P268 The effects of priming theta burst stimulation with transcranial direct current stimulation on prefrontal cortex functioning: A double-blind sham-controlled study in healthy subjects—**S. De Smet [a,*], C. Baeken [a], A.R. Brunoni [b], R. De Raedt [c], S. Van Damme [c], M.M. Pulopulos [c], S. De Witte [a], M.A. Vanderhasselt [a,c] ([a] Ghent University, Department of Head and Skin - Psychiatry and Medical Psychology, Ghent, Belgium, [b] Universidade de São Paulo, Department and Institute of Psychiatry, São Paulo, Brazil, [c] Ghent University, Department of Experimental Clinical and Health Psychology, Ghent, Belgium)**

Non-invasive brain stimulation (NIBS) techniques such as transcranial direct current stimulation (tDCS) and theta-burst stimulation (TBS) have been increasingly used to target prefrontal brain regions, such as the dorsolateral prefrontal cortex (DLPFC), to optimize therapeutic outcomes. Recently, several innovative studies targeting the motor cortex have suggested that combining distinct NIBS techniques enhance changes in brain activity. Surprisingly, effects on the prefrontal areas are not systematically evaluated. Considering the role of the DLPFC in the pathogenesis of psychiatric and stress-related disorders, there is a lack of knowledge whether the combination of NIBS techniques targeting the DLPFC would result in changes in prefrontal functioning and mood related variables. In this double-blind, sham-controlled, within-subjects study, 68 healthy were submitted to two stimulation protocols targeting the DLPFC (active tDCS + active iTBS and sham tDCS + active iTBS), with one-week interval. The psychophysiological effects and safety of combined NIBS interventions over the DLPFC were evaluated. Moreover, the Maastricht Acute Stress Test (MAST) was used to activate the stress system and to examine the changes in prefrontal functioning following the two stimulation protocols. Results showed significant changes in autonomic activity (decreased heart rate, increased blood pressure and heart rate variability) directly following the stimulation but no differences between the two stimulation protocols were found. In both sessions, the confrontation with the stressor resulted in psychophysiological changes. However, these changes were not significantly different for the active tDCS + active iTBS compared to the sham tDCS + iTBS protocol. Overall, priming iTBS with tDCS did not result in significant changes in prefrontal functioning. Moreover, priming iTBS with active tDCS resulted in more subjective stress and was experienced as more painful compared to the sham tDCS + active iTBS protocol.

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P269 Ultra-focal magnetic stimulation: A numerical comparison between two different miniaturized coils—**M. Colella [a,b,*], M. Liberti [a], F. Apollonio [a], G. Bonmassar [b] ([a] University of Rome La Sapienza, Department of Information Engineering, Electronics and Telecommunications, Rome, Italy, [b] AA. Martinos Center, Massachusetts General Hospital, Harvard Medical School, Radiology, Charlestown, United States)**

Introduction: Transcranial magnetic stimulation (TMS) is a non-invasive brain stimulation technique with several clinical applications for the treatment of psychiatric diseases and neurological disorders, as well as in research, for investigation of neuronal connections. Due to the large dimensions of the stimulator, TMS is affected by a lack of spatial resolution, which causes concurrent excitation of both excitatory and inhibitory neuronal networks and makes it challenging to correlate the stimulation site to the targeted cortical region. To overcome this limitation, the first miniaturized figure-of-8 coil (μCoil) was developed and its ability to excite nervous tissue has been tested by stimulating the radial nerve of healthy subjects and by recording the consequently elicited sensorial action potential. The μCoil was numerically modeled and neurodynamic studies on the peripheral nervous system predicted a stimulation threshold for the radial nerve of 60 A, which was very close to the working conditions of the μCoil. Following such results, the second prototype of the miniaturized coil (μTMS coil) was built to target cortical regions.

Objective: In this work, we present the μTMS coil and we numerically compare it with the previous μCoil. The aim is to show the enhancement we can achieve with the μTMS coil over the μCoil in terms of the induced electric field.

Methods: The μTMS coil and the μCoil share a similar geometry. They both consist of two paired solenoids that form an 8-shaped coil. Each solenoid is composed of either 8 (μTMS) or 4 (μCoil) parallel copper traces. In the μCoil, each solenoid is 10 mm high and 15 mm wide, with the traces wrapped in 123 turns around a thin copper pin. In the μTMS coil, each solenoid is 12 mm high and 21 mm wide, and it's wrapped in 100 turns around an iron core. The corresponding numerical models match the dimensions and circuitry of the physical coils. The comparison between the two coils was performed with numerical electromagnetic simulations using Sim4Life v.5 (Zurich MedTech) with the same driving conditions matching the experiments (1.9 kHz).

Results: The presence of the core and the greater number of traces ensure the μTMS coil to generate a field at the center of the coil 3.75 times higher than that generated by the μCoil and an field 6 times higher. Furthermore, with the same driving conditions, the μCoil is characterized by a focal area of 1 cm^2 with a penetration depth of 1.5 cm, while the μTMS coil can reach regions up to a depth of 4 cm with a focal area of 2.25 cm^2.

Conclusions: We have numerically demonstrated that the μTMS produces higher magnetic and electric fields than the previous μCoil, ensuring a higher penetration depth. Nevertheless, the new structure is affected by a loss of focality. Despite this, we expect that the new μTMS coil will be able to induce inside the cortex an electric field able to determine a neuronal response at a lower threshold.

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P270 Using a rabbit model to observe corticospinal contributions of noninvasive electrical stimulation—**M. McCullen, C. Grosskopf, S. Jafary, P. Chan, V. Chen [*] (Loyola University Chicago, Chicago, United States)**

Introduction: Electrical stimulation is conducted by applying electric fields to neural tissues in an attempt to assist or enhance the recovery process by inducing neuroplasticity during neurorehabilitation. The exact mechanism or concept behind how electrical stimulations assist or enhance the recovery process of neurological ailments are not yet fully understood, suggesting the need to conduct more thorough examination of electrical stimulation parameters by using an animal model in place of human or cellular samples to gain insights that are not attainable in current studies.

Objectives: We speculate that the power intensity at certain frequencies or within certain frequency bands, i.e., the power spectral density, is probably the key factor that decides the extent of neuroplasticity via the activation of action potentials, communication between synapses, and increased synaptic connections. The electrode-tissue impedance model suggests that human tissues act as a complex analog filter that can attenuate the power spectral density of certain frequency bandwidths.

Materials & Methods: A customized stimulation sequence including a burst of higher power spectral density was applied to observe the correlation between the corresponding changes of