

Supplemental Material

This document is a text supplement of the article “Effective connectivity of the human cerebellum during visual attention” (Thilo Kellermann, Christina Regenbogen, Maarten De Vos, Carolin Mößnang, Andreas Finkelmeyer, Ute Habel) and describes the methods for the analysis of the electroencephalography (EEG) data, which were simultaneously acquired with functional magnetic resonance imaging (fMRI).

EEG Data Analysis

Electroencephalography (EEG) data were recorded simultaneously during functional image acquisition using MRI compatible hardware with 64 electrodes (BrainAmp MR plus, BrainProducts GmbH, Gilching, Germany), 63 of which covered the 10-20 system on an MR-optimized electrode cap (Easycap GmbH, Herrsching-Breitbrunn, Germany) and one electrocardiogram electrode was placed ~10 cm below the left scapula. Due to the absence of behavioral reactions we sought psychophysiological evidence for enhanced attention in terms of a desynchronization in the alpha frequency (Klimesch et al., 1998; Pfurtscheller et al., 1994). Details about acquisition and preprocessing of the EEG data will be reported elsewhere. In short, the impedance of all electrodes was below 20 K Ω at start time, data were recorded at 5000 Hz and subsequent processing steps were as follows: MR artifact correction (using Brain Vision Analyzer 2, BrainProducts GmbH, Gilching, Germany), downsampling to 250 Hz, correction for cardioballistic artifacts (using EEGLAB, Delorme and Makeig, 2004), removal of eye-blink and eye-movement components via independent component analysis (Debener, 2007), bandpass filtering between 1 Hz and 30 Hz and epoching according to the three blocks STATIONARY, FIX-MOVING and ATTEND-MOVING. Alpha frequency was assessed at 22 central electrodes (F1, Fz, F2, FC1, FC2, C1, Cz, C2, CP1, Cpz, CP2, P3, P1, Pz, P2, P4, PO3, POz, PO4, O1, Oz, O2). Power spectral density was estimated according to Welch's method with 50% overlapping segments using a Hamming window with 42.5 dB sidelobe attenuation. Individual alpha frequency was defined as the maximum spectral density in the range of 6-12 Hz during STATIONARY and yielded a mean of 10.13 Hz (standard error ± 0.21). Alpha bands were integrated across the individual alpha ± 2 Hz for fixation and attending moving bars, respectively. An exact permutation test showed a significant decrease in the alpha band for the comparison

of FIX-MOVING and ATTEND-MOVING ($P < 0.0191$, one-tailed), indicating increased alertness and expectancy during attention (Klimesch et al. 1998).

References

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