

Research Shows Exercise May Improve Cognition with MS

By Lisette Hilton

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A new study suggests a positive association between fitness level and cognitive functioning in people with multiple sclerosis. This adds to a growing body of evidence that appropriate exercise offers wide-reaching benefits for MS patients.

Lead author Ruchika Shaurya Prakash, PhD, assistant professor of psychology, Ohio State University, Columbus, and colleagues conducted the study, published last year in *Brain Research*, to examine if fitness was associated with better cognitive functioning in individuals with MS. Many of the treatments that are available for MS are disease-modifying drugs, she says, and few of those have been tested for their efficacy in reducing cognitive deficits among MS patients.

Cognitive impairments, which can significantly affect quality of life, are highly prevalent in MS, affecting 65% to 80% of people diagnosed with the disease, according to Prakash.

The authors recruited women with relapsing-remitting MS and an age-, gender- and education-matched control group. They selected female patients with RRMS because it is the most common type of MS (found in about 85% of the MS population) and women are more likely than men to have MS, she says.

Study participants underwent three assessment sessions: In the first session, researchers assessed VO₂ peak scores using a cycle ergometer. In the second session, they assessed participants' cognitive functioning using tests specifically designed to assess cognitive deficits in MS. Finally, they had participants go through imaging to assess the volume of normal-appearing gray matter and lesions, as well as the integrity of the white matter tracts. They set out to determine fractional anisotropy, which is a measure of the diffusion of water molecules in the white matter tracts. Reduced FA has been found in MS individuals and has been associated with disease progression and cognitive impairment, according to Prakash.

“We found that higher-fit MS participants performed better on tasks of processing speed. These tasks basically tap into an individual's ability to

process and respond efficiently. In addition, we found that the volume of the lesions, a characteristic feature of MS, was reduced as a function of the fitness level of the participant. That is, those who were higher fit showed less volume of the lesions and increased gray matter volume,” Prakash says. “[We] also found that higher levels of fitness were associated with higher [fractional anisotropy] FA values in a number of white matter tracts, thereby providing evidence of a positive association between fitness and white matter integrity.”

A top physical therapist expert in MS, Patricia G. Provance, PT, MSCS, who practices in The Villages, Fla., says the study is interesting for PTs, but it has shortcomings. Provance says the sample size is small and rather homogeneous.

The good news is that Prakash and colleagues are working on extending their study by examining this relationship in a much larger sample of MS individuals, looking at whether the fitness-cognition relationship is moderated by gender and type of MS.

Despite the current limitations, Provance says that larger studies have increasingly shown that MS patients who exercise regularly have improved levels of function, alertness and quality of life. However, PTs with little or no experience working with MS patients need to realize that there is no “exercise protocol” for MS, according to Provance.

Susan E. Bennett, PT, DPT, EdD, NCS, MSCS, clinical associate professor in rehabilitation, science and neurology, University at Buffalo (N.Y.), says that MS physically affects patients by impairing the transmission of action potentials to subcortical structures and the spinal cord with the primary physical symptoms of weakness and spasticity.

“Both of these impairments impact the individual’s ability to ambulate, which is documented in the literature as one of the patient’s biggest concerns and complaints. Impaired transmission in brainstem pathways also results in interrupted communication of nuclei, specifically between cranial nerves III, IV, and VI with cranial nerve VIII, resulting in balance dysfunction,” Bennett says. “Individuals with lesions in the cerebellum will often display a wide base of support, ataxic movements, intension tremor and again balance dysfunction. Ocular motility weakness is another common symptom in cerebellar lesions.”

Weakness also can occur indirectly in MS when the patient becomes inactive and suffers atrophy of motor units as a result of disuse. These individuals most often develop concurrent muscle imbalance with certain muscles becoming shortened and weak, and antagonist muscles elongated and weak. Intervening with an exercise program early on in the individual's diagnosis can have a major effect on function and mobility, according to Bennett.

But unlike stroke or spinal cord injuries, MS does not have a fixed deficit and tends to progress at various rates, which fluctuate and are unique for each patient. PTs, according to Provance, should strive to provide each MS patient, regardless of ability, with an exercise and activity program that appropriately addresses functional and fitness needs and desires. Treating these patients does not require that the PT learn new skills, she says; rather, they need to be willing to think outside the box and consider psychosocial, physical and cognitive issues.

One of the key components of care is to listen, Provance says. "You can't develop a 'game plan' until you know the issues ... which are often complex and ever changing," Provance says. "Most of my successes in treating several thousand MS patients over many years was in honing in on functional losses [gait, core stability, balance, transfers, weakness, etc.]; developing exercise and activity programs that directly focused on the problems, without unnecessary meaningless exertion; and encouraging them to practice these throughout the day, instead of in one or two exhausting home exercise sessions."

PTs and their patients should know that progress will be gradual and the focus should be on developing and progressing to a well-paced realistic home program, with the goal of independence and community activity involvement. •

Lisette Hilton is a contributing writer for Today in PT.

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