Competition and prediction in the auditory processing of morphologically complex words

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Introduction

• Words are often made up of morphemes, e.g. stem + suffix (ageless)
• A high number of potential suffixes (ageless, aging) leads to slower RTs in spoken word recognition (Wurm et al., 2006), suggesting that continuations are predicted and compete with each other
• Is there neural evidence for competition after the stem?
• Recent studies have found that predictability affects neural responses at the phoneme level (Gagnepain, Henson, & Davis, 2012) and at the morpheme level (Ettinger, Linzen, & Marantz, 2014)
• Does the range of possible continuations affect the predictions made at the stem? (More options = weaker predictions?)

Design

• Predictability quantified using surprisal: $-\log p_i$
• Competition quantified using entropy: $-\sum p_i \log p_i$
• Factorial 2 × 2 design (competition × predictability)
• 280 target words (70 in each condition) + 100 filler items (fume, tundra)
• Paraphrase judgment task for 15% of items (median accuracy: 92%)

MEG methods

• 208 channel axial gradiometer system (KIT/Eagle)
• 24 participants
• Distributed minimum-norm solutions (dSPM) using MNE (based on FreeSurfer average brain)
• Spatiotemporal cluster test in left hemisphere language areas (based on Hickok & Poeppel, 2007)

Conclusions

• Morphological competition causes increased activity in the left temporal lobe (mostly in the superior temporal gyrus)
• No evidence that stems that are more strongly constraining (less competition) lead to a stronger surprise effect when the suffix is unpredictable

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