

## Can You Get Fit in Six Minutes a Week?

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A few years ago, researchers at the National Institute of Health and Nutrition in Japan put rats through a series of swim tests with surprising results. They had one group of rodents paddle in a small pool for six hours, this long workout broken into two sessions of three hours each. A second group of rats were made to stroke furiously through short, intense bouts of swimming, while carrying ballast to increase their workload. After 20 seconds, the weighted rats were scooped out of the water and allowed to rest for 10 seconds, before being placed back in the pool for another 20 seconds of exertion. The scientists had the rats repeat these brief, strenuous swims 14 times, for a total of about four-and-a-half minutes of swimming. Afterward, the researchers tested each rat's muscle fibers and found that, as expected, the rats that had gone for the six-hour swim showed preliminary molecular changes that would increase endurance. But the second rodent group, which exercised for less than five minutes also showed the same molecular changes.

The potency of interval training is nothing new. Many athletes have been straining through interval sessions once or twice a week along with their regular workout for years. But what researchers have been looking at recently is whether humans, like that second group of rats, can increase endurance with only a few minutes of strenuous exercise, instead of hours? Could it be that most of us are spending more time than we need to trying to get fit?

The answer, a growing number of these sports scientists believe, may be yes.

"There was a time when the scientific literature suggested that the only way to achieve endurance was through endurance-type activities," such as long runs or bike rides or, perhaps, six-hour swims, says Martin Gibala, PhD, chairman of the Department of Kinesiology at McMaster University in Ontario, Canada. But ongoing research from Gibala's lab is turning that idea on its head. In one of the group's recent studies, Gibala and his colleagues had a group of college students, who were healthy but not athletes, ride a stationary bike at a sustainable pace for between 90 and 120 minutes. Another set of students grunted through a series of short, strenuous intervals: 20 to 30 seconds of cycling at the highest intensity the riders could stand. After resting for four minutes, the students pedaled hard again for another 20 to 30 seconds, repeating the cycle four to six times (depending on how much each person could stand), "for a total of two to three minutes of very intense exercise per training session," Gibala says.

Each of the two groups exercised three times a week. After two weeks, both groups showed almost identical increases in their endurance (as measured in a stationary bicycle time trial), even though the one group had exercised for six to nine minutes per week, and the other about five hours. Additionally, molecular changes that signal increased fitness were evident equally in both groups. "The number and size of the mitochondria within the muscles" of the students had increased significantly, Gibala says, a change that, before this work, had been associated almost exclusively with prolonged endurance training. Since mitochondria enable muscle cells to use oxygen to create energy, "changes in the volume of the mitochondria can have a big impact on endurance performance." In other words, six minutes or so a week of hard exercise (plus the time spent warming up, cooling down, and resting between the bouts of intense work) had proven to be as good as multiple hours of working out for achieving fitness. The short, intense workouts aided in weight loss, too, although Gibala hadn't been studying that effect. "The rate of energy expenditure remains higher longer into recovery" after brief, high-intensity exercise than after longer, easier workouts, Gibala says. Other researchers have found that

similar, intense, brief sessions of exercise improve cardiac health, even among people with heart disease.

There's a catch, though. Those six minutes, if they're to be effective, must hurt. "We describe it as an 'all-out' effort," Gibala says. You'll be straying "well out of your comfort zone." That level of discomfort makes some activities better-suited to intense training than others. "We haven't studied runners," Gibala says. The pounding involved in repeated sprinting could lead to injuries, depending on a runner's experience and stride mechanics. But cycling and swimming work well. "I'm a terrible swimmer," Gibala says, "so every session for me is intense, just because my technique is so awful."

Meanwhile, his lab is studying whether people could telescope their workouts into even less time. Could a single, two- to three-minute bout of intense exercise confer the same endurance and health benefits as those six minutes of multiple intervals? Gibala is hopeful. "I'm 41, with two young children," he says. "I don't have time to go out and exercise for hours." The results should be available this fall.