

Affix Frequency vs. Positional Letter String Frequency in Visual Recognition of Morphologically Complex Words



Gwyneth Lewis¹ & Alec Marantz^{1,2}

New York University, Departments of Psychology¹ & Linguistics²

Introduction

Fusiform (FF) activation at ~150ms post-stimulus is modulated by the morphological form of complex words like “worker” and pseudo-affixed words like “brother,” but not by lexical properties (e.g., meaning entropy) (Solomyak & Marantz, 2009a, 2009b; Lewis, Solomyak, & Marantz, in press).

What is the role of letter string frequency in decomposition? Previous results were based on stimuli with affixes, which are comparatively more frequent than other letter-strings.

This study employed “unique-root” items (e.g., “sporadic” where the root does not appear in any other word) and non-affixed items with frequent letter string endings (e.g., “scoundrel”) in an MEG word recognition experiment.

Primary focus: Effects of word class’ orthographic and morphological affix frequency on cuneus and FF responses.

Design

Word Classes

- Unique-root*: 106 words ending in one of four affixes: al (n=36), ic (n=29), ity (n=10), and ous (n=31).
- Non-affixed*: 106 words ending in one of four letter strings similar to the affixes in length and bigram-, surface-, and token frequency: de (n=36), el,(n=29), ure (n=10), and ain (n=31).
- Non-words*: 212 non-words similar to target items in length and bigram frequency

Stimulus Variables

- residual Morphological Affix Frequency (rMAF)**: residual frequency of the affix as a true morpheme (after removing orthographic affix frequency), rather than an orthographic ending.
- Orthographic Affix Frequency (OAF)**: frequency of affix or ngram as an orthographic ending.
- Word Class (WC)**: Unique-Root = 1, Non-Affixed = 0

Analysis

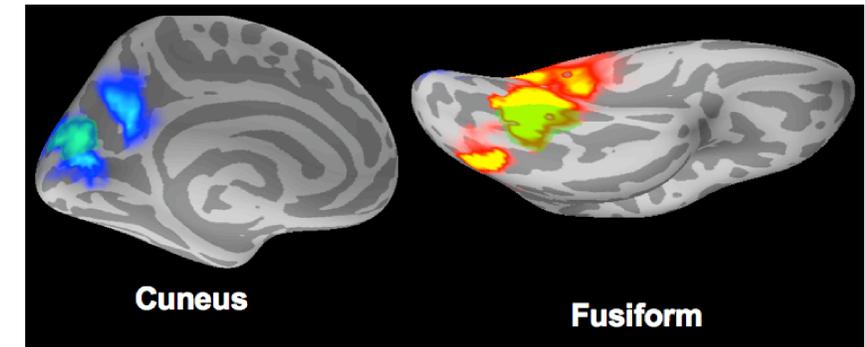
Subjects and Task

Ten native English speakers completed a visual lexical decision task of 424 trials randomized over four blocks with breaks in between. MEG data were acquired continuously throughout the experiment.

MRI and MEG data

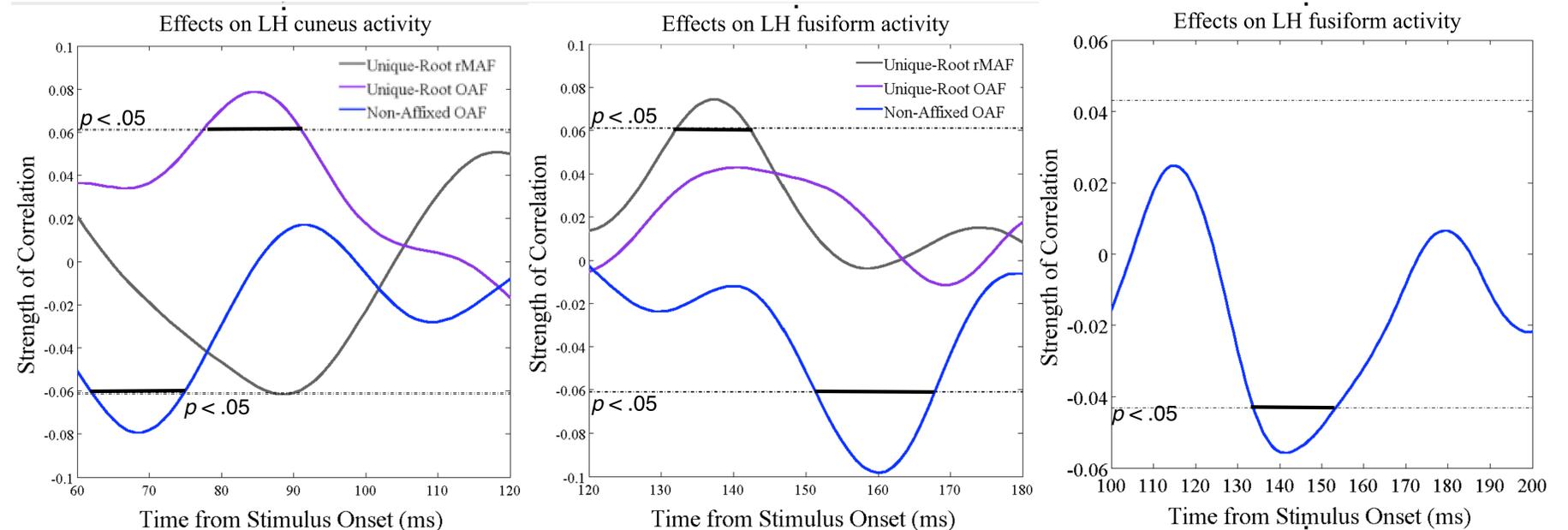
Structural MRIs were reconstructed in FreeSurfer to cortically constrain MEG data. Inverse solutions were computed for data in MNE (MGH/HMS/MIT Athinoula A. Martinos Center for Biomedical Imaging, Charleston, MA). Grand average subject minimum-norm solutions were visualized on a standard brain in MNE.

Regions of interest (ROIs) were based on grand average activation peaks within anatomical labels for later correlations with stimulus variables.



•Cuneus peak activation at ~90ms; Fusiform peak activation at ~140ms

Results



	Cuneus	Fusiform
Non-Affixed OAF	r = 1.31, p < .04	r = ?, p = ?
Unique-Root OAF	r = .95, p < .04	ns
Unique-Root MAF	ns	r = .79, p = .03
Word Class	ns	r = .84, p < .02

Conclusion

The OAF effects from both classes on cuneus activation resemble the findings for complex words in Solomyak & Marantz (2009b). The rMAF FF effect for unique-root words taken with the FF WC effect support the position that decomposition ~150ms in the FF is modulated by morphemic word forms rather than by frequent letter strings.