half undertook EEG and TMS — EEG recordings at the same intervals as well as one week after treatment commenced. EEG was recorded at rest and during the Sternberg working memory task.

Results: Responders to rTMS showed higher levels of both working memory related and resting fronto-midline theta power and theta connectivity compared to non-responders and similar elevations were seen after one week of treatment. Several predictive machine learning algorithms including a combination of measures were able to predict response with >85% accuracy. Similar levels of accuracy were obtained using predictive machine learning algorithms applied to resting state data from baseline fMRI recordings.

Conclusions: Although there is little evidence that clinical or demographic variables can accurately predict response to rTMS treatment, it is possible that sophisticated analyses of EEG and fMRI data may prove capable of having clinical utility in this regard. Algorithms looking at more complex elements of network connectivity appear to have potential in this regard but the data from our study requires validation in a second prospective analysis.

Keywords: fMRI, EEG, depression, rTMS

108 TRANSCRANIAL PHOTOBIMODULATION: APPLICATION OF LLLT IN SPEECH AND LANGUAGE CIRCUITS FOR THE REHABILITATION OF PATIENTS WITH CRANIAL BRAIN TRAUMA

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Abstract: Much has been talked about in the last decade of the application of different techniques of transcranial stimulation for the rehabilitation of language in different pathologies, autism, Alzheimer, Parkinson, TEC, etc. The Journal of Medical Ethics 2011 defines trancranial stimulation as a neurostimulatory and neuromodulatory non-invasive technique that is increasingly used in clinical and research practices around the world. According to Daniel M. Johnstone and others in 2015 from the Department of Physiology of the University of Sydney, Australia, laser therapy with infrared light is emerging as a safe and effective therapy that is capable of stopping neuronal death. Given the safety features offered by LLLT, it is chosen as the therapeutic technique to apply transcranial stimulation and the brain circuits implicit in speech and language are determined for application to patients with cranial brain trauma, since these patients are precisely the ones they present lesions and edema that lead to neuronal death.

Method: It is a study carried out so far with 35 patients diagnosed with aphasia and low level of consciousness, secondary to cranial brain trauma. The technique used is the LLLT (Low level laser therapy), 650 to 830nm, 5 mw, light, infrared pulsatile, for 2 minutes, in application for each of the points of the cerebral circuits of speech and language, for a week. Registering the answers for speech and language, which have communicative intention.

Conclusion: The application of LLLT for the recovery of patients with aphasia secondary to ECT is a useful, non-invasive tool that allows obtaining short-term responses in the therapy of language and speech. The research should continue and obtain a representative number of patients, clearly define the speech emission and redefine the expected findings.

Keywords: Photobiomodulation, transcranial, stimulation, fonoaudiologia

109 TRANSCRANIAL DIRECT CURRENT STIMULATION (tDCS): MOLECULAR AND BEHAVIORAL EVOKED ALTERATIONS

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Transcranial Direct Current Stimulation (tDCS) is a non-invasive, therapeutic technique, focusing on neuronal modulation through low-intensity continuous currents. tDCS has been proposed in clinical studies as an alternative and complementary treatment for neurological and neuropsychiatric disorders. Despite growing use in clinical trials, detailed cellular and molecular evoked alterations, short and long-lasting effects as well as side effects are yet to be deeply investigated. Therefore, this study aims at investigating tDCS’ gene expression and behavioral (learning and memory) evoked alterations in an animal tDCS model. 4 groups were studied (5/1, 5/5, 10/1) and Task Paired-Barnes Maze 5/1 - meaning ex: 5/1 Five days of stimulation, collecting the tissue 24h after the last stimulation), comprising of treatment (tDCS) and control (Sham). Groups underwent differential chronic stimulation, varying on days of treatment, time of tissue extraction (Hippocampus and Cortex) for gene expression analysis and paired task stimulation. Groups received anodal stimulation at 0.35 mA for 10 min. Among eight genes analyzed, tDCS evoked significantly higher levels of BDNF and GFAP gene expression in the tDCS stimulated 5/1 group, but no differences were found in the remaining groups. We also assessed cortical glutamate levels through a redox analysis but no significant differences were observed. Task paired tDCS animals presented no significant differences in GFAP gene expression, while BDNF levels were considerably higher in the tDCS group no statistical significance was observed. Moreover, an enhanced performance (latency, errors, distance and adopted strategy to execute task) in the barnes maze task stimulated (tDCS) group was observed. The task paired tDCS group presented no difference in glutamate quantification, but generally presented higher levels compared to the other groups. In conclusion, tDCS evokes gene expression alterations and enhanced learning and memory performance, which, furthermore, may help in selecting ideal treatment protocols and in the understanding of tDCS treatable diseases.

Keywords: Transcranial Direct Current Stimulation, Behaviour, Gene Expression

110 PERIOD AND AMPLITUDE CONTROL STIMULATING PULSES ENERGIES

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It has recently been experimentally shown that, for atrial fibrillation patients, increasing the amplitude of the applied defibrillating single pulse and decreasing its duration leads to a “gentler” influence than that obtained for regular defibrillating pulses, in that it drastically lowers the electrical energy delivered. The authors of the paper could not explain the reason for such a beneficial outcome.

We use a simple nonlinear mathematical model to explain why, in pacing, short pulses of high amplitudes are more beneficial to the patient than lower and longer ones. Results demonstrate that, for the nonlinear model, the structure of the energy delivered by pulses as a function of the pulse parameters is different from that of the energy obtained for linear systems. For a linear system, according to the Weiss–Lapicque theory, the energy has a minimum for a certain value of the pulse-duration called Cronaxie. On the other hand, for non-linear systems (and neurons and definitely the brain are such systems) the situation is different in that the energy delivered by short pulses (up to a certain minimum duration) is smaller than that of longer pulses (no minimum!). Thus, unless high pulses of short duration cause tissue damage (e.g. by electrophoresis), short and high pulses should be the ones to use clinically both for defibrillation in the heart and for stimulations in the brain.

Keywords: pulse energy, nonlinear model, FHN, Morris Lecar

111 RESTING MOTOR THRESHOLD’S ASYMMETRY CORRELATES WITH THE COGNITIVE LEVEL IN ALZHEIMER’S

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The utilization of repetitive transcranial magnetic stimulation (rTMS) is becoming increasingly popular in research to treat neurological and psychiatric disorders. The strength of the applied pulses during treatment is determined by measuring the resting motor threshold (RMT) on both sides of the brain. Hypothetically, the RMT may reflect the functional integrity of