

Spatiotemporal brain imaging during involuntary attention switching: A combined fMRI-ERP-study

This diploma thesis is based on several studies of Escera et al. (1998, 2001, 2002), Yago et al. (2001a,b) and Alho et al. (1997) concerning involuntary attention switching caused by auditory stimuli during a simple visual task. These studies have identified an increased reaction time and larger number of incorrect choices in the visual task caused by the occurrence of distracting sounds. The temporal dynamics of cerebral activation during exogenous control of attention have been investigated by Escera et al. (see above) using event related potentials (ERPs), thereby providing a high temporal resolution for neuronal activity in association with involuntary attention switching. Increased scalp current density was observed at left frontotemporal, bilateral temporoparietal and prefrontal locations. Furthermore, increased scalp current density was found at a central location and at superior parietal locations.

For this diploma thesis a combined approach using ERPs and functional magnetic resonance imaging (fMRI) will provide a more accurate view on the temporal as well as the spatial dynamics of brain activation during attention switching since this approach offers the opportunity to reveal the cerebral locations of specific neural events contributing to involuntary attention.

A sample of 16 healthy human subjects will be scanned (fMRI at a 3 Tesla headscanner) and recorded (ERP) performing a simple visual task (discriminating odd and even figures by pressing the corresponding response button) with instructions to ignore irrelevant sounds. These sounds, i.e. auditory stimuli, are presented 300 ms before onset of each visual stimulus and consist of 80 percent standard tones, 10 percent deviant tones (slightly higher in frequency than standards) and 10 percent novel (i.e. natural) sounds.

The ERP source locations as well as the temporal order of activation will be used for a more accurate spatiotemporal model of cerebral areas activated during the fMRI sequences. This should lead to a more precise understanding of the brain mechanisms and neural networks involved in involuntary attention switching.

References:

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