

Exercise helps protect brain of multiple sclerosis patients

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Highly fit multiple sclerosis patients perform significantly better on tests of cognitive function than similar less-fit patients, a new study shows.

In addition, MRI scans of the patients showed that the fitter MS patients showed less damage in parts of the brain that show deterioration as a result of MS, as well as a greater volume of vital gray matter.

"We found that aerobic fitness has a protective effect on parts of the brain that are most affected by [multiple sclerosis](#)," said Ruchika Shaurya Prakash, lead author of the study and assistant professor of psychology at Ohio State University.

"As a result, these fitter patients actually show better performance on tasks that measure processing speed."

The study, done with colleagues Robert Motl and Arthur Kramer of the University of Illinois and Erin Snook of the University of Massachusetts, Amherst, appears online in the journal *Brain Research* and will be published in a future print edition.

The study involved 21 women diagnosed with relapsing-remitting MS. They were compared with 15 age- and education-matched healthy female controls. The study assessed fitness, cognitive function, and structural changes in all participants.

In order to measure fitness levels, the participants underwent a VO2 max

test, in which they rode a stationary bicycle until they felt exhausted. During the test, they breathed into a mask which measured their [oxygen consumption](#).

All the women also took a variety of tests designed to evaluate cognitive functions, such as processing speed and selective attention. In one test, for example, participants had to write down in one minute as many words as they could think of that began with the letter "F." MS patients generally perform poorly on these tests compared to healthy people.

The third analysis involved MRIs of the participants, revealing any damage to their brains.

As expected, the MS patients did much worse than the healthy controls on the tests of brain functioning, and showed more deterioration in their brains as revealed through the MRIs.

But what was interesting, Prakash said, was the significant differences between the more aerobically fit MS patients and those who were less fit.

Take, for instance, lesions, which are the characteristic feature of MS. Lesions are areas of inflammation in the central nervous system in which neurons have been stripped of myelin, an insulating protein.

"Physically fit MS patients had fewer lesions compared to those who weren't as fit and the lesions they did have tended to be smaller," Prakash said. "This is significant and can help explain why the higher-fit patients did better on tests of brain functioning."

[Aerobic fitness](#) was also associated with less-damaged brain tissue in MS patients, both the gray matter and white matter.

Gray matter is the cell bodies in the brain tissue, while white matter is the fibers that connect the various gray matter areas.

The study found that fitness in MS patients was associated with larger volume of gray matter, accounting for about 20 percent of the volume in gray matter. That's important, Prakash said, because gray matter is linked to brain processing skills.

"Even in gray matter that appeared relatively healthy, we found a deterioration in the volume in MS patients," she said. "But for some of the highest fit MS patients, we found that their gray matter volume was nearly equivalent to that of healthy controls."

Another MRI analysis involved the integrity of the white matter in the brain. In MS patients, the white matter deteriorates as the myelin is stripped from neurons. Again, higher-fit MS patients showed less deterioration of white matter compared to those who were less fit.

Overall, the three MRI tests in this study showed that parts of the brain involved in processing speed are all negatively affected by MS - but less so in patients who are aerobically fit.

Prakash noted that other researchers have found that exercise promotes the production of nerve growth factors, proteins which are important for the growth and maintenance of neurons in the brain.

"Our hypothesis is that aerobic exercise enhances these nerve growth factors in MS patients, which increases the volume of the [gray matter](#) and increases the integrity of the [white matter](#)," she said.

"As a result there is an improvement in cognitive function."

Prakash and her colleagues plan to extend this research by studying

whether exercise interventions with MS patients can actually improve their cognition and have positive physical effects on the [brain](#).

"For a long time, MS patients were told not to exercise because there was a fear it could exacerbate their symptoms," she said.

"But we're finding that if MS patients exercise in a controlled setting, it can actually help them with their cognitive function."

Provided by The Ohio State University

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