

# Brain activity patterns linked with improved learning and memory in multiple sclerosis

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Dr. Boukrina, research scientist at Kessler Foundation, utilizes neuroimaging techniques in her cognitive research in populations with disabilities caused by stroke, brain injury and multiple sclerosis. Credit: Kessler Foundation/Jody Banks

A recent article by Kessler Foundation researchers demonstrated g people with multiple sclerosis (MS). The article, "Brain activation

patterns associated with paragraph learning in persons with multiple sclerosis: The MEMREHAB trial," (doi: 10.1016/j.ijpsycho.2019.09.008 ) was published on October 20, 2019 by the *International Journal of Psychophysiology*. The authors are Olga Boukrina, Ph.D., Ekaterina Dobryakova, Ph.D., Veronica Schneider, BA, John DeLuca, Ph.D., and Nancy Chiaravalloti, Ph.D., of Kessler Foundation.

This study furthers understanding of the findings of prior MEMREHAB studies using the modified Story Memory Technique for memory rehabilitation in the population with multiple sclerosis (MS). Prior studies at Kessler Foundation showed improvement in learning and memory in response to treatment with mSMT in individuals with MS, and associated changes in [brain](#) activity on functional magnetic resonance imaging (fMRI) related to working memory and word encoding. Findings suggested that the treatment resulted in effects on cerebral activation and functional connectivity. In this study, brain activation was examined in a subset of 16 participants with MS from the MEMREHAB trial. The participants were randomized to treatment (n=6) or placebo control (n=10) groups, and tested for their ability to remember a paragraph, before and after treatment with mSMT. It was hypothesized that mSMT treatment may produce different [brain activation patterns](#) during paragraph encoding in the treatment group compared to the [control group](#).

Participants in the treatment c=group exhibited decreased [brain activity](#) in the language network (LAN), default mode network (DMN), and executive control network (ECN). This pattern of reduced activation was associated with marginally significant improvement on the Rivermead Behavioral Memory Test with a large effect size noted between baseline and follow-up performance for the treatment group.

"The decreased [brain activation](#) seen in this study may be a sign of more efficient processing after treatment," said Dr. Boukrina, research

scientist in the Center for Stroke Rehabilitation Research at Kessler Foundation. "At baseline, individuals with MS often show hyperactivation of cortical areas during [cognitive tasks](#)," she explained, "which may be a necessary compensation in order to complete the task like their counterparts without MS. After treatment, the task becomes less demanding for them, and this lower demand may account for the reduction in activation."

This study has important implications for cognitive research in MS. Identifying the regions of the brain associated with improvements in learning and [memory](#) may foster investigation into methods that may augment the beneficial activation patterns, such as pharmacological agents or transcranial magnetic stimulation. Combining therapies may be a means of achieving optimal behavioral response in individuals with MS affected by cognitive deficits.

**More information:** Olga Boukrina et al, Brain activation patterns associated with paragraph learning in persons with multiple sclerosis: The MEMREHAB trial, *International Journal of Psychophysiology* (2019). [DOI: 10.1016/j.ijpsycho.2019.09.008](https://doi.org/10.1016/j.ijpsycho.2019.09.008)

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