SIMULTANEOUS EEG-fMRI RECORDINGS TO LOCALIZE NEURAL SOURCE MODELLING OF ENDOGENOUS POTENTIALS (ERPs), ELICITED BY OMITTED TARGETS.

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Background: ERPs occurring independently of any specific sensory event are purely *endogenous* (*emitted potentials*): and their neural generators univocally linked with cognitive components. Aim of the present study was to localize and compare the cortical and subcortical neural sources of the scalp-recorded ERPs from two similar visual tasks: a standard two-stimulus oddball, and an omitted-target oddball task, using EEG-fMRI simultaneous recordings.

*Material and method*s: Thirteen healthy right-handed volunteers (5 females; mean age 26 years, range 22-29), were enrolled. The high temporal resolution of electrophysiology was combined with the fine spatial information provided by functional MRI. In addition, the source modelling (dipole analysis) of ERPs was seeded to the clusters of fMRI activations. The simultaneous recording of EEG and fMRI guaranteed that the cognitive states of the subjects were the same during the experimental session.

Results: The results of both the omitted-target oddball and the standard oddball task were unanimous in depicting an antero-to-posterior neural circuitry for the detection of rare, task–relevant events. P300 (P3b) was generated in the frontal, temporo-parietal and parietal areas (these latter only in the standard oddball), namely the temporo-parietal junction (TPj), the premotor and motor area (M1) and the anterior intraparietal sulcus (aIPs). Anterior Insula contributed to the pP2, a recently described prefrontal component (different from the well known P3a) associated with the stimulus-response mapping. The anticipatory (i.e., pre-stimulus) prefrontal negativity (pN) and Bereitschaftspotential (BP), also endogenous in their nature, were produced by anterior areas, namely the inferior and middle frontal gyrus over the lateral brain surface and the SMA-CMA areas over the medial cortex.

Conclusions: recording *emitted* ERPs from omission of target stimuli in a simultaneous EEG-fMRI event-related paradigm allows a detailed spatio-temporal modeling of the neural generators of purely endogenous late potentials and provide useful insight to the interpretation of emiited/endogenous ERPs.