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Skill Learning Improved By Magnetic Brain Stimulation

Main Category: Neurology / Neuroscience
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(Abstract from research article given below)

The use of magnetic pulses to stimulate the dorsal premotor cortex (PMd) region of the brain results in an improved ability to learn a skilled motor task. Researchers writing in the open access journal *BMC Neuroscience* show that skilled movements can be stored as memories in the PMd and that magnetic stimulation of this area can facilitate this learning process.

Lara Boyd and Meghan Linsdell, from the University of British Columbia, studied the effect of transcranial magnetic stimulation of the PMd on the ability of 30 volunteers to track a target on a computer screen using a joystick. During the task, the target would move randomly, then enter a programmed pattern and finally return to moving randomly. The participants were not aware of the repeated section, believing that movements were random throughout.

The volunteers received four days of training, during which they were either given excitatory stimulation, inhibitory stimulation or sham stimulation immediately before practicing the motor task. The volunteers were not aware which group they were in. On the fifth day, they were tested to see how well they had learned the task. By comparing the improvements between the random and repeated sections of the task, the researchers were able to separate the general improvement due to practice from the learned motor memory of the repeated section.

Those participants who had received the excitatory stimulation were significantly better than the other groups at tracking the target during the repeated section of the test. They showed no significant difference in improvement during the random sections. The researchers conclude, "Our data support the hypothesis that the PMd is important for continuous motor learning, specifically via off-line consolidation of learned motor behaviors".

From the abstract

Excitatory repetitive transcranial magnetic stimulation to left dorsal premotor cortex enhances motor consolidation of new skills

Lara A Boyd and **Meghan A Linsdell**

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Following practice of skilled movements, changes continue to take place in the brain that both strengthen and modify memory for motor learning. These changes represent motor memory consolidation a process whereby new memories are transformed from a fragile to a more permanent, robust and stable state. In the present study, the neural correlates of motor memory consolidation were probed using repetitive transcranial magnetic stimulation (rTMS) to the dorsal premotor cortex (PMd). Participants engaged in four days of continuous tracking practice that immediately followed either excitatory 5 HZ, inhibitory 1 HZ or control, sham rTMS. A delayed retention test assessed motor learning of repeated and random sequences of continuous movement; no rTMS was applied at retention.

Results
We discovered that 5 HZ excitatory rTMS to PMd stimulated motor memory consolidation as evidenced by off-line learning, whereas only memory stabilization was noted following 1 Hz inhibitory or sham stimulation.

Conclusions
Our data support the hypothesis that PMd is important for continuous motor learning, specifically via off-line consolidation of learned motor behaviors.