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Introduction

- Semantic features associated with animate objects are more strongly correlated than those associated with inanimate objects [1,2].

- We have hypothesized that comprehenders can use animacy selection restrictions of verbs to predictively pre-activate semantic features associated with nouns [3,4].

- If this is the case, then the spatial pattern of neural activity pre-activated by animate-selecting verbs should be more consistent than that pre-activated by inanimate-selecting verbs.

- We used multivariate Spatial Similarity Analysis, in conjunction with MEG and EEG, to test this hypothesis.

Methods

- Participants: 32 native English speakers (16 males).
- Experimental stimuli: 200 three-sentence scenarios. The third sentence included a verb that either selected for an animate (100 trials) or inanimate (100 trials) noun-phrase argument.
 - Animate-selecting: *The lifeguards received a report of sharks right near the beach. Their immediate concern was to prevent any incidents in the sea. Hence, they cautioned the ...*
 - Inanimate-selecting: *Hannah was annoyed because her MacBook was working so slowly. She remembered that she had recently deleted a number of large files. After that, she emptied the ...*
- Procedure: word-by-word visual presentation of the third sentence (450ms + 100ms).

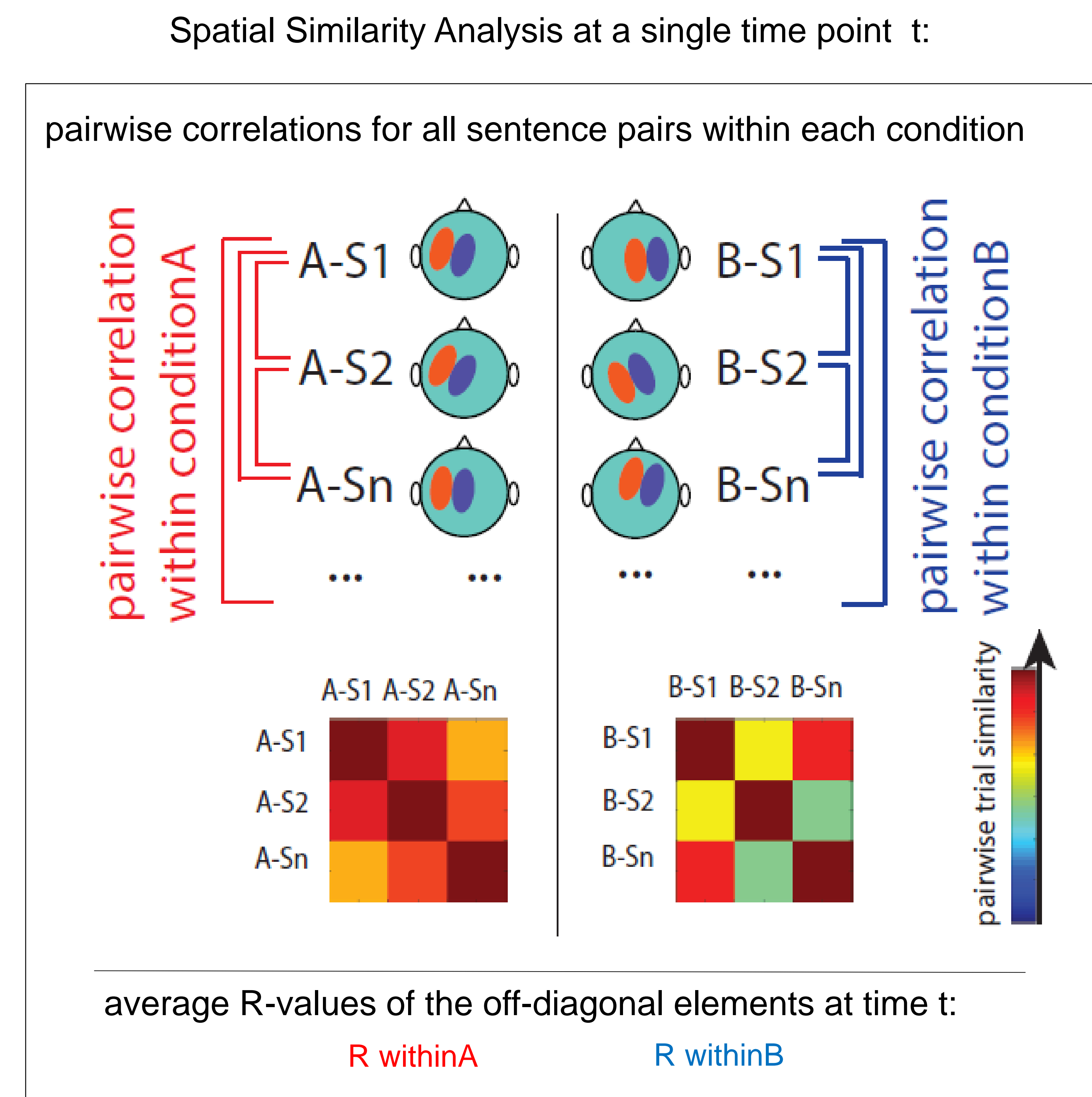
Fig 1. Sentence presentation procedure.



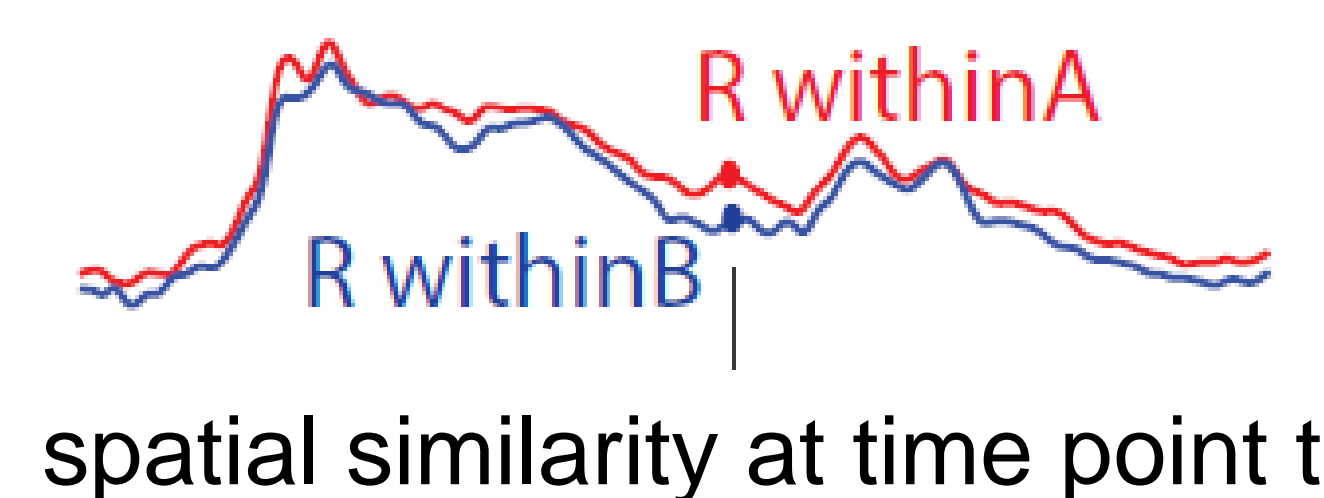
- Task: Plausibility judgement of the whole scenario (50% of scenarios had selection restriction violations).

Spatial Similarity Analysis

Fig 2. Illustration of spatial similarity analysis.



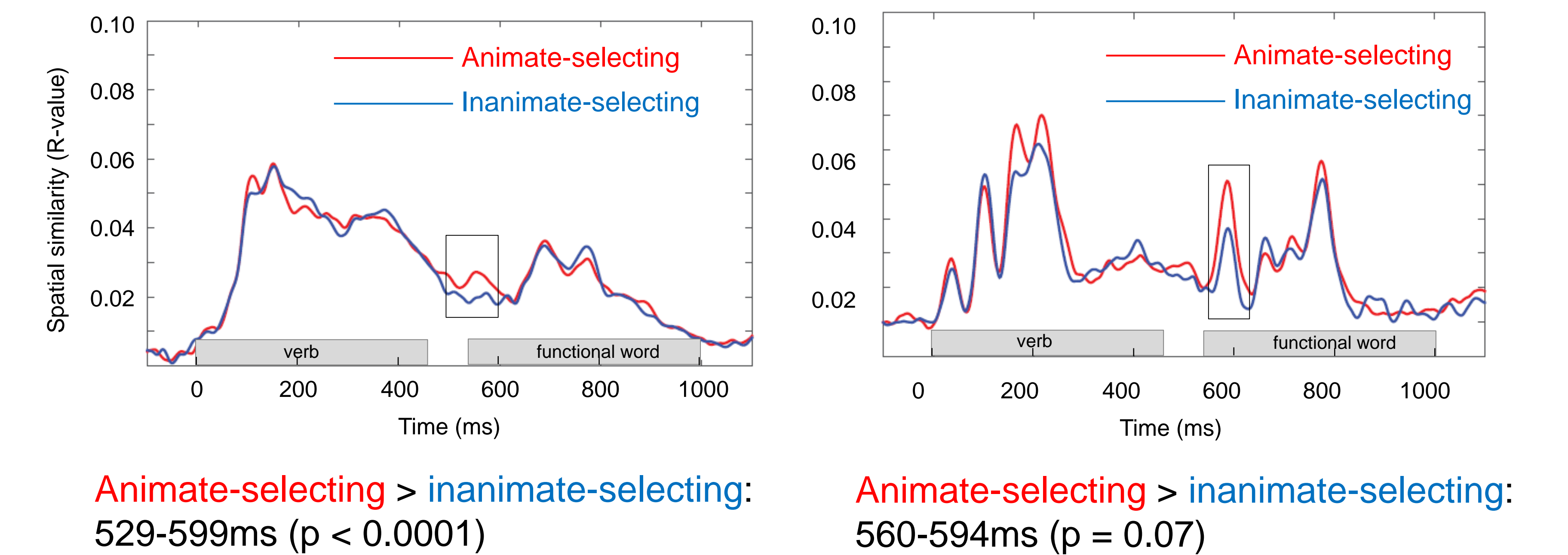
time series of the averaged spatial similarity R-values



- Recordings: MEG (Elekta-Neuromag, 306 sensors) and EEG (BrainProducts, 72 channels) signals were simultaneously recorded.
- Epochs: MEG and EEG signals were time-locked to the onset of the verbs and nouns separately (-100ms – 1100ms).
- Statistical analysis: cluster-based permutation test (10000 permutations) across the 0 – 1100ms time window relative to the onset of the verbs; pair-wise t-test between 300 – 600ms following noun onset.

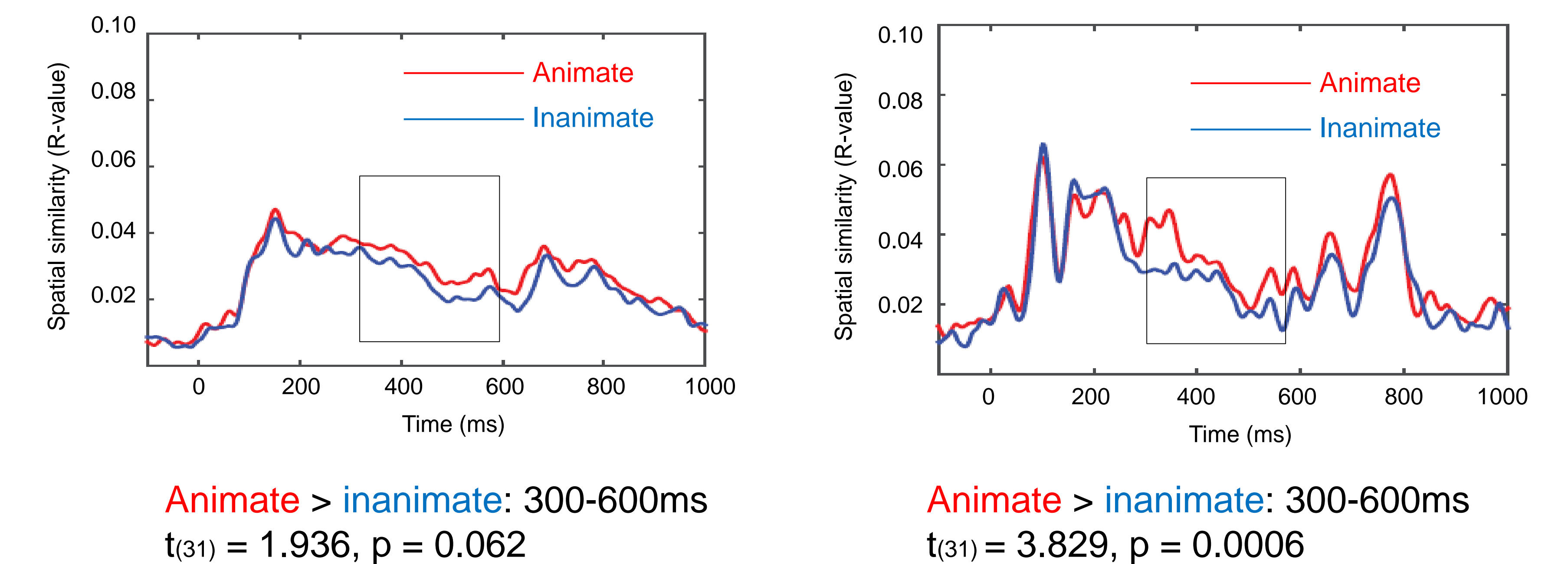
Results: Verbs

Fig 3. Spatial similarity time series time-locked to verbs.



Results: Nouns

Fig 4. Spatial similarity time series time-locked to nouns.



Discussion

- The spatial pattern of neural activity was more correlated following animate-selecting than inanimate-selecting verbs.
- This effect appeared >500ms after verb onset.
- It may reflect the increased correlation amongst semantic features associated with pre-activated animate versus inanimate nouns.
- These findings provide evidence that comprehenders can use the animacy restrictions of verbs to pre-activate semantic features associated with nouns before their bottom-up input becomes available.

References

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