Event-Related Brain Potentials in Language

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Description of the Tutorial

In the investigation of human cognitive abilities, language has always played a primordial role. With the advent of neurophysiological methods (such as electroencephalo-graphy, EEG, or functional magnetic resonance imaging, fMRI), which map the neural responses to cognitive stimuli with a high temporal and spatial resolution, respectively, this research has taken on a new dimension. This tutorial provides a state-of-the-art introduction to event-related brain potentials (ERPs; cf. Fig. 1) with a special focus on language and its different domains (e.g. lexicon or syntax).
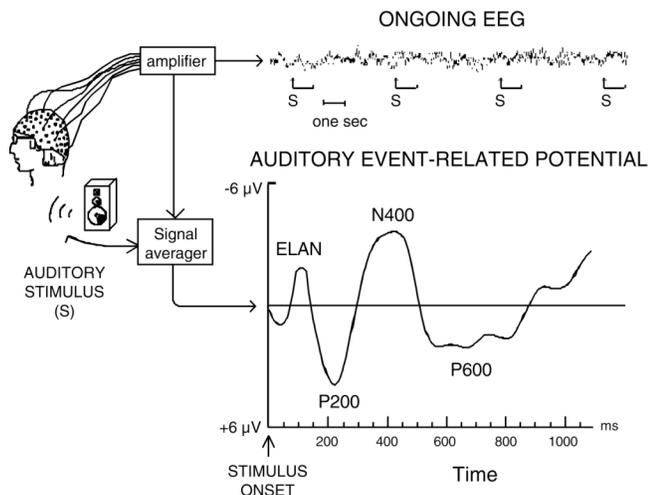

Figure 1: A schematic illustration of the ERP methodology.

The tutorial will begin with a brief introduction to the history of the ERP method and its basic premises, followed by a critical review of the physiological and functional nature of language-related components (e.g. left-anterior negativities, N400, P600) and the scope of their interpretation. This initial section will further include a discussion of the technical and experimental requirements for running ERP studies, including a practical demonstration.

In a second section, the ERP method will be compared and contrasted with other experimental techniques in cognitive science. On the one hand, we will focus on a comparison of ERPs and fMRI, in order to shed light on the relation between temporal and spatial characteristics of neurocognitive processes. Furthermore, the relationship between ERPs and behavioural methods with a high temporal resolution (particularly speed-accuracy tradeoff, SAT) will be discussed.

Finally, language-related ERP components will be situated in the broader context of current neurocognitive models of language processing. Moreover, language-related ERP findings will be compared to neurophysiological responses observed with respect to other domains of higher cognition (e.g. music, arithmetic).

Intended Audience

The tutorial is aimed both at non-linguists with a general background in cognitive science and at linguists without a specialisation in neurolinguistics. It intends to demonstrate the capacity and scope of the method as a means of investigating language as an example of higher cognition. Basic knowledge in linguistics, psychology, computer science or biology will be helpful.

Suggested Readings

Friederici, A. D. (2002). Towards a neural basis of auditory sentence processing. *Trends in Cognitive Sciences, 6,* 78-84.

Rugg, M. D., & Coles, M. G. H. (Eds.) (1995). *Electrophysiology of Mind. Event-Related Brain Potentials and Cognition.* Oxford: Oxford University Press.

Segalowitz, S. J., & Chevalier, H. (1998). Event-related potential (ERP) research in neurolonguistics: Part I. Techniques and Applications to Lexical Access. In B. Stemmer & H. A. Whitaker (Eds.), *Handbook of Neurolinguistics*. San Diego: Academic Press.

Segalowitz, S. J., & Chevalier, H. (1998). Event-related potential (ERP) research in neurolonguistics: Part II. Language Processing and Acquisition. In B. Stemmer & H. A. Whitaker (Eds.), *Handbook of Neurolinguistics*. San Diego: Academic Press.