Exercise May Make The Brain More Flexible

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The brain used to be the one organ that researchers believed was pretty unchanging over time, in contrast to other organs that are always replenishing themselves. After all, the brain sort of *has* to stay constant if it's going to keep all our memories and experiences intact over the course of our lifetimes. But in recent years, neuroscientists have found that indeed the brain does retain some plasticity – malleability – and it seems to become considerably more plastic when people exercise their bodies. Now, a new study finds that an area of the brain involved in vision, originally thought to be fairly resistant to change, also responds strongly to short bouts of exercise. The discovery is exciting, and it makes you wonder what other effects exercise might have on the brain, especially over the course of a lifetime.

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The team of researchers behind the new study replicated a setup that had been done in animals before: They had people wear eye patches, and either exercise or sit still and watch a movie. Normally, when a person or animal wears an eye patch, the covered eye becomes stronger to compensate for the lack of input. In the current study, when people exercised intermittently on a stationary bike, their covered eye became significantly stronger, compared with the people who were sedentary. Which suggests that the brain may enter a state of increased plasticity as a response to physical exercise.

Why would exercise increase plasticity in a brain region known to not be plastic? Author Claudia Lunghi, who carried out the study along with Alessandro Sale from the National Research Council, tells me that exercise seems to reduce inhibition in certain cells – in other words, "it's as if physical activity removed the brakes, to trigger plasticity," she says. The neurotransmitter GABA is the main inhibitor of neuronal activity, so if its presence is decreased by exercise or by anything else, then the brain can amp up its activity, and therefore become more malleable.

This is certainly not the first study to show that the brain is more adaptable than we thought. There's been lot of work, for instance, on how antidepressants can increase plasticity in certain brain regions, which is thought to be why antidepressants and talk therapy are more effective in

tandem than alone. Exercise does a similar thing, particularly in the way of helping "grow" new neurons in the hippocampus, the area of the brain that shrinks with age, depression, and dementia. But Lunghi thinks it's too early to prescribe exercise alone for depression, or for any other disorder for that matter.

"Our study is more surprising because it indicates that moderate levels of physical exercise can promote plasticity in the visual cortex, a structure that is thought to be lacking plasticity in adulthood," she says. "For this reason the fact that a non-invasive manipulation such as physical activity can boost plasticity in the visual cortex is particularly surprising and particularly important. It indicates that the effect of physical activity on brain plasticity is pervasive and very strong." Using different types of exercise to help treat people with brain injuries is an obvious application, she adds, especially in times when "new connections and circuits need to be 'built' to recover, or in the case of pathological aging, when brain-death has to be slowed down. Keeping the brain plastic actually would be very important to prevent pathological brain aging."

Time will tell how exercise may be used in the future to help the brain recover function by boosting plasticity. Her immediate plans are to research "lazy eye," or amblyopia, which is thought to be treatable only in childhood, since in adulthood the brain can't recover function as well. But that all may change now. "If by combining the classic treatment for amblyopia (occlusion of the non-amblyopic eye) and physical activity we will be able to enhance visual plasticity to recover visual function of the amblyopic eye, then we will give a chance to these patients."

In the meantime, exercise can only benefit your body and brain, whether we understand all the molecular mechanisms or not. So, if you can, take a walk or hop on the stationary bike. It may do more for your neurons than science can even understand right now.

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