

Abstract CNS

Sensitivity to syntax in visual cortex: an MEG study

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Language is among the most complex of human cognitive systems, yet its processing is extremely automated and fast. Electroencephalography (EEG) studies have demonstrated that syntactic operations can take effect as early as 130-150ms post-stimulus onset, at which point the presence of an unpredicted word category elicits an early left anterior negativity (ELAN). We employed magnetoencephalography (using a 148-channel whole-head neuromagnetometer) to investigate the neural generators of this effect in word-by-word reading. Subjects read sentences including either an expected or unexpected target word. In two conditions, the target contained overt category-marking morphology-prepositions ('Joe's ABOUT stories Africa') and participles ('The discovery was in the REPORTED'). As a test of whether overt category-marking morphology is a prerequisite for early effects of structural prediction, a third condition contained a bare stem ('the discovery was REPORT'). Surprisingly, we found that expectedness modulates activity already at ~100ms, in visual cortex (visual M100). This early effect was limited to prepositions and participles though, showing that it is not a result of just any mismatch between prediction and visual input. Rather, the visual cortex seems to identify only a limited set of closed class morphemes, which can be compared against the predicted input. In addition to the visual M100 effect, all conditions elicited later, temporally dissociated, increased activity in left anterior and temporal sources, consistent with the previous ERP literature. The finding that the visual cortex monitors syntactic properties of linguistic input may provide a crucial key for understanding how language processing can be so remarkably fast.