

EEG/NIRS Dataset During Mental Arithmetic

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Citation: it will be added soon.

Experimental Paradigm

Twelve subjects participated in the experiment. All subjects were seated in a comfortable armchair 1.6 m from a 50-inch white screen and all instructions were displayed by a video projector. Each session consisted of a pre-rest (15 s) with a fixation cross and 20 repetitions of a single trial followed by a post-rest (15 s). In the pre- and post-rest periods, subjects rested with their eyes open while looking at a fixation cross that was displayed in the middle of the screen. A single trial included a visual instruction (2 s) indicating the type of task, a task period (10 s), and a rest period with a random length (15 to 17 s). In the instruction period, the type of task was randomly given (MA or BL). For MA, an arbitrary three-digit number minus a one-digit number between 6 and 9 was given as an initial calculation. For BL, a fixation cross was displayed. Subjects were instructed to close their eyes as soon as they recognized the type of task. During the task period that began with a short beep (250 ms), subjects were asked to continue performing the given task with their eyes closed. For MA, subjects continuously subtracted a one-digit number from the result of their previous calculation. For BL, subjects remained relaxed. After the short beep (250 ms), a “STOP” sign was displayed on the screen, the fixation cross reappeared, and subjects relaxed with their eyes open while looking at the cross.

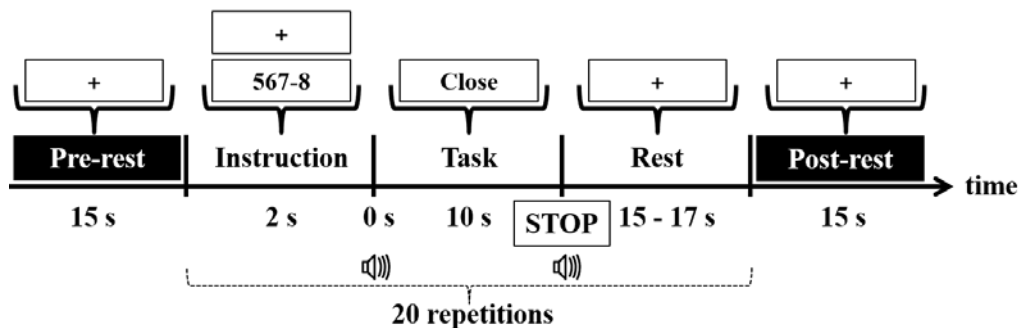


Figure 1. Experimental paradigm

Data recording

A brainAmp amplifier (Brain Products GmbH, Gliching, Germany) was used to record EEG signals using linked mastoid reference (sampling rate: 1000 Hz) from 22 locations on a custom-made elastic cap (EASYCAP GmbH, Herrsching, Germany; AFp1, AFp2, AFF1h, AFF2h, AFF5h, AFF6h, F3, F4, F7, F8, Cz, C3, C4, T7, T8, Pz, P3, P4, P7, P8, OI1, and OI2). The ground electrode was placed on Fz. A NIRScout (NIRx GmbH, Berlin, Germany) was used to record NIRS signals (sampling rate: 12.5 Hz). Five NIR light sources and three detectors were positioned on the prefrontal cortex (PFC). The adjacent sources and detectors consisted of nine channels near Fp1, Fp2, and Fpz. The inter-optode distance was set as 30 mm. NIRS optodes were placed on the same cap as the EEG electrodes.

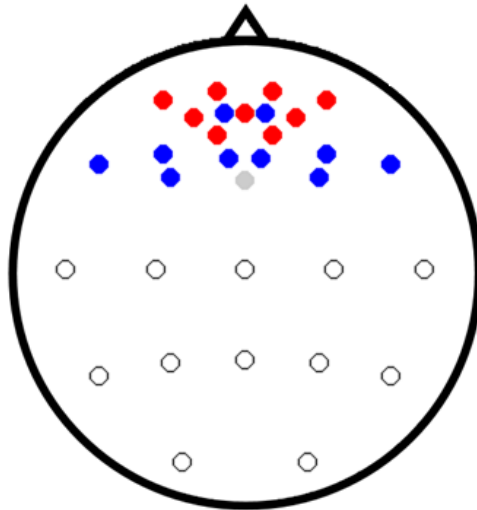


Figure 2. Locations of the EEG and NIRS channels. Blue (with white) and red circles denote the location of the EEG and NIRS channels, respectively. The one gray circle indicates the ground electrode.

Data file description

The MATLAB-compatible resource (in vendor-agnostic format) consists of EEG/EOG data and NIRS data separately. The name of each zip file consists of participant code and modality, e.g., “VP001-EEG” for EEG data and “VP001-NIRS” for NIRS data. Each zip file has continuous data (cnt), marker (mrk), and montage (mnt) for datasets A-C each. Each file comprises of MATLAB structure array with several fields. For NIRS data, the cnt files contain deoxy/oxy-hemoglobin data as separate fields. For data structure information, please refer to the BBCI toolbox. The description text file of the uploaded dataset explains the data structure in more detail.