

The Electrophysiology of Language Comprehension: A Neurocomputational Model

Harm Brouwer (brouwer@coli.uni-saarland.de)

Saarland University

One decade ago, researchers using Event-Related brain Potential (ERP) measurements stumbled upon what looked like a *Semantic Illusion* in language comprehension: Semantically anomalous, but otherwise well-formed sentences did not affect the meaning-related N400 component, but instead increased the amplitude of the structure-related P600 component. This finding spawned five new models of language comprehension, all of which claim that instead of a single comprehension process, there are two or even more separate processing streams, one of which is not driven by structure, but by word meaning alone. I will make a case for rethinking the functional role of the N400 and the P600, thereby providing a much simpler way to account for these data. As a 'proof of concept', I present a neurocomputational model that directly instantiates a functional-anatomic mapping of the proposed reinterpretations of N400 and the P600 onto a minimal cortical network for language processing; simulations show that this model accounts for signature processing phenomena, including semantic anomaly, semantic expectancy (on nouns and articles), syntactic violations, and garden-paths. Crucially, the model also captures the much debated 'semantic P600'-phenomenon. The implications of the model will be outlined, and I will argue that explicit computational models and quantitative simulations are generally superior to verbal 'box-and-arrow' accounts, and necessary for settling theoretical debates, such as the one concerning the 'semantic P600'-phenomenon.