

Lists with and without syntax: MEG effects of syntactic structure

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INTRODUCTION

- A challenge in the neurobiology of composition is to dissociate syntactic from semantic composition.
- A candidate for syntactic composition: **posterior temporal lobe**, when local conceptual combination occurs in both conditions but syntactic merge only in one.^[1]
- A novel control for semantics: **lists** can either occur in a sentence (thus with structure) or occur inside longer lists (thus without).

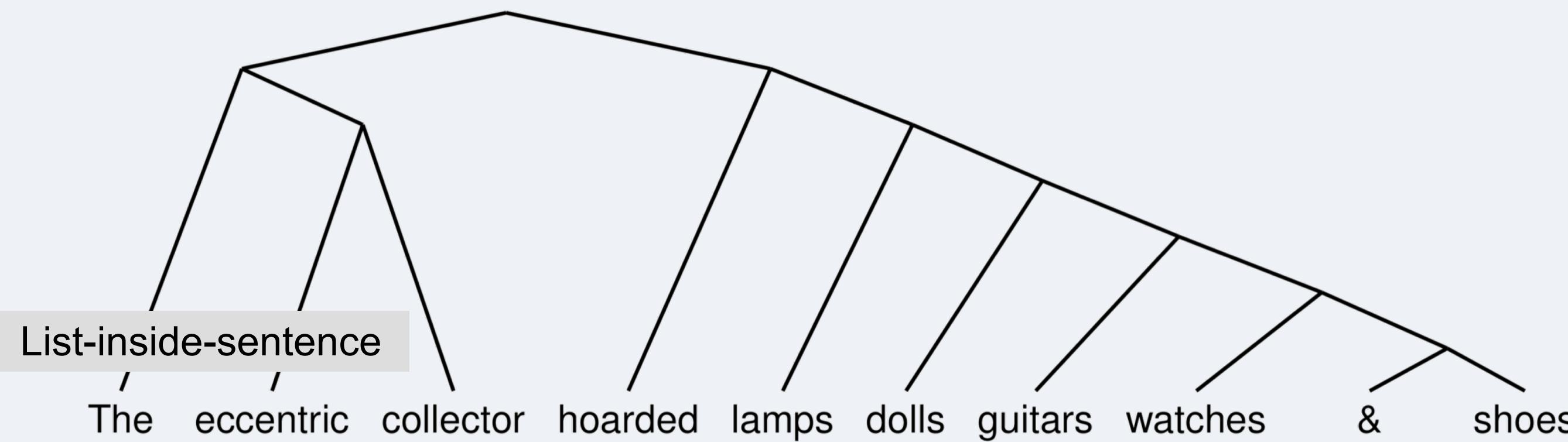
LIST INSIDE SENTENCE

The music store sells **pianos violins guitars** drums & clarinets.

LIST INSIDE LIST

theater graves drums mulch **pianos violins guitars** crates knuckle

- Here, no conceptually combination among **bolded words** in either case, but they are incorporated into a structured representation in a sentence.



SAME LACK OF CONCEPTUAL COMBINATION,
DIFFERENT SYNTAX

QUESTION

What are the neural correlates of syntactic structure when there are no local combinatorics?

METHOD

Stimuli ► Word association among words 1-7 (as Latent Semantic Analysis scores) also varied.

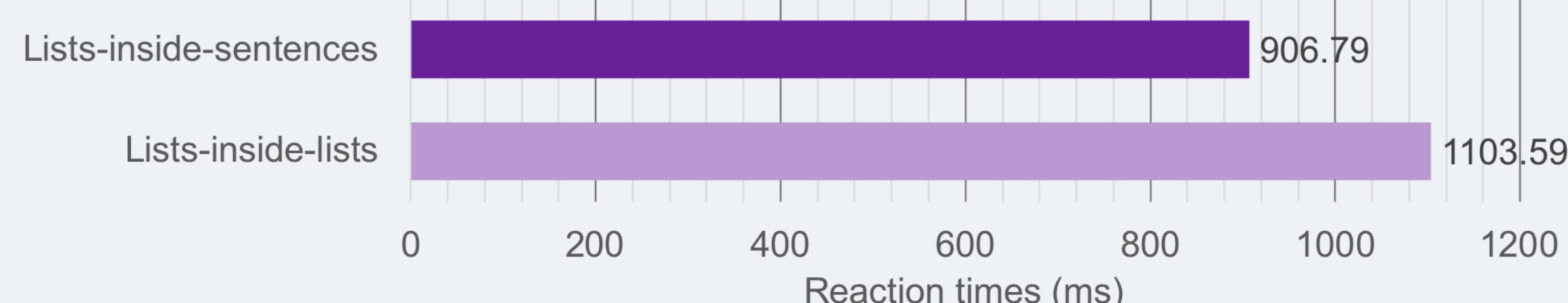
	Words 1-4	Word5	Word6	Word7	Words 8-10
High Sent	The music store sells	pianos	violins	guitars	drums & clarinets.
High List	theater graves drums mulch	pianos	violins	guitars	crates knuckle cocoa
Low Sent	The eccentric collector hoarded	lamps	dolls	guitars	watches & shoes.
Low List	forks pen toilet rodeo	lamps	dolls	guitars	wood symbols straps

- End of trial memory probe ► 19 native English speakers

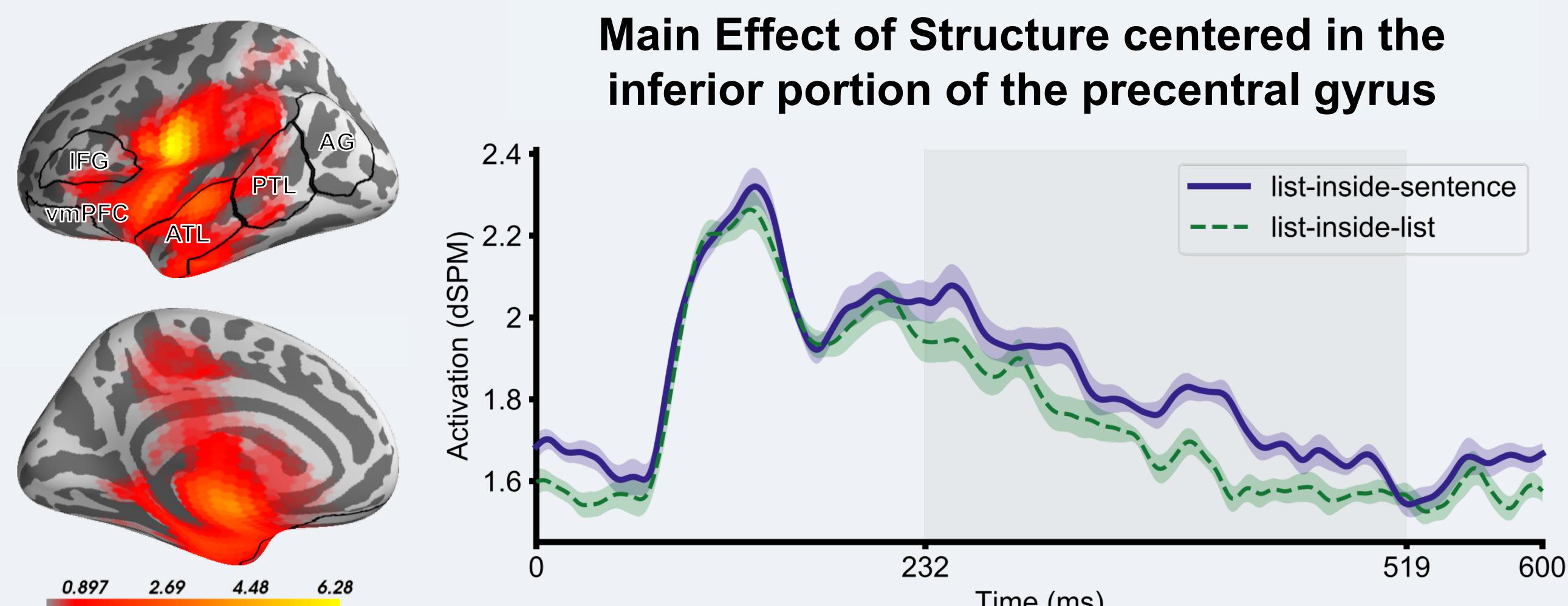
2 cluster-based permutation analyses across words 5-7 ►
Primary whole brain spatiotemporal analysis + Secondary region of interest (ROI) analysis

RESULTS (all p-values reported here are < 0.05)

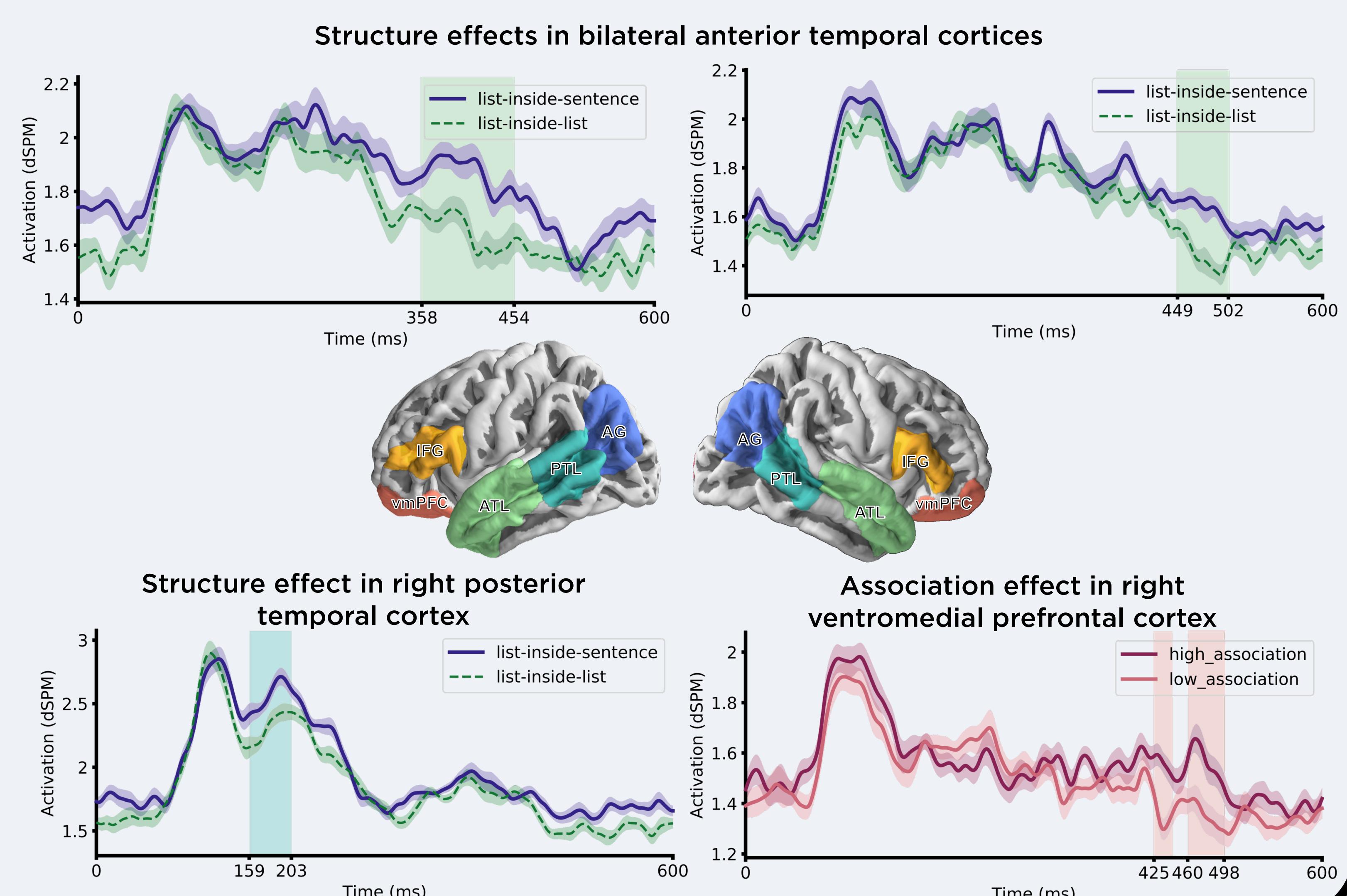
Behavioural ► Recall took longer for words drawn from lists-inside-lists than lists-inside-sentences.



Primary whole brain spatiotemporal analysis



Secondary region of interest (ROI) analysis



DISCUSSION

1. Activity increase was observed in the inferior precentral gyrus and bilateral temporal cortices when nouns are composed into a structured representation.
 - Lexical semantic and local conceptual combinatoric effects cannot account for this result.
 - Bi-hemispheric activity here contrasts with the ubiquitous emphasis on language system's left lateralisation, especially for syntactic processes (see e.g. [2, 3]).
 - Left IFG remain relatively insensitive to this manipulation.
2. High word association did not modulate behavioural responses but increased activity in the right vmPFC.
 - It is possible that words with higher co-occurrence rates were evaluated for semantic composition (see [4]).

Follow up question: are global semantic representations driving these effects?