

## Abstract View

## ASSESSING BRAIN DYNAMICS WITH SIMULTANEOUS EEG AND FMRI

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We here report the results of simultaneous electroencephalographic (EEG) and functional magnetic resonance imaging (fMRI) recordings and analysis of event-related brain dynamics involved in a working memory task using independent component analysis (ICA). Fifteen healthy adults participated in this study. EEG activity was recorded by 72 custom tin EEG electrodes in a Siemens 1.5T scanner while the subjects performed 3 5.5-min bouts of a two-back working memory task, each consisted of 5 40-s "on" periods alternating with 6 20-s "off" periods. During on periods, participants were instructed to press a button if a visually presented letter (A-E) matched the letter presented 2 trials previously. fMRI data were analyzed with preprocessing, ICA, and visualization methods implemented in FMRLAB ([scn.ucsd.edu/fmrlab](http://scn.ucsd.edu/fmrlab)). For each subject, we found one independent component with region of activity covering bilateral dorsal lateral prefrontal cortex and bilateral inferior parietal cortex, and component time course highly resembling the experimental paradigm. After removing RF-pulse and other artifacts from the EEG, and time-aligning the EEG and BOLD signals, we obtained EEG signals that were generally comparable to the EEG signals collected outside of the scanner from the same subjects. In the theta band, EEG power was positively correlated with the block design at fronto-central electrodes, indicating that EEG theta power increased during task performance. Above 12 Hz, however, the correlations between the block design and EEG power were predominately negative. We also found a correspondence between the time courses of the BOLD signal and EEG power, predominantly a strong negative correlation in the alpha band. The linkages between the two types of signals, concurrent EEG and fMRI recording allow localizing areas with altered blood oxygenation and flow associated with EEG dynamic events.

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