

Study reveals a short bout of exercise enhances brain function

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Most people know that regular exercise is good for your health. New research shows it may make you smarter, too.

Neuroscientists at OHSU in Portland, Oregon, working with mice, have discovered that a short burst of [exercise](#) directly boosts the function of a gene that increases connections between neurons in the hippocampus, the region of the brain associated with learning and memory.

The research is published online in the journal *eLife*.

"Exercise is cheap, and you don't necessarily need a fancy gym membership or have to run 10 miles a day," said co-senior author Gary Westbrook, M.D., senior scientist at the OHSU Vollum Institute and Dixon Professor of Neurology in the OHSU School of Medicine.

Previous research in animals and in people shows that [regular exercise](#) promotes general brain health. However, it's hard to untangle the overall benefits of exercise to the heart, liver and muscles

from the specific effect on the brain. For example, a healthy heart oxygenates the whole body, including the brain.

"Previous studies of exercise almost all focus on sustained exercise," Westbrook said. "As neuroscientists, it's not that we don't care about the benefits on the heart and muscles but we wanted to know the brain-specific benefit of exercise."

So the scientists designed a study in mice that specifically measured the brain's response to single bouts of exercise in otherwise sedentary mice that were placed for short periods on running wheels. The mice ran a few kilometers in two hours.

The study found that short-term bursts of exercise—the human equivalent of a weekly game of pickup basketball, or 4,000 steps—promoted an increase in synapses in the hippocampus. Scientists made the key discovery by analyzing [genes](#) that were increased in single neurons activated during exercise.

One particular gene stood out: Mtss1L. This gene had been largely ignored in prior studies in the brain.

"That was the most exciting thing," said co-lead author Christina Chatzi, Ph.D.

The Mtss1L gene encodes a protein that causes bending of the cell membrane. Researchers discovered that when this gene is activated by short bursts of exercise, it promotes small growths on neurons known as [dendritic spines](#)—the site at which synapses form.

In effect, the study showed that an acute burst of exercise is enough to prime the [brain](#) for learning.

In the next stage of research, scientists plan to pair acute bouts of exercise with learning tasks to better understand the impact on learning and memory.

More information: Christina Chatzi et al, Exercise-induced enhancement of synaptic function triggered by the inverse BAR protein, Mtss1L, *eLife* (2019).

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