S. Parmigiani

Revising the language network with direct stimulation: Reading and listening during SPES modulates CCEPs in cortical nodes

Since Paul Broca, in 1861, first described the posterior two thirds of the inferior frontal gyrus as the seat of the ability to articulate language, and Carl Wernicke who, in 1874, reported that lesions in the superior temporal gyrus was crucial to language comprehension, yet preserving the language articulation ability, many scholars were prompted to seek language in the human brain, attempting to describe in even more details the organization and the neuroanatomy of language functions. In the last years, tackling this issue shifted from relying on lesion studies only to taking advantage of dedicated non-invasive recording and neuromodulation techniques (as fMRI, EEG, TMS, tDCS). Neuromodulation techniques have provided clues on the neural circuits underlying normal language and helped to explain the pathophysiology and recovery of aphasia (Monti et al., 2013). Data included in the present study are collected during invasive language-related investigation of nine patients with a history of drug-resistant, focal epilepsy candidates for surgical removal of the epileptic focus (Nakai et al., 2017; Cossu et al., 2005; Matsumoto et al., 2004). Patients' electrodes explored broadly defined language areas, such as Heschl, Wernike and Broca, among the others. Simultaneous single pulse electrical stimulation and recordings (Parmigiani et al., 2022; Pigorini et al., 20150) were performed during a language task with three different conditions: listening, reading, and resting state with the eyes open. The resulting cortico cortical evoked potentials (CCEPs) revealed state-dependent changes during tasks that involves specific information processing, challenging the cortical dual stream model.