

Need to remember something? Exercise four hours later

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Credit: Peter Griffin/Public Domain

A new study suggests an intriguing strategy to boost memory for what you've just learned: hit the gym four hours later. The findings reported in the Cell Press journal *Current Biology* on June 16 show that physical exercise after learning improves memory and memory traces, but only if the exercise is done in a specific time window and not immediately after learning.

"It shows that we can improve memory consolidation by doing sports after learning," says Guillén Fernández of the Donders Institute at the Radboud University Medical Center in the Netherlands.

In the new study, Fernández, along with Eelco van Dongen and their colleagues, tested the effects of a single session of [physical exercise](#) after learning on memory consolidation and long-term memory. Seventy-two study participants learned 90 picture-location associations over a period of approximately 40 minutes before being randomly assigned to one of three groups: one group performed [exercise](#) immediately, the second performed exercise four hours later, and the third did not perform any exercise. The exercise consisted of 35 minutes of interval training on an [exercise bike](#) at an intensity of up to 80 percent of participants' maximum heart rates. Forty-eight hours later, participants returned for a test to show how much they remembered while their brains were imaged via [magnetic resonance imaging](#) (MRI).

The researchers found that those who exercised four hours after their learning session retained the information better two days later than those who exercised either immediately or not at all. The brain images also showed that exercise after a time delay was associated with more precise representations in the hippocampus, an area important to learning and memory, when an individual answered a question correctly.

"Our results suggest that appropriately timed physical exercise can improve [long-term memory](#) and highlight the potential of exercise as an intervention in educational and clinical settings," the researchers conclude.

It's not yet clear exactly how or why delayed exercise has this effect on memory. However, earlier studies of laboratory animals suggest that naturally occurring chemical compounds in the body known as catecholamines, including dopamine and norepinephrine, can improve

[memory consolidation](#), the researchers say. One way to boost catecholamines is through physical exercise.

Fernández says they will now use a similar experimental setup to study the timing and molecular underpinnings of exercise and its influence on learning and memory in more detail.

More information: *Current Biology*, van Dongen et al.: "Physical Exercise Performed Four Hours after Learning Improves Memory Retention and Increases Hippocampal Pattern Similarity during Retrieval" [www.cell.com/current-biology/f ... 0960-9822\(16\)30465-1](http://www.cell.com/current-biology/full-article/S0960-9822(16)30465-1) , DOI: [10.1016/j.cub.2016.04.071](https://doi.org/10.1016/j.cub.2016.04.071)

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