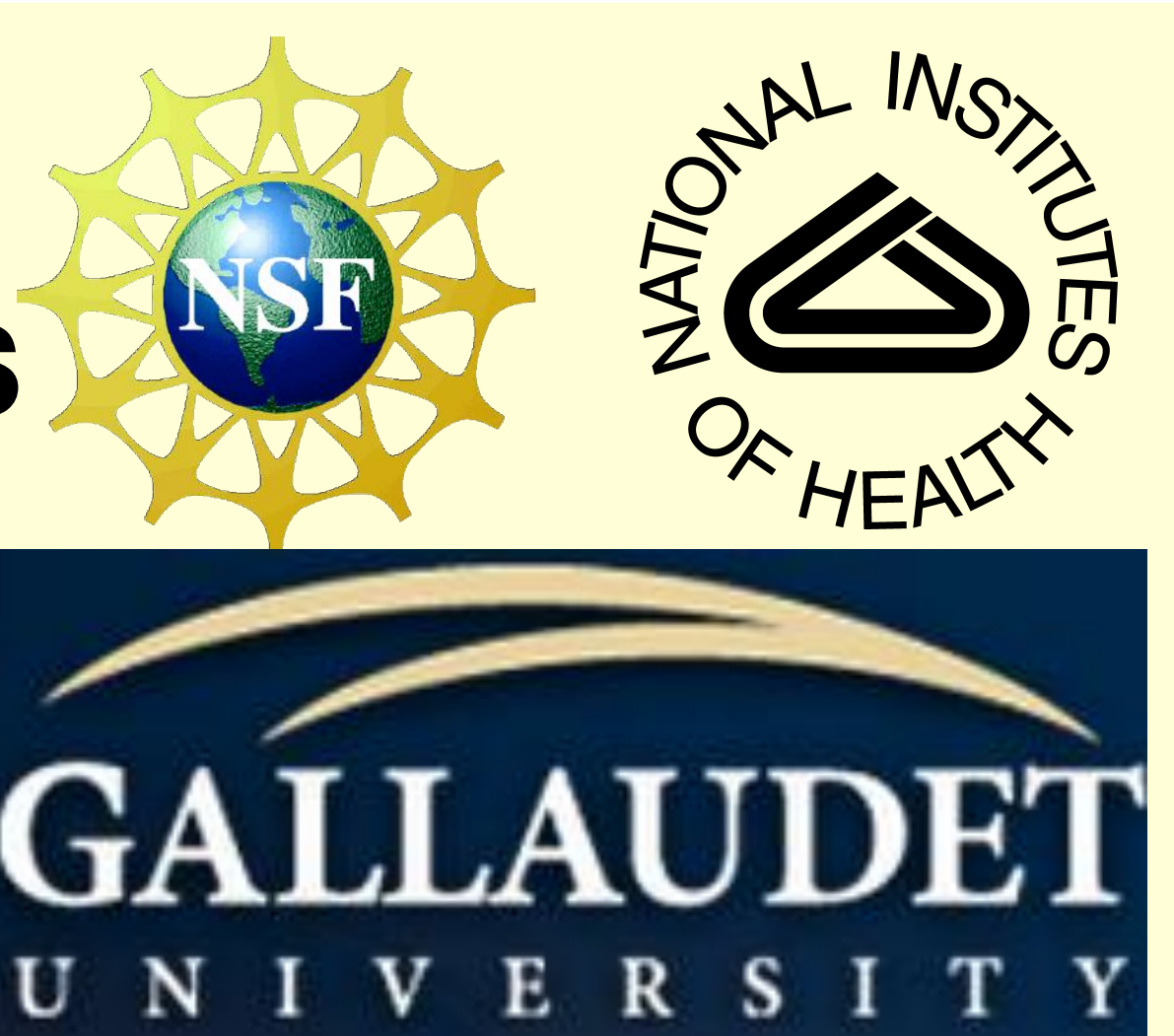




# Does early exposure to a visual signed language “hurt” auditory language tissue development: Evidence from fNIRS neuroimaging of language processing in deaf individuals with cochlear implants



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## ABSTRACT

Controversy abounds regarding the specific impact of differences in language experience on the acquisition of spoken language in deaf individuals with cochlear implants (CI)<sup>1,2,3,4</sup>. Noteworthy are claims that due to neuroplasticity of auditory language tissue, early exposure to a signed language results in deviance to auditory language tissue development. We find that early, but not later, exposure to a signed language supports typical language development.

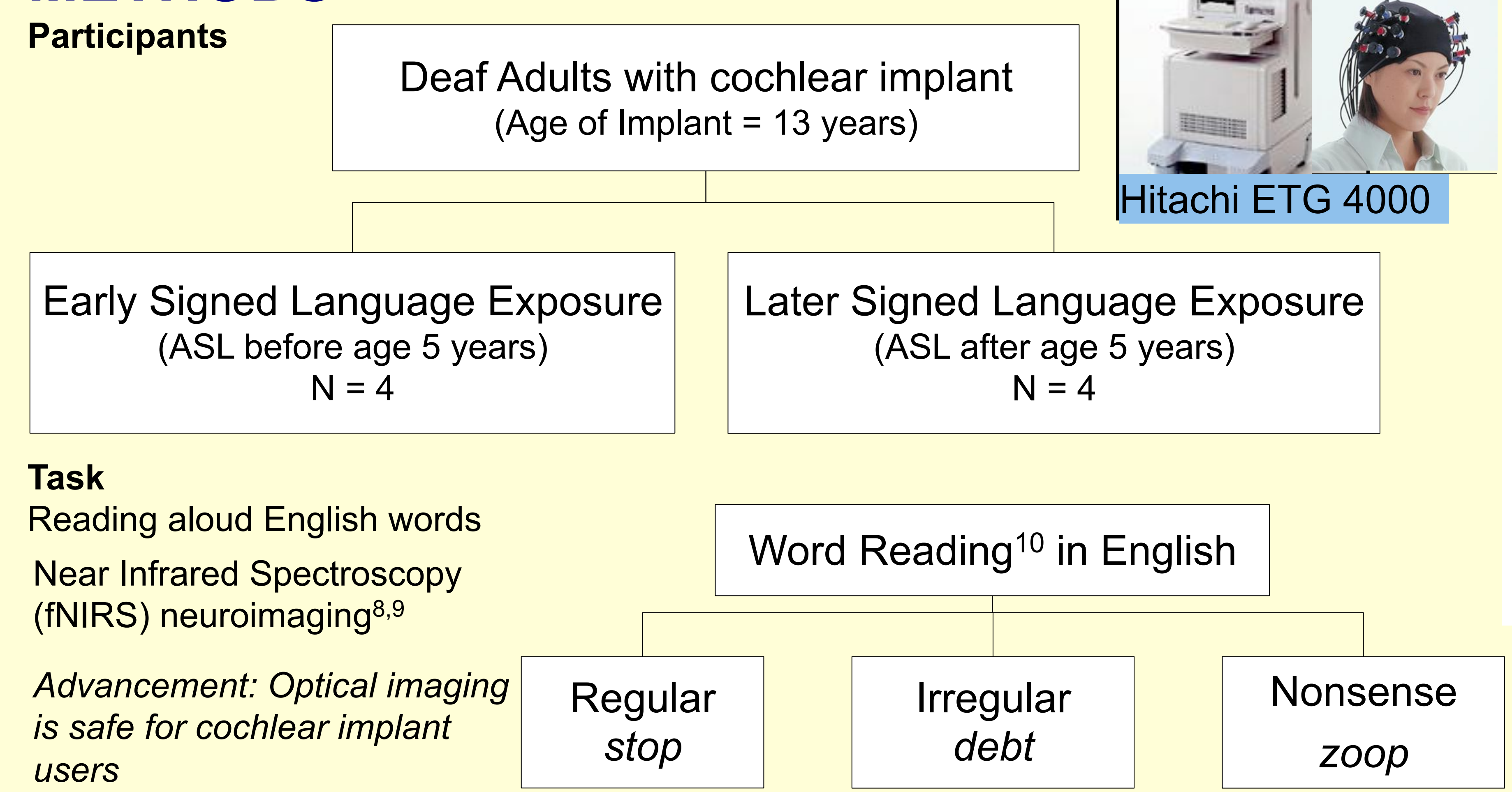
## QUESTION

Does early exposure to a visual signed language impact classic left-hemisphere spoken language tissue development, including left Inferior Frontal Gyrus (LIFG) and Superior Temporal Gyrus (STG)<sup>5,6,7</sup>, in a deaf individual with a CI?  
Does age of signed language exposure impact language processing in the deaf CI individual?

## HYPOTHESES

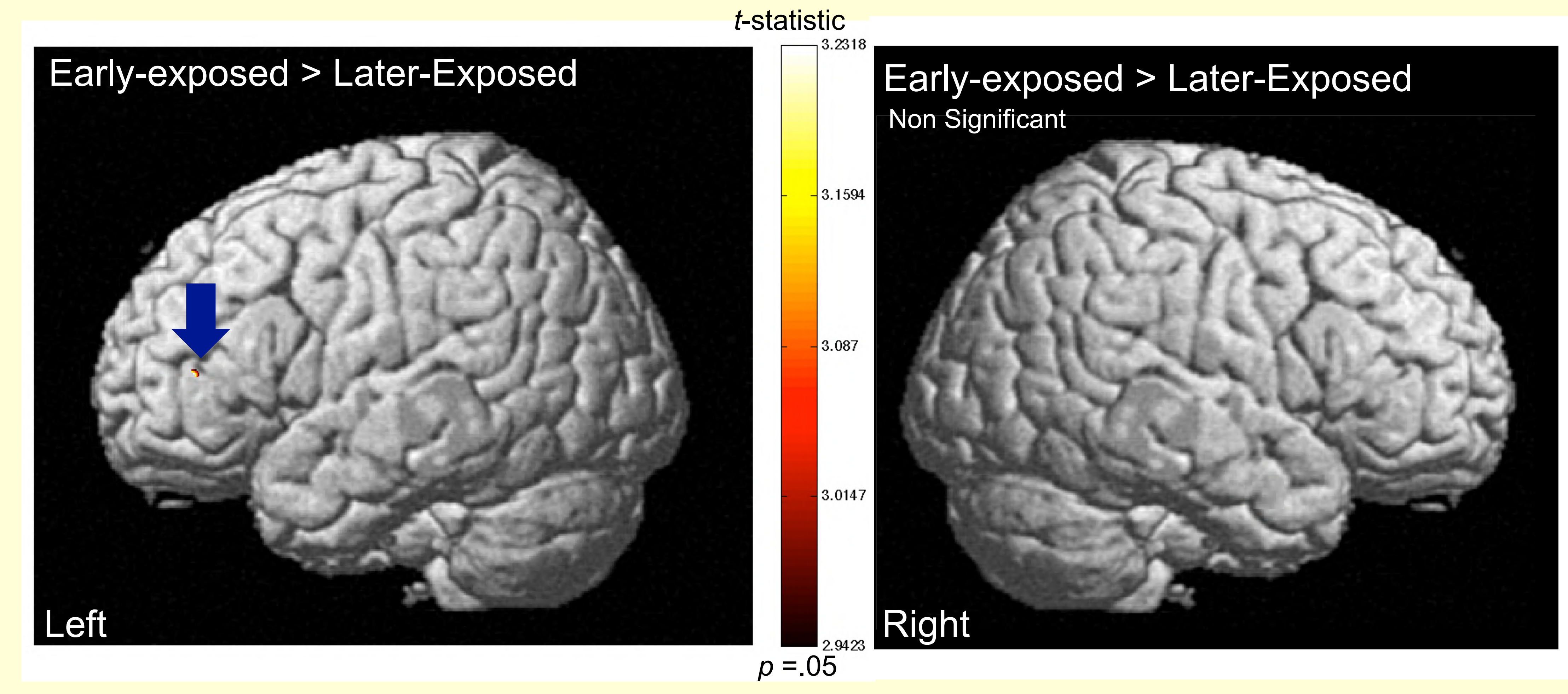
- H1** Early language exposure, *both signed and spoken*, facilitates normal neural development for language processing
- P1** CI individual with *early, but not later*, signed language exposure recruit left-hemisphere language areas
- H2** *Only* early spoken language exposure facilitates normal neural development for language processing  
Early signed language exposure disrupts development
- P2** CI individual with *early and later* signed language exposure do *not* recruit left-hemisphere language areas

## METHODS

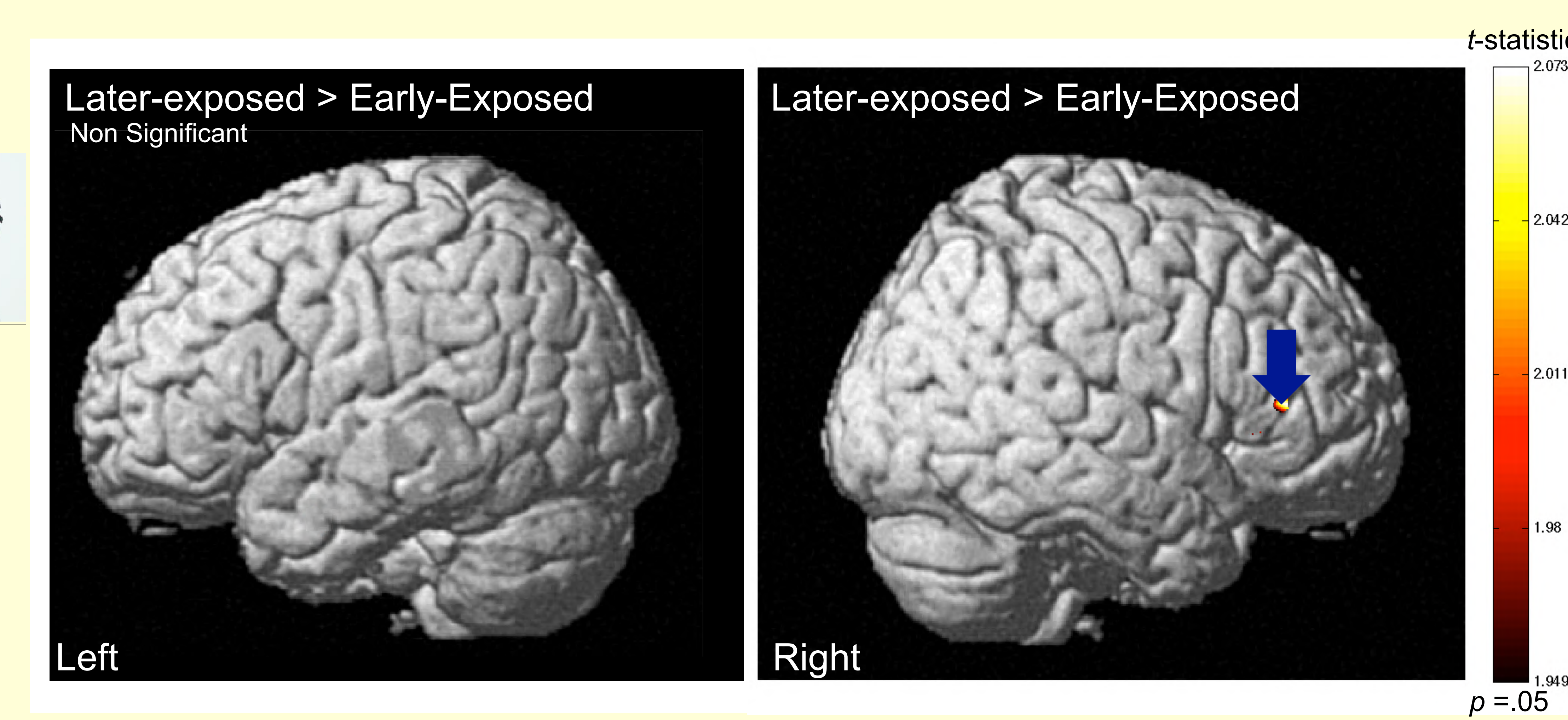


## RESULTS

### Early Signed Language Exposed Deaf CI Individuals Show Greater Neural Activation in Left Inferior Frontal Gyrus



### Later Signed Language Exposed Deaf CI Individuals Show Greater Neural Activation in Right Inferior Frontal Gyrus



## CONCLUSION

**Early exposed** deaf CI individuals showed greater activation in classic **left-hemisphere** language areas (LIFG)

**Late exposed** deaf CI individuals showed greater activation in the **right-hemisphere** (RIFG), not in classic left hemisphere language areas (LIFG)

### Supports Hypothesis 1

Early signed language exposure facilitates normal language processing

No evidence of a negative impact on language processing as a result of early visual signed language exposure

### Implications

Optimal developmental timing of signed language exposure  
Early language exposure, be it signed or spoken, supports healthy, typical language development

*New view on how early life language exposure, irrespective of modality (signed, spoken), can facilitate language processing in the deaf CI individual*

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