Poster 1-068

DOES TRANSCRANIAL DIRECT CURRENT STIMULATION AFFECT THE LEARNING OF A FINE SEQUENTIAL HAND MOTOR SKILL WITH MOTOR IMAGERY?

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Descriptors: motor imagery, motor learning, transcranial direct current stimulation

Learning a fine sequential hand motor skill, comparable to playing the piano or learning to type, improves not only due to physical practice, but also due to motor imagery. Previous studies revealed that transcranial direct current stimulation (tDCS) and motor imagery independently affect motor learning. Other studies showed that training with motor imagery combined with anodal tDCS might generally enhance motor performance. In the present study, we investigated whether tDCS combined with motor imagery above the primary motor cortex influences sequence-specific learning of a fine hand motor skill. Four groups of participants were involved: an anodal, cathodal, and sham stimulation group, and a control group without stimulation. A modified discrete sequence production (DSP) task was employed: the Go/NoGo DSP task. After a sequence of spatial cues, a response sequence had to be either executed, imagined or withheld. The task allows to estimate general learning effects in a practice phase, and sequence-specific learning effects in a test phase by comparing the execution of unfamiliar sequences, familiar imagined sequences, familiar withheld and familiar executed sequences. Results showed that the effects of anodal tDCS were already developing during the practice phase, while no sequence-specific effects were visible during the test phase. These findings confirm that anodal tDCS affects motor performance but they also reveal that it does not facilitate the influence of motor imagery on sequence learning.

Poster 1-069

NEURAL MECHANISMS OF SOCIAL LEARNING IN A COOPERATIVE AND COMPETITIVE SOCIAL CONTEXT

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Descriptors: social learning, performance monitoring, prediction error

In competitive social contexts, it can be advantageous to monitor the performance of an opponent. For example, we might track the value of an action for another player in a card game and use the information to predict and counter their next move. The biological basis of social performance monitoring is not well understood but model-based analyses of neural data can offer insight into the latent computations of the brain during social tasks. In the current study participants completed a reversal learning, three-armed bandit game, in which the actor and observer switched roles every 1–3 trials. Participants worked together, gaining points for themselves and a computer player in one half of the experiment and in the other half, fought for points, gaining only when their opponent lost points. The magnitude of these wins and losses varied trial by trial. To examine the integration of outcome probability, magnitude and social information throughout the experiment, we fit a reinforcement-learning model to participants' choices in the task and regressed the model-estimated output with their fMRI activity. Specifically, we calculate predictions errors - the difference between the actual and expected outcome on each trial and examine gain and loss trial PE-related activity in the two social contexts.

Poster 1-070

NEUROSTIMULATION OF HUMAN CEREBELLUM DURING ASSOCIATIVE LEARNING

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Descriptors: cerebellar tDCS, eye-blink conditioning

Delayed eye-blink conditioning (EBC) is a cerebellar-dependent associative learning task, which has been shown to be impaired in individuals with cerebellar lesions and cerebellar disorders. Transcranial direct current stimulation (tDCS), a form of noninvasive neurostimulation, has been experimentally utilized to potentially excite (anodal) and inhibit (cathodal) various brain structures including the cerebellum to impact behavior. The effects of cerebellar tDCS on EBC was examined in 37 healthy participants in a double blinded, between-subjects sham-controlled experiment. During conditioning, participants received stimulation of either sham, anodal, or cathodal tDCS at 1.5 mA for 25 minutes in the active conditions (anodal and cathodal). As predicted, cathodal stimulation significantly decreased conditioned responding compared to anodal stimulation, with effects of sham stimulation being intermediate but not significantly different compared to the two stimulation conditions. There were significant differences between sham and both cathodal and anodal for both conditioned response peak and onset latency. No significant differences were found in conditioned response peak amplitude across the three conditions. Results demonstrate that tDCS has an effect on acquisition and timing of EBC in humans and may be a viable mechanism of modifying cerebellar function. Further research is warranted to investigate potential therapeutic effects of anodal stimulation on populations with cerebellar deficits such as individuals with schizophrenia.