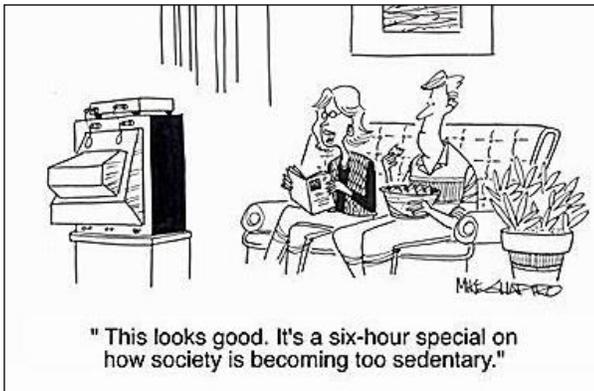


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Sweating Makes You Smart

Thanks to brain-imaging studies in humans and neurochemical studies in animals, scientists have found evidence that exercise actually makes a stronger brain.

By: Chris Jozefowicz



John Lavery is a rower. Whether cutting through green water under a clear blue sky or sliding past wet black rocks under a light snow, Lavery is usually out on the Potomac River six days a week, as long as the water is free of ice. One year he covered more than 1,500 miles of river in his thin racing boats. It's an impressive feat for any athlete—but John Lavery is also 73 years old.

Lavery first put oar to water when he was 57, to fight becoming a "blob," he says. His goal was to keep his body toned. But as he perfected his technique, he relished the sense of mastery he achieved, what he calls his "Zen zone."

Although Lavery was looking to help his body through exercise, he was probably keeping his brain in top shape as well. Now, at an age when some of his friends are beginning to slip into mental decline, Lavery feels really good. "This is not an ego statement," he says...

"But most people think I am at least ten years younger than I am."

It turns out that the brain-body connection is more powerful than anyone thought. Shaking a leg (or curling a bicep) doesn't just make you stronger, healthier and better-looking—it also helps your brain shrug off damage and the effects of aging.

Thanks to brain-imaging studies in humans and neurochemical studies in animals, scientists have found evidence that exercise actually makes a stronger brain. Physical exertion induces the cells in the brain to reinforce old connections between neurons and to forge new connections. This denser neuron network is better able to process and store information...

Essentially resulting in a smarter brain.

Best of all, exercisers may not need the endurance of an ironman—or even a John Lavery, for that matter—to benefit. For older people in particular, even a moderate program of exercise can boost brain health and cognition.

Much of this research focuses on a protein called BDNF, for "brain-derived neurotrophic factor." This chemical, which helps nerve cells grow and connect, is important for fetal development. But it turns out to be critical in the adult brain, as well.

The benefits of BDNF are broad. Rats with boosted BDNF in their brains navigate mazes faster than cage mates with lower levels. Brain injuries in the high-BDNF animals heal faster. Data even suggest that an increase in BDNF helps rats avoid a type of behavior that is considered to be the rodent equivalent of depression.

How does the chemical work? Vassilis Koliatsos, a psychiatrist at Johns Hopkins University in Maryland who has studied BDNF for more than a decade, says the molecule actually helps rewire the brain. BDNF is one of the tools a brain uses to turn life experiences into long-lasting changes, influencing everything from memory to mood.



"Learning is taking signals that come in from your senses and embedding them into brain anatomy," he says. BDNF, which helps build the nervous system, seems to play an important role.

Even better, researchers have learned that boosting this beneficial brain chemical may be simple to do: Scores of studies during the last decade show that short stints of exercise increase BDNF in the brains of animals. In rat studies conducted by Fernando Gomez-Pinilla and his colleagues at UCLA, even a few minutes of swimming raised levels of BDNF.

Exercise Helps Human Brains

The dynamics of BDNF are harder to study in people, but researchers have been able to use imaging techniques to show that exercise helps human brains. Using magnetic resonance imaging, which allows the living brain to be visualized, University of Illinois at Urbana-Champaign researchers Arthur Kramer and Stanley Colcombe have found that exercise postpones the effects of aging.

Everyone's brain loses nerve tissue as it ages, beginning in the third decade of life. "[Aging] sort of damages the brain as you go along," says Colcombe. **But people who exercise lose brain tissue more slowly.** In early 2003, Kramer and Colcombe demonstrated that athletic older adults had denser brains than their inactive counterparts, suggesting that workouts protected their brains.

Exercise Improves Thinking

Colcombe and Kramer think that exercise does more than simply preserve brain tissue—it can also improve thinking. In a comparison of 18 studies, inactive older adults who began an exercise routine got significantly better at cognitive tests that measured skills such as planning and paying attention.

Gym-phobes take note: The kind of exercise that makes a difference in these studies is not hard to tackle. In Kramer and Colcombe's research, subjects work up from a slow 15-minute walk to a brisk 45-minute jaunt. They follow this regimen three days a week for six months. "It's not like people are running marathons here," Kramer says.

So far, Kramer's research has focused on adults who are 55 and older. He doesn't believe that working out will transform smart young people into geniuses—but he does think that athletic activity helps sharpen the brain over the long term. "There isn't much cumulative decline in brain function and cognitive condition when you're 20," Kramer says, "so there's less room for improvement." Still, young exercisers can expect to see some benefits, such as an improved ability to handle complex cognitive tasks and the knowledge that their brains are probably somewhat protected. "I think you get long-term benefits that accrue as you age," he says.

Since diet and exercise are so often connected, Gomez-Pinilla and colleagues have broadened their studies to find out how other aspects of the couch-potato lifestyle might influence brain health. In 2003, they found that rats who were fed lots of saturated fats and sugar—such as the bacon-cheeseburger-and-extra-large-Coke diet that many Americans love—had less BDNF in the brain and did not recover as well from brain injuries. In his latest research Gomez-Pinilla finds that, in contrast, a healthy diet high in omega-3 fatty acids like fish oils increases BDNF in rats.

Direct connections between BDNF, physical exercise and brain health haven't yet been proven in humans, so Gomez-Pinilla and a colleague, Paul Vespa, have launched a project to study BDNF in exercising people. **In the meantime, given the other benefits of exercise, the smart thinking seems to be with athletes like John Lavery. Although he wasn't so concerned with his mental health when he began, he gets more out of his workouts than he expected. "It's greater than just exercise," he says. "There is a great psychic reward."**