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Cognitive rehabilitation improves brain performance in patients with MS

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In a new study published in the March issue of *Radiology*, functional magnetic resonance imaging (fMRI) shows that cognitive rehabilitation changes brain function and improves cognitive performance in patients with relapsing-remitting multiple sclerosis (MS).

"These results prompt the use of specific computer-based rehabilitation programs to treat deficits in selected neuropsychological domains in patients with relapsing-remitting MS," said the study's lead author, Massimo Filippi, M.D., professor of neurology at the San Raffaele Vita-Salute University and director of the "BrainMap" interdepartmental research program and the Neuroimaging Research Unit, Department of Neuroscience, Scientific Institute San Raffaele, Milan, Italy. "They also suggest that fMRI might provide useful metrics to monitor the effects of rehab in MS."

MS is a nervous system disease affecting the brain and spinal cord. MS damages a material called the myelin sheath that surrounds and protects nerve cells. This damage disrupts messages between the brain and other parts of the body, leading to symptoms such as muscle weakness, coordination and balance difficulties, numbness, problems with vision, memory loss and other cognitive issues. MS affects women more than men and often becomes symptomatic between the ages of 20 and 40.

In relapsing-remitting MS, the most common type, patients experience a series of attacks followed by partial or complete disappearance of symptoms. The interval between relapses can range from weeks to years.

Cognitive impairment affects a large proportion of patients with MS in the areas of attention, information processing, executive functions, memory and visual-spatial abilities. Cognitive dysfunction impacts a range of activities, including work, driving and social integration.

For the study, Dr. Filippi and colleagues recruited 20 patients with relapsing-remitting MS. Patients were randomized into two groups of 10. The first group received a 12-week program of computer-assisted cognitive rehabilitation of attention and information processing and executive functions, and the second (control) group received no cognitive rehabilitation.

Aspects of the rehabilitation program included a day-planning task, which employed realistic simulations of a set of scheduled dates and duties to address the patient's ability to organize, plan and develop solution strategies; and an attention task requiring the patient to simulate driving a train, carefully observing the control panel of the train and the countryside while encountering several distractions at increasing levels of difficulty.

All of the patients underwent neuropsychological assessment and MRI exams at baseline and after 12 weeks. As compared to their performance at baseline, the patients in the treatment group improved in tests of attention and information processing and executive functions. The fMRI results showed modifications in activity in several brain regions in the rehabilitation group, compared to the non-rehabilitation group. These fMRI modifications were correlated with cognitive improvement.

Analysis after cognitive rehabilitation found no structural changes in the gray matter or normal-appearing white matter of the brain in the treatment group.

"The findings demonstrated that computer-assisted cognitive

rehabilitation in patients with MS results in an improvement of the trained cognitive functions," Dr. Filippi said. "However, the structural integrity of the brain's gray matter and white matter showed no modifications in these patients, suggesting an impairment of structural plasticity."

More information: "Multiple Sclerosis: Effects of Cognitive Rehabilitation on Structural and Functional MR Imaging Measures—An Explorative Study." radiology.rsna.org/

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