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Neuroplasticity and cognitive rehabilitation in multiple sclerosis: Evidence from a polish clinical cohort

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Statement: Multiple Sclerosis (MS) often leads to significant cognitive impairment, affecting attention, memory, and executive function. Enhancing neuroplasticity through cognitive rehabilitation is a promising strategy, yet the evidence base remains under development. This study aims to evaluate the effectiveness of a structured cognitive rehabilitation program in improving cognitive function in MS patients and its association with neuroplastic changes.

Methodology: A prospective study was conducted involving 45 patients diagnosed with relapsing-remitting MS at the Neurology Department of Jagiellonian University Medical College, Kraków, Poland. Patients were randomized into intervention (n=25) and control (n=20) groups. The intervention group underwent a 12-week computerized cognitive rehabilitation program, focused on memory and executive functioning tasks. Pre- and post-intervention assessments included the Brief International Cognitive Assessment for MS (BICAMS) and functional MRI (fMRI) to observe changes in brain connectivity.

Results: Patients in the intervention group showed significant improvements in cognitive performance, particularly in processing speed (mean SDMT increase of 11.4 points, $p < 0.001$) and verbal learning (CVLT-II, $p = 0.005$). fMRI revealed increased activation in the prefrontal cortex and hippocampus post-rehabilitation. No significant changes were observed in the control group.

Biography

Katarzyna Nowak is a neurologist and clinical neuroscientist specializing in neurodegenerative and demyelinating diseases. She earned her PhD in Neurology from Jagiellonian University and has contributed significantly to MS research in Poland. Her work focuses on neuroplasticity, cognitive rehabilitation, and advanced neuroimaging. Dr. Nowak leads several national studies on brain training in MS and collaborates with European institutions on cross-border neurorehabilitation programs. She is committed to bridging neuroscience and patient-centered therapy through translational research.

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