ERP-fMRI Interface in Bilingual Speakers during Morphosyntactic Processing

Simin Meykadeh[1*]

1. Tarbiat Modares University, Tehran, Iran

Abstract

The neural mechanisms underlying morphosyntactic processing in bilinguals, particularly regarding the relationship between electrophysiological markers and their neuroanatomical sources, remain underexplored. While the P600 component is a well-established temporal index of syntactic revision, its brain generators have been primarily studied in monolinguals, yielding heterogeneous findings. Moreover, the role of language context (mode) in shaping these mechanisms is poorly understood. This talk presented a study that directly addressed this gap by integrating previously acquired ERP and fMRI data from the same group of balanced Turkish-Persian bilinguals. Participants performed an auditory grammaticality judgment task under different language modes: a monolingual mode (ERP session) and a bilingual mode (fMRI session with language switching). A novel correlation analysis was conducted between the P600 mean amplitude (500-700 ms) and the extent of fMRI activation (number of activated voxels) in two syntax-sensitive regions: the Pars Opercularis (PO) and the posterior Superior Temporal Gyrus (pSTG). The results revealed a language-dependent and region-specific neural interface. A significant positive correlation was found only in the PO and only for L1. Individuals with larger P600 amplitudes also showed greater fMRI activation in this region. These findings suggest that the PO is a key neural generator of the P600 component for morphosyntax in the current sample. On a broader level, this study demonstrates that the neurocognitive architecture of syntax is not fixed but is flexibly modulated by language context. The findings underscore the necessity of multimodal approaches and highlight the dynamic nature of language processing in the bilingual brain.

Keywords: Bilingualism, P600, Morphosyntax, Pars opercularis, Language mode

Email: A.meykadeh@modares.ac.ir

doi.org/10.30514/icss.27.0.18

The Second International Biennial Conference on the Science of Language & the Brain
(SOLAB 2025) 9-10 October