

# Have brain fatigue? A bout of exercise may be the cure

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Researchers have long known that regular exercise increases the number of organelles called mitochondria in muscle cells. Since mitochondria are responsible for generating energy, this numerical boost is thought to underlie many of the positive physical effects of exercise, such as increased strength or endurance. Exercise also has a number of positive mental effects, such as relieving depression and improving memory. However, the mechanism behind these mental effects has been unclear. In a new study in mice, researchers at the University of South Carolina have discovered that regular exercise also increases mitochondrial numbers in brain cells, a potential cause for exercise's beneficial mental effects.

Their article is entitled "[Exercise Training](#) Increases Mitochondrial Biogenesis in the Brain." It appears in the Articles in PresS section of the [American Journal of Physiology – Regulatory, Integrative, and Comparative Physiology](#), published by the American Physiological Society.

The researchers assigned mice to either an exercise group, which ran on an inclined treadmill six days a week for an hour, or to a sedentary group, which was exposed to the same sounds and handling as the exercise group but remained in their cages during the exercise period. After eight weeks, researchers examined brain and muscle tissue from some of the mice in each group to test for signs of increases in [mitochondria](#). Additionally, some of the mice from each group performed a "run to fatigue" test to assess their endurance after the eight-

week period.

Confirming previous studies, the results showed that mice in the exercise group had increased mitochondria in their muscle tissue compared to mice in the sedentary group. However, the researchers also found that the exercising mice also showed several positive markers of mitochondria increase in the brain, including a rise in the expression of genes for peroxisome proliferator-activated receptor- $\alpha$  coactivator 1- $\alpha$ , silent information regulator T1, and citrate synthase, all regulators for mitochondrial biogenesis; and mitochondrial DNA. These results correlate well with the animals' increased fitness. Overall, mice in the exercise group increased their run to fatigue times from about 74 minutes to about 126 minutes. No change was seen for the sedentary [mice](#).

These findings suggest that exercise training increases the number of mitochondria in the brain much like it increases mitochondria in muscles. The study authors note that this increase in brain mitochondria may play a role in boosting exercise endurance by making the brain more resistant to fatigue, which can affect physical performance. They also suggest that this boost in brain mitochondria could have clinical implications for mental disorders, making exercise a potential treatment for psychiatric disorders, genetic disorders, and neurodegenerative diseases.

"These findings could lead to the enhancement of athletic performance through reduced mental and physical fatigue, as well as to the expanded use of exercise as a therapeutic option to attenuate the negative effects of aging, and the treatment and/or prevention of neurological diseases," the authors say.

Provided by American Physiological Society

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