

Evidence of how the adult brain processes grammatical errors that are typical and atypical of childhood language acquisition

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Introduction

An **Optional Infinitive (OI)** stage marks language acquisition in many languages. Children ages 2-4 use *nonfinite (infinitival)* verb-forms and finite verb-forms interchangeably in contexts requiring finite forms.¹⁻³ In English, children's errors include omissions of past tense *-ed/*, 3rd singular *-s/*, and auxiliary */to be/*.

While OI is widely studied in language development, little is known about its neural basis.

Question

What are the neural correlates of Optional Infinitive in the adult brain?

Predictions

Sentences with Developmental (Optional Infinitive) errors should elicit different brain activations as compared to sentences with errors that are not made during development.

Methods

fMRI IMAGING

Sparse/silent acquisition, analysis method by Satrajit Ghosh⁴

PARTICIPANTS 25 adults (mean age =25)

GRAMMATICALITY JUDGMENT TASK

Auditory and visual presentations

DEVELOPMENTAL Optional Infinitive Errors

Errors children make in development¹⁻³

Yesterday I enjoy the music

omitted -ed

She empty the trash daily

omitted -s

He the tallest in town

omitted "to be"

NON-DEVELOPMENTAL Non-OI Errors

Errors children do not make in development¹⁻³

They are ring the bell

omitted -ing

They am eating their snack

bad agreement

CORRECT Sentences

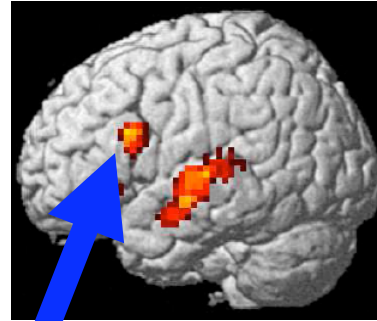
I am brushing my teeth

Last week I saw Dad

Imaging Results

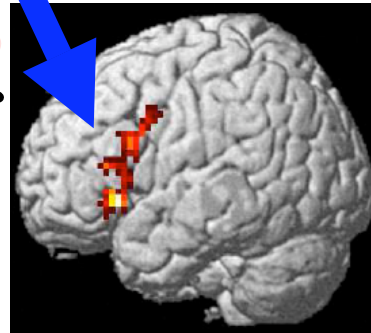
Sentences with Developmental-Optional Infinitive errors yielded greater activation in Left IFG relative to Non-Developmental error and Correct sentences in both Auditory and Visual sentence presentations ($p < 0.01$ FDR)

Auditory: OI > Non Dev. Errors



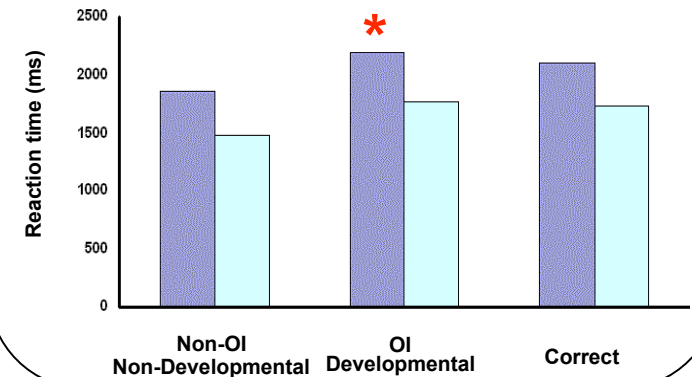
Left IFG

Visual: OI > Non Dev. Errors



Behavioral Results

Participants were significantly **slower** when judging Developmental-OI errors ($P < 0.01$) in both Auditory and Visual modalities. Participants were **less accurate** when judging Developmental OI errors in Auditory but not in Visual modality.



Discussion

Left IFG appears to play a critical role in tense computation in adults.

Adult participants showed greater left IFG recruitment, made more errors, and took longer when processing sentences with Developmental-Optional Infinitive errors.

Implications

Acquisition of finiteness in typical development, as well as the delayed acquisition of finiteness in Specific Language Impairment (Extended Optional Infinitive stage) may depend on the maturation of the language-computational abilities of left IFG.

References

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