

Distinct neural signatures of semantic retrieval and event updating during discourse comprehension

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Currently, there are multiple competing accounts of the functional significance of the N400 component of the event-related brain response. Some theories have linked this neural response to the difficulty of retrieving semantic information from long-term memory, while recent computational accounts have formalized the N400 as an “input driven update of a representation of sentence meaning” (Rabovsky, Hansen & McClelland, 2018). To help distinguish the neural mechanisms underlying semantic retrieval and event updating, we developed a set of discourse scenarios with critical words that were either highly informative or uninformative (e.g. “The way things were going, no one expected it to happen. It left all of the onlookers completely speechless. After the touchdown/commotion...”). As confirmed by offline ratings, only informative continuations were useful for interpreting the previously ambiguous event. Otherwise, these critical words were carefully matched in lexical characteristics, predictability, and semantic association with the preceding context. Contrary to the predictions of some accounts, this novel informativeness manipulation produced no differences in the amplitude of the N400, and instead produced a long-lasting frontal positivity, beginning approximately 250ms after word onset. When semantic predictability was manipulated in a separate set of discourse contexts, this produced clear differences in the N400, which differed in both polarity and scalp distribution from the effects of informativeness. Finally, the magnitude of the informativeness effect (but not the N400 effect) correlated significantly with participants’ offline comprehension accuracy. These findings provide evidence for two distinct neural signatures of semantic retrieval and event updating during reading comprehension.