

Workshop on

Transcranial brain stimulation techniques in biological psychology

Jena, June 6th-7th 2012

(preceding the 38. conference on „Psychology and the Brain “, Jena, June 8th-10th 2012)

Abstract

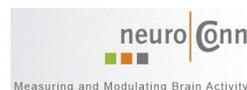
Non-invasive brain stimulation techniques like transcranial magnetic stimulation (TMS) and transcranial direct/alternating current stimulation (tDCS/tACS) are an important approach in cognitive neuroscience to investigate brain functions. The ability to experimentally manipulate local neuronal activity before or during the performance of a certain cognitive task allows for the investigation of causal structure-function relationships that go beyond the mere correlative approach of neuroimaging and electrophysiology. The workshop addresses PhD students and postdocs interested in learning how to use TMS/tDCS. In addition to talks providing the necessary background knowledge about technical and physiological mechanisms as well as experimental paradigms, practical demonstrations will allow participants to gather first hands-on experience with the techniques.

Organization

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Sponsors



Programme

Wednesday, 6th of June 2012

09:00 Welcome (Gordon Feld)

09:15 Talk: What is TMS/tDCS and how does it work?

This talk will introduce the physical and physiological underpinnings of TMS and tDCS and briefly outlines the most essential technical parameters such as TMS coil forms, pulse forms, stimulation intensity, tDCS electrode types, sizes, and montages.

09:45 Talk: Cortical excitability & intracortical networks

This talk will explain why and how TMS can be used to assess the excitability of primary motor and visual cortex by measuring motor evoked potentials (MEP) and phosphenes, respectively. With respect to the motor cortex, we will further explain the concepts of resting and active motor threshold, cortical silent period, paired-pulse protocols with one or more TMS coils to measure intracortical inhibition and facilitation. In addition, a brief outlook towards the usage in clinical diagnostics will be provided.

10:15 Talk: Where to stimulate?

This talk will introduce various possibilities of localizing and targeting brain areas of interest, ranging from functional TMS-localizers over the 10-20 system to state-of-the-art stereotactical neuronavigation based on anatomical landmarks, MNI-coordinates or fMRI-localizers. Important parameters like coil orientation, direction of current flow, adjustment of stimulation intensity to target depth, etc. will be discussed.

10:30 Talk: Safety first!

This talk will briefly outline the relevant inclusion/exclusion criteria, safety guidelines and risks (syncopes, seizures, unwanted acute sensory and cognitive effects) and discusses the necessity of ethical approval and subject insurance.

10:45 Coffee break

11:15 Demo: Twitching muscles and flashing lights

This demo will first show how MEPs can be evoked at the hand area of the primary motor cortex, how they can be measured at the contralateral hand muscles using surface EMG, and how resting and active motor threshold can be determined. Second, the triggering of phosphenes by visual cortex stimulation as well as phosphene threshold determination will be demonstrated.

12:30 Questions & Answers

12:45 Lunch break

14:00 Talk: Experimental approaches

This talk will outline the different experimental approaches which apply TMS/tDCS in cognitive neuroscience either offline (before a task) or online (during a task). We will introduce stimulation protocols capable of inducing transient changes in cortical excitability, such as 1Hz or 5Hz rTMS, theta burst stimulation (TBS), and paired associative stimulation (PAS). We will explain concepts such as “virtual lesion”, “perturb & measure”, “condition & perturb”, “chronometry”, “short-term functional reorganization”, etc. We will further discuss “sham stimulation”, the specific experimental confounds related to TMS/tDCS during a task (e.g., when presenting auditory stimuli), as well as the requirements for good control conditions. Example studies will be discussed.

15:30 Coffee break

16:00 Demo: Offline rTMS/tDCS and Neuronavigation

This demo will show how different plasticity-inducing protocols (1Hz/5Hz rTMS, cTBS/iTBS, PAS, and anodal/cathodal tDCS) are applied. In addition, we will demonstrate how state-of-the-art MR-based stereotactical neuronavigation can be used to guide the positioning of the TMS coil.

17:15 Questions & Answers

17:30 End

20:00 Optional: Ethanol-based pharmacological brain stimulation (aka *drinks*) ;-)

Thursday, 7th of June 2012**09:15 Talk: Multimodal approaches**

This talk will introduce the different approaches that combine TMS/tDCS and neuroimaging (e.g., EEG and fMRI) either one after another („consecutively“) or at the same time („concurrently“). We will outline the technical challenges (in particular for concurrent TMS-EEG) and how to cope with them. Further, we will discuss possible applications and example studies.

10:45 Coffee break

11:15 Demo: Concurrent TMS-EEG

This demo will show how to run a basic concurrent TMS-EEG experiment, i.e., the measurement of TMS-evoked EEG potentials. We will highlight the technical caveats in preparing subject, electrode cap, and TMS device. Stereotactic neuronavigation will be used to coregister EEG electrodes to the individual MRI and to guide coil positioning. A basic measurement will be performed, and we will show and discuss the various TMS-related artefacts and how to cope with them during the analysis.

12:30 Questions & Answers

12:45 End of workshop

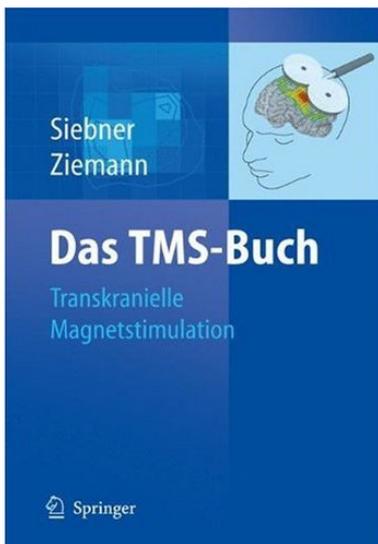
Further Information

Fees: 40€ for non-members; 20€ for members of DGPA or DGPs. For further allowance please contact Gordon Feld (gordon.feld@uni-tuebingen.de)

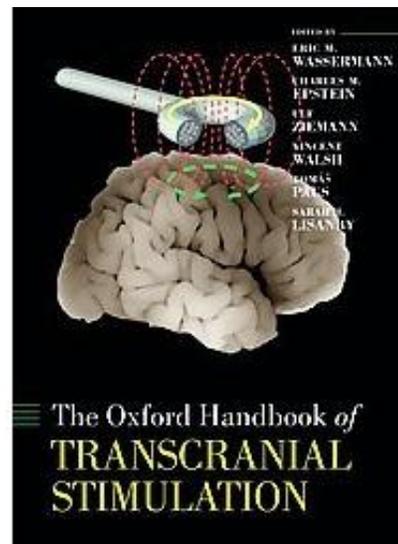
Language: Slides in English, Talks in English, Q&A in English/German

Location: University of Jena, Carl-Zeiss-Straße 3, room 308

Suggested Readings:



Siebner HR & Ziemann U (2007). **Das TMS-Buch: Handbuch der transkraniellen Magnetstimulation**. Berlin: Springer.



Wassermann EM, Epstein CM & Ziemann U (2008). **The Oxford Handbook of Transcranial Stimulation**. Oxford: Oxford University Press.