N. Ko[1,2], C. Laine[2], F. Valero-Cuevas[2], B. Fisher[2]. [1] *California State University, Fresno, USA;* [2] *University of Southern California, USA*

Precision pinch against unstable objects elicits dynamic control of fingertip forces. Unilateral dynamic precision grip engages both hemispheres as evidenced by several imaging studies. However, our understanding of underlying mechanisms of functional communication between hemispheres is still lacking. Here, we tested corticospinal excitability to assess changes in interhemispheric communication with increasing instability of objects during unimanual-pinch tasks. Ten right-dominant healthy adults (29.5±3.5yrs, 4M/6F) performed three force-matched pinch tasks at low forces (<3N) with right thumb and index finger while their left hand was resting. The pinch tasks included compression of (i) a rigid dowel, (ii) short (stable) spring, and (iii) long (unstable) spring while single-pulse TMS was delivered over the right M1. Motor-evoked-potentials (MEPs) and mirror EMG activity from the left first dorsal interosseous (left_FDI) and ipsilateral silent periods (ISPs) from the right_FDI were recorded and analyzed. We found that the average MEPs in the resting left_FDI were highest for the unstable spring (p<0.001). The stable spring and dowel elicited similar MEP amplitudes (p=0.79), but greater than a control, rest condition (p<0.05). Mirror EMG activity in the left_FDI did not differ across tasks, nor correlate with MEP amplitudes. Importantly, ISPs in the right_FDI did not differ among conditions. These demonstrate that instability control demands required for unimanual tasks can modulate the net excitability of the unengaged corticospinal tract without eliciting mirror EMG activity in the resting hand for healthy individuals. Furthermore, inhibitory mechanisms from the ipsilateral M1 of the manipulating hand may not play an important role during low-force, dynamic instability control. These modulations of ipsilateral corticospinal excitability with instability control demands may provide alternative neurorehabilitation strategies for individuals with hemiparesis. Moreover, measuring the ipsilateral corticospinal-excitability and mirror EMG activity in the paralyzed hand may be a practical means to quantify disruption or recovery of brain function after injuries.

Keywords: Dynamic precision grip, instability control, corticospinal excitability, ipsilateral silent periods

1006

TARGETING RUMINATION WITH COMBINED MINDFUL BREATHING AND TDCS IN ADOLESCENTS WITH SUICIDAL THOUGHTS

K. Cullen, M. Thai, K. Lim, B. Klimes-Dougan. *University of Minnesota, USA*

Suicide is a leading cause of death among adolescents, and nearly 1 in 5 adolescents experience suicidal thoughts. Research is urgently needed to understand and prevent adolescent suicide. Rumination, or the persistent dwelling on negative, self-focused thoughts, is a key risk factor for suicidal behavior. This study will pilot a novel intervention designed to decrease rumination by altering its underlying neural circuitry in adolescents with suicidal thoughts. Neural correlates of rumination include (1) hyper-connectivity of the default mode network (DMN; a set of regions that mediate spontaneous cognitions during rest) with the salience network (regions underlying negative emotion), underlying excessive influence of negative emotion on resting-state thoughts, and (2) hypo-connectivity of DMN to dorsolateral prefrontal cortex (DLPFC), underlying impaired regulation of negative thoughts. Mindful breath training may be capable of decreasing rumination by reshaping the DMN to decrease its connections to the salience network. Further, transcranial direct current stimulation (tDCS) to DLPFC could augment mindful breathing by increasing DMN-DLPFC connectivity. This study will pilot the feasibility of randomizing 34 adolescents with rumination and suicidal thoughts into 2 experimental groups: (1) active tDCS plus mindful breath training (n=17); (2) sham tDCS plus mindful breath training (n=17). Our hypothesis is that combined mindful breath training and tDCS can decrease rumination by reshaping DMN connectivity in adolescents with suicidal thoughts. Anticipated drop-out is ~10%; expected final size per group is 15. The study goals are to document feasibility of these interventions in the proposed population, to explore biological effects on the proposed construct of rumination and its underlying neural components, to characterize the target construct using multiple levels of analysis including self-report measures, behavioral measures, EEG, and fMRI to allow identification of the most useful metrics for the next study.

Keywords: adolescent, suicide, tDCS, mindfulness

1007

TOWARDS MODELING THE INFLUENCE OF TRANSCRANIAL DIRECT CURRENT STIMULATION ON NEURONAL RESPONSE

C. Thomas[1], A. Datta[1,2], M. Kaiser[3], F. Hutchings[3]. [1] *Soterix Medical, USA;* [2] *City College of New York, CUNY, USA;* [3] *Newcastle University, United Kingdom*

Whole head MRI-derived computational finite element models are commonly used to predict current flow patterns through the brain. These predictions are used to guide stimulation strategy (electrode placement), prognosticate stimulation outcome, as well as to retrospectively interpret stimulation outcome. However, these whole head macroscopic models do not provide any information on neuronal level response leading to a gap in understanding how cortical current flow patterns ultimately impact underlying cellular populations.

Since specific neuronal elements targeted by stimulation are thought to mediate effects, it becomes important to understand which ones are affected versus not.

A prior in vitro study on rat motor cortex slices by our group indicated that distinct morphology of cortical cell type affects their response to stimulation by uniform electric field. The electric field magnitude considered reflected the typical sub-threshold induced value from 1 mA tDCS (~1 V/m). In this study, we sought to compare the experimental results reported previously to the predictions of a freely available software tool called VERTEX that allows simulation of extracellular potential recordings in spiking neural network models. The VERTEX simulator has previously been shown to predict the effects of transcranial current stimulation using a ferret visual cortex model.

Preliminary results in our study indicate that similar to the experimental findings, VERTEX tool predicts that cortical neuronal morphology correlates with level of somatic polarization.

This initial validation of the tool paves the path for further exploration of underlying neural response predictions by coupling macroscopic induced electric field data from transcranial direct current stimulation.

Keywords: computational modeling, neuron model,

1008

REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION (RTMS) AS AN EFFECTIVE INTERVENTION FOR CHRONIC DIZZINESS FOLLOWING MILD TRAUMATIC BRAIN INJURY: A CASE STUDY

E. Paxman, J. Stilling, L. Mercier, C. Debert. *Department of Clinical Neurosciences, Cumming School of Medicine, University of Calgary, Canada*

Case Hx: A 61-year-old male was seen at the Calgary Brain Injury Program (Alberta, Canada) after sustaining a mild traumatic brain injury (mTBI) following a pedestrian versus vehicle traffic accident. Post-injury, he reported light-headedness, spatial disorientation, nausea, fatigue, and prominent dizziness brought on by postural change, physical activity, and eye movements. Symptoms of dizziness persisted over 5 years, despite numerous rigorous vestibular and vision therapy regimens. Investigations suggested normal peripheral and central vestibular functioning.

Methods: The patient underwent 10 sessions of rTMS treatment with stimulation of the left dorsolateral prefrontal cortex (DLPFC) at 70% of resting motor threshold (RMT) and frequency of 10Hz. Ten trains of 60 pulses/train (total of 600 pulses) were administered at each session, with an inter-train interval of 45 seconds. RMT was identified using EMG at the *abductor digiti minimi* (ADM) muscle of the right hand during stimulation of left primary motor cortex.

Results: Dizziness Handicap Inventory, frequency, severity, and quality of life were assessed at baseline, during treatment and at 1 and 3 months post-treatment. Pre-treatment dizziness severity was reduced from 6.14/10 to 5.00 at 1-month post-treatment and further reduced to 3.00 at 3-months post-treatment. Symptom frequency was reduced from 58.5 episodes/week pre-treatment, to 21 episodes/week at 3 months post-treatment. The patient's DHI was 40/100 pre-treatment and was reduced to 26/