

Vigorous exercise makes you smarter

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A study reports that vigorous exercise increases blood levels of the protein called BDNF, known for its crucial role in the brain's knowledge acquisition performance, known as cognitive performance.

It is estimated that regular physical exercise reduces the risk of at least 26 different diseases, including those that are responsible for the majority of deaths in Quebec: cardiovascular and pulmonary diseases, type 2 diabetes and several types of cancers (1).

Better still, these benefits of exercise are not limited to physical functions: several studies show that the brain is also positively influenced by regular physical activity, both in terms of general mental health (reduced risk of depression, for example) than global cognitive performance.

BDNF

The mechanisms responsible for this improvement in cognitive health through exercise are not fully understood, but several studies suggest the involvement of brain-derived neurotrophic factor (BDNF).

This growth factor plays a fundamental role in the creation, maturation and survival of neurons as well as in the formation of synapses (the interconnections between neurons) essential to memory and cognitive performance.

This importance is highlighted by the existence of certain mutations in the BDNF gene, which cause, in patients carrying these mutations, a reduction in the volume of certain regions of the brain, memory deficits and an increase in anxiety and of depression.

Since many studies have shown that exercise stimulates the production of BDNF in the brain, particularly in the hippocampus (the seat of learning), it is generally accepted that this growth factor contributes to the cognitive benefits of exercise. However, the types of exercise most effective in raising BDNF levels remain poorly characterized.

Strenuous exercise

According to a recent study, maximum stimulation of BDNF production requires fairly high-intensity physical activity (2).

In this study, researchers recruited healthy young adults and put them through a two-stage cycling exercise program: Part 1, where volunteers rode an exercise bike at a very leisurely pace for 90 minutes, followed by a second portion consisting of six minutes of interval training consisting of 40 seconds of pedaling at maximum capacity, interspersed with 20 seconds of rest.

Before, during and after each session, the researchers measured the people's blood levels of BDNF, as well as levels of lactic acid released by the muscles, believed to act as a trigger for BDNF synthesis.



They observed that during low-intensity exercise (90 minutes of leisurely cycling), lactic acid levels rose slightly in people's blood after about 30 minutes, as did the amounts of BDNF in their blood. However, during and after the six minutes of full-throttle pedaling, lactate levels, like BDNF, spiked, reaching concentrations four to six times higher than before exercise.

These results therefore confirm that exercise, even light, can significantly increase BDNF levels, which is a very positive effect for brain function.

In addition, the study also shows how these benefits can be maximized by more intense exercise, and that the inclusion, even occasionally, of a little more vigorous exercise is a good way to improve cognitive health.

- (1) Rowe GC et al. Running forward: new frontiers in endurance exercise biology. *Circulation* 2014; 129: 798-810.
- (2) Gibbons TD et al. Fasting for 20 h does not affect exercise-induced increases in circulating BDNF in humans. *J. Physiol.* 2023, Jan 11. doi: 10.1113/JP283582. Online ahead of print.