Introduction

- Studies on the neural basis of semantic composition of words in phrases suggest activity in the ventromedial prefrontal cortex. The same mechanisms involved in semantically composing words may be responsible for composing morphemes within words (Bemis & Pykkänen, 2011, Pykkänen, Olveri & Smart, 2009).
- Is there semantic composition within compound words as indexed by vmPFC activity?
- If so, does it vary across compounds that differ in the semantic relationship between their constituents?

Methods

MEG methods:
- 9 right-handed native English speakers
- 157 channel axial gradiometer array
- Distributed minimum norm source estimates (MNE, BESA)
- vmPFC ROI defined in Bemis and Pykkänen, 2011; posterior fusiform, posterior temporal ROIs from FreeSurfer parcellations.
- Permutation cluster tests looking for temporally contiguous effect in a ROI to correct for multiple comparisons over time (Maris & Oostenveld, 2007).

Task and Results: Effects of Priming

Read Aloud Study
- Priming paradigm: constituent, identity
- 60 words per wordtype
- Every word appeared in every condition
- 480 trials per subject.
- Subjects are asked to read aloud the second word in a word pair.

To test whether the primes were being analyzed during the task, we look for priming effects on the target.

Priming Effects
- Posterior Fusiform
  235-427ms (p=.009)
- Posterior Temporal
  240-330ms (p=.032)
  340-431ms (p=.048)

Conclusions

- Priming effects shows that primes are being processed in this task.
- The vmPFC showed greater activation for the morphologically complex compound words compared to their orthographic controls.
- This vmPFC effect appears around 400-500 ms after the visual onset. This time region follows the M350/N400 time window typically associate with lexical access (Pykkänen & Marantz, 2003)
- This suggests that constituents of a compound are first accessed in the lexicon then combined later at a stage of composition.

Experimental Design

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Results: Composition Effects of Compounds as Primes

The primes in the identity condition were used to test for composition effects in the absence of priming.

Composition Effects in vmPFC:
- Novel: p=.024 (396-460ms)
- Transparent: p=.018 (400-478ms)
- Opaque: p=.096 (399-443ms)

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