

Motor excitability predicts working memory

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Measuring of the motor excitability with transcranial magnetic stimulation
Credit: Cognitive Neuroscience, University of Basel

Humans with a high motor excitability have a better working memory than humans with a low excitability. This was shown in a study conducted by scientists from the Transfaculty Research Platform at the University of Basel. By measuring the motor excitability, conclusions can be drawn as to the general cortical excitability – as well as to cognitive performance.

Working memory allows the temporary storage of information such as memorizing a phone number for a short period of time. Studies in animals have shown that [working memory](#) processes among others

depend on the excitability of neurons in the prefrontal cortex. Moreover, there is evidence that motor neuronal excitability might be related to the neuronal excitability of other cortical regions. Researchers from the Psychiatric University Clinics (UPK Basel) and the Faculty of Psychology in Basel have now studied if the excitability of the motor cortex correlates with working memory performance— results were positive.

"The motor cortical excitability can be easily studied with transcranial magnetic stimulation", says Nathalie Schicktanz, doctoral student and first author of the study. During this procedure, electromagnetic impulses with increasing intensity are applied over the motor cortex. For subjects with high motor excitability already weak impulses are sufficient to trigger certain muscles – such as those of the hand – to show a visible twitch.

Conclusions for other cortical regions

In the present study, that included 188 healthy young subjects, the scientists were able to show that subjects with a high motor excitability had increased working memory performance as compared to subjects with a low excitability. "By measuring the excitability of the [motor cortex](#), conclusions can be drawn as to the excitability of other cortical areas", says Schicktanz.

"The findings help us to understand the importance of neuronal excitability for cognitive processes in humans", adds Dr. Kyrill Schwegler, co-author of the study. The results might also have important clinical implications, as working memory deficits are a component of many neuropsychiatric disorders, such as schizophrenia or attention deficit hyperactivity disorder. In a next step, the scientists plan to study the relation between neuronal excitability and memory on a molecular level.

The study is part of a project lead by Prof. Dominique de Quervain and Prof. Andreas Papassotiropoulos. The project uses [transcranial magnetic stimulation](#) to study the cognitive functions in humans. The goal is to identify the neurobiological and molecular mechanisms of human memory.

More information: Nathalie Schicktanz, Kyrill Schwegler, Matthias Fastenrath, Klara Spalek, Annette Milnik, Andreas Papassotiropoulos, Thomas Nyffeler & Dominique J.-F. de Quervain. "Motor threshold predicts working memory performance in healthy humans." *Annals of Clinical and Translational Neurology*, 2013, [DOI: 10.1002/acn3.22](#)

Provided by University of Basel

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