

An MEG study of lexico-semantic processing in sentence comprehension: A Representational Similarity Analysis

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Abstract

In EEG/MEG, semantic processing is classically indexed by a smaller N400(m) to expected than unexpected words between 300-600ms. MEG source localization suggests that one source of this effect is the left anterior superior temporal cortex. Intracranial recordings, however, report sources in the medial temporal region. The current MEG study used a representational similarity analysis to identify brain regions distinguishing between semantically expected and unexpected critical words. Twenty-six Chinese participants read 240 high-constraining sentences, ending with either *expected* or *unexpected* sentence-final words (SFWs). We extracted the spatial pattern of neural activity to SFWs within two regions of interest (ROIs): left superior temporal cortex and left medial temporal region (left parahippocampus + hippocampus + fusiform). Within each ROI, we correlated the spatial pattern between all possible pairs of (a) expected SFWs (b) unexpected SFWs (c) expected – unexpected SFWs. We then averaged these spatial patterns to construct two time series of R values, reflecting shared spatial patterns for expected SFWs (*within-expected pairs*), unexpected SFWs (*within-unexpected pairs*), as well as between the unexpected and expected SFWs (*between-condition pairs*). Within the superior temporal ROI, between 300–600ms after SFWs onset, spatial similarity was greater for *within-unexpected* than both *within-expected* and *between-condition pairs*. However, within the medial temporal ROI, spatial similarity was greater for both *within-unexpected* and *within-expected* pairs than for the *between-condition* pairs. We suggest that both the superior temporal and medial temporal regions were engaged in processing semantically unexpected words, whereas the medial temporal region was selectively engaged in processing semantically expected words.