A language research about sustained attention through the influence of TMS on right DLPFC with first phase of results

Yangyang Jiang, Doctor Candidate[1]; Haosu Zhang, Doctor Candidate[1],Severin Schramm, Doctor Candidate[1];
Nico Sollmann,MD[1]; Chiara Negwer, MD[1]; Sandro Krieg, Professor Dr. med, Master of Business Administration [1]
[1.] Department of Neurosurgery, Klinikum rechts der Isar, Technische Universität München, Ismaninger Str. 22,81675 Munich, Germany

CONTACT

Yangyang Jiang
Email:
jiangyangyang009@gmail.com
Phone: +49 015258959409

INTRODUCTION

Sustained attention (SA) is a complex neurological process and might influence language production. The dorsolateral prefrontal cortex (DLPFC, Fig. 1) is known to be associated with the SA process. In this study we want to examine if stimulation of the DLPFC with rTMS will interfere with SA during language production.

MATERIAL AND METHOD

We have enrolled 9 healthy volunteers. A picture naming test (PNT) was performed using two different settings of inter-picture interval (IPI) 1400 ms and 1900 ms respectively (display time 100 ms). Furthermore a Digit Discrimination Test (DDT) was performed using an IPI of 700 ms and 1900 ms (display time 100 ms). A stimulation of the DLPFC was performed with nrTMS using 1 Hz and in a second session after 2 weeks with 10 Hz for 30 minutes.

Ex-Gaussian distribution will be used in analysis of naming latency , outputting 3 indexes such as μ , σ , τ (Tab.1).

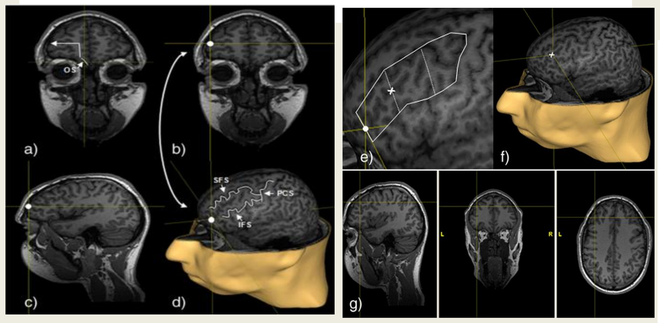

Figure 1. Determination DLPFC. (V. Mylius, S.S. Ayache etl, 2013.)

RESULTS

D-prime of the slow block (IPI 1900 ms) before and after stimuli in 1Hz session showed significant difference (mean of difference -9.399±5.333, $p<0.05$). Similar positive results also occurred in fast block (IPI 700 ms) before and after stimuli with 1Hz (mean difference -1.705±0.5602, $p<0.05$) and 10Hz session (mean difference 2.107±1.256, $p<0.05$), but failed in slow block before and after stimuli in 10Hz session(mean difference -0.1698±2.74,$p>0.05$), (Fig.2 and 3) .

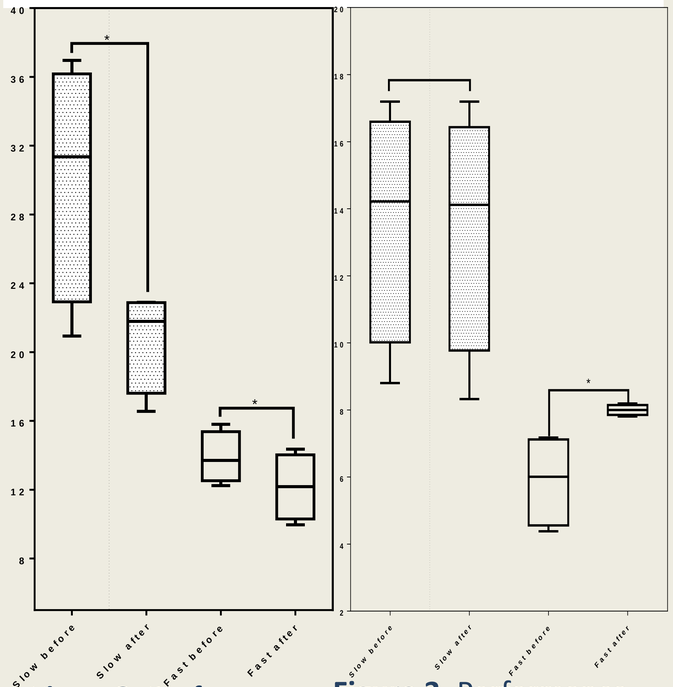

Figure2. Performance between before and after 1 Hz stimulation. Y-axis stands for d-prime.

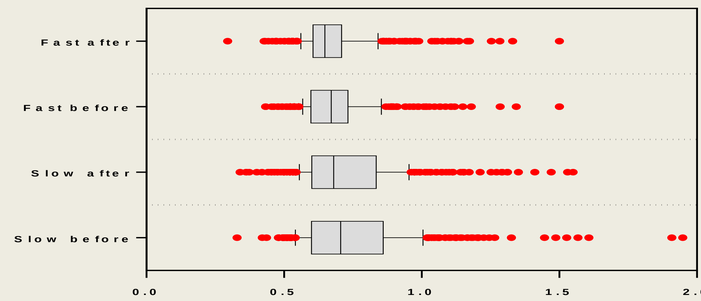

Figure3. Performance between before and after 10 Hz stimulation. Y-axis stands for d-prime.

Figure4. Naming latency in various groups of PNT under 1 Hz stimulation. X-axis stands for naming latency.

	Slow before stimuli	Slow after stimuli	Fast before stimuli	Fast after stimuli
μ	0.5638	0.5859	0.7629	0.7704
σ	0.0437	0.0608	0.0512	0.0745
τ	0.1312	0.0783	0.1600	0.1527

Table1. Ex-Gaussian distribution between in various blocks before and after 1 Hz stimulation（one data sample）.

Naming latency (IPI 1900 ms, slow) before stimulation with 1Hz : mean 0.7479±0.2003 and after stimulation with 1 Hz: mean 0.7349±0.1916.
Naming latency (fast) before stimulation with 1Hz: mean 0.6907±0.1379; and after stimulation with 1Hz : mean 0.6795±0.1367, (Fig. 4).

CONCLUSION

The first phase of result has showed that different frequency TMS has a strong relationship with event rates of sustained attention. Slow and fast events are influenced by 1Hz stimulation And fast event rate is could be obstructed by 10Hz stimulation. In a next step the relation between naming latency and naming error should be further analyzed.