Recording and Stimulation

Throughout the experiment, participants sat in a comfortable chair and rested their right-hand index finger on a keypad. EMG signals were recorded from the muscles of right hand first dorsal interosseous (FDI) and abductor digiti minimi (ADM), as shown in . EMG signals were amplified 1000, band-pass filtered (20-2kHz, Digitimer-D360R amplifier, Digitimer Ltd, UK), and digitized at 5 kHz. EMG signals were stored using a Power Micro1401 which is controlled by software Signal 7 (CED, UK). TMS pulse was delivered with a 70mm figure-of-eight coil (NTK-TMS-I, Jiangxi Brain Regulation Technology Development, Inc. China) over the M1 of FDI "hot-spot" where the largest MEPs could be acquired. TMS coil with an angle of 45° to the mid-sagittal plane was held tangentially on the scalp. During the intervention, participants received rTMS at a frequency of 10Hz, with 1200 pules in 10 min stimulation duration. EEG signals were collected from 32 scalp Ag-AgCl electrodes which located according to the International 10-10 system by a BrainAmp system (Brain Products, Gilching, Germany). The ground electrode was set to FpZ. The recording was performed in DC mode, with a 5k Hz sampling rate.

Movement Task

A cue-guided task with anticipated movement times was used to combine rTMS with task related brain state to make our results to be compared with former corresponding studies. Each trial in the task pattern included four periods: 1) Focus time (1-2s), 2) Preparation phase (2s), 3) reaction period activated by a "0" cue (0.5-1s) and 4) feedback period (inter-trial rest phase, 3-4s) showing participants their performance There are four different feedback according to the response of subject: 'Good', 'OK', 'Too soon', and 'Time out'. During focus and preparation phase, subjects put their index finger on keyboard buttons in a comfortable position. During reaction phase, subjects would press the button as rapid as possible through brisk movement [14]. Thirty trials were measured after training and the mean reaction times (RTs) were computed.

Experimental Paradigm

The experimental sessions began with a resting state with eye open (pre-REST), followed by task familiarization and 30 additional trials before intervention (TASK), 5 min after intervention (TASK5), and 20 min after intervention (TASK 20). Movement-related EMG signals were recorded and used to estimate the participants' RT and monitor their movement performance during the above 3 task-related periods. TMS-evoked EEG responses were collected before intervention (PRE), 0 min after intervention (POST0), and15 min after intervention (POST15) by using 100 TMS pulses. Stimulus intensity was given at 120% of the resting motor threshold (RMT). Interventions consisted of 90 trials of movement task wherein a 10Hz rTMS at 80% of the RMT was implemented. Sessions ended with a resting state 25 min after intervention (post-REST).