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# Weighing the Evidence on Exercise

By GRETCHEN REYNOLDS

**How exercise affects** body weight is one of the more intriguing and vexing issues in physiology. Exercise burns [calories](#), no one doubts that, and so it should, in theory, produce weight loss, a fact that has prompted countless people to undertake exercise programs to shed pounds. Without significantly changing their diets, few succeed. "Anecdotally, all of us have been cornered by people claiming to have spent hours each week walking, running, stair-stepping, etc., and are displeased with the results on the scale or in the mirror," wrote Barry Braun, an associate professor of kinesiology at the [University of Massachusetts at Amherst](#), in the American College of Sports Medicine's February newsletter.

But a growing body of science suggests that exercise does have an important role in weight loss. That role, however, is different from what many people expect and probably wish. The newest science suggests that exercise alone will not make you thin, but it may determine whether you stay thin, if you can achieve that state. Until recently, the bodily mechanisms involved were mysterious. But scientists are slowly teasing out exercise's impact on metabolism, appetite and body composition, though the consequences of exercise can vary. Women's bodies, for instance, seem to react differently than men's bodies to the metabolic effects of exercise. None of which is a reason to abandon exercise as a weight-loss tool. You just have to understand what exercise can and cannot do.

"In general, exercise by itself is pretty useless for weight loss," says Eric Ravussin, a professor at the Pennington Biomedical Research Center in Baton Rouge, La., and an expert on weight loss. It's especially useless because people often end up consuming more calories when they exercise. The mathematics of weight loss is, in fact, quite simple, involving only subtraction. "Take in fewer calories than you burn, put yourself in negative energy balance, lose weight," says Braun, who has been studying exercise and weight loss for years. The deficit in calories can result from cutting back your food intake or from increasing your

energy output — the amount of exercise you complete — or both. When researchers affiliated with the Pennington center had volunteers reduce their energy balance for a study last year by either cutting their calorie intakes by 25 percent or increasing their daily exercise by 12.5 percent and cutting their calories by 12.5 percent, everyone involved lost weight. They all lost about the same amount of weight too — about a pound a week. But in the exercising group, the dose of exercise required was nearly an hour a day of moderate-intensity activity, what the federal government currently recommends for weight loss but “a lot more than what many people would be able or willing to do,” Ravussin says.

At the same time, as many people have found after starting a new exercise regimen, working out can have a significant effect on appetite. The mechanisms that control appetite and energy balance in the human body are elegantly calibrated. “The body aims for homeostasis,” Braun says. It likes to remain at whatever weight it’s used to. So even small changes in energy balance can produce rapid changes in certain hormones associated with appetite, particularly acylated ghrelin, which is known to increase the desire for food, as well as insulin and leptin, hormones that affect how the body burns fuel.

The effects of exercise on the appetite and energy systems, however, are by no means consistent. In one study presented last year at the annual conference of the American College of Sports Medicine, when healthy young men ran for an hour and a half on a treadmill at a fairly high intensity, their blood concentrations of acylated ghrelin fell, and food held little appeal for the rest of that day. Exercise blunted their appetites. A study that Braun oversaw and that was published last year by *The American Journal of Physiology* had a slightly different outcome. In it, 18 overweight men and women walked on treadmills in multiple sessions while either eating enough that day to replace the calories burned during exercise or not. Afterward, the men displayed little or no changes in their energy-regulating hormones or their appetites, much as in the other study. But the women uniformly had increased blood concentrations of acylated ghrelin and decreased concentrations of insulin after the sessions in which they had eaten less than they had burned. Their bodies were directing them to replace the lost calories. In physiological terms, the results “are consistent with the paradigm that mechanisms to maintain body fat are more effective in women,” Braun and his colleagues wrote. In practical terms, the results are scientific proof that life is unfair. Female bodies, inspired almost certainly “by a biological need to maintain energy stores for reproduction,” Braun says, fight hard to hold on to every ounce of fat. Exercise for many women (and for some men) increases the desire to eat.

**Thankfully there has** lately been some more encouraging news about exercise and weight

loss, including for women. In a study published late last month in *The Journal of the American Medical Association*, researchers from [Harvard University](#) looked at the weight-change histories of more than 34,000 participants in a women's health study. The women began the study middle-aged (at an average of about 54 years) and were followed for 13 years. During that time, the women gained, on average, six pounds. Some packed on considerably more. But a small subset gained far less, coming close to maintaining the body size with which they started the study. Those were the women who reported exercising almost every day for an hour or so. The exercise involved was not strenuous. "It was the equivalent of brisk walking," says I-Min Lee, a researcher at Harvard Medical School and [Brigham and Women's Hospital](#) and the lead author of the study. But it was consistently engaged in over the years. "It wasn't something the women started and stopped," Lee says. "It was something they'd been doing for years." The women who exercised also tended to have lower body weights to start with. All began the study with a body-mass index below 25, the high end of normal weight. "We didn't look at this, but it's probably safe to speculate that it's easier and more pleasant to exercise if you're not already heavy," Lee says.

On the other hand, if you can somehow pry off the pounds, exercise may be the most important element in keeping the weight off. "When you look at the results in the National Weight Control Registry," Braun says, "you see over and over that exercise is one constant among people who've maintained their weight loss." About 90 percent of the people in the registry who have shed pounds and kept them at bay worked out, a result also seen in recent studies. In one representative experiment from last year, 97 healthy, slightly overweight women were put on an 800-calorie [diet](#) until they lost an average of about 27 pounds each. Some of the women were then assigned to a walking program, some were put on a weight-training regimen and others were assigned no exercise; all returned to their old eating habits. Those who stuck with either of the exercise programs regained less weight than those who didn't exercise and, even more striking, did not regain weight around their middles. The women who didn't exercise regained their weight and preferentially packed on these new pounds around their abdomens. It's well known that abdominal fat is particularly unhealthy, contributing significantly to metabolic disruptions and heart disease.

Scientists are "not really sure yet" just how and why exercise is so important in maintaining weight loss in people, Braun says. But in animal experiments, exercise seems to remodel the metabolic pathways that determine how the body stores and utilizes food. For a study published last summer, scientists at the [University of Colorado](#) at Denver fattened a group of male rats. The animals already had an inbred propensity to gain weight and, thanks to a high-fat diet laid out for them, they fulfilled that genetic destiny. After 16 weeks of eating as

much as they wanted and lolling around in their cages, all were rotund. The scientists then switched them to a calorie-controlled, low-fat diet. The animals shed weight, dropping an average of about 14 percent of their corpulence.

Afterward the animals were put on a weight-maintenance diet. At the same time, half of them were required to run on a treadmill for about 30 minutes most days. The other half remained sedentary. For eight weeks, the rats were kept at their lower weights in order to establish a new base-line weight.

Then the fun began. For the final eight weeks of the experiment, the rats were allowed to relapse, to eat as much food as they wanted. The rats that had not been running on the treadmill fell upon the food eagerly. Most regained the weight they lost and then some.

But the exercising rats metabolized calories differently. They tended to burn fat immediately after their meals, while the sedentary rats' bodies preferentially burned **carbohydrates** and sent the fat off to be stored in fat cells. The running rats' bodies, meanwhile, also produced signals suggesting that they were satiated and didn't need more kibble. Although the treadmill exercisers regained some weight, their relapses were not as extreme. Exercise "re-established the homeostatic steady state between intake and expenditure to defend a lower body weight," the study authors concluded. Running had remade the rats' bodies so that they ate less.

Streaming through much of the science and advice about exercise and weight loss is a certain Puritan streak, a sense that exercise, to be effective in keeping you slim, must be of almost medicinal dosage — an hour a day, every day; plenty of brisk walking; frequent long runs on the treadmill. But the very latest science about exercise and weight loss has a gentler tone and a more achievable goal. "Emerging evidence suggests that unlike bouts of moderate-vigorous activity, low-intensity ambulation, standing, etc., may contribute to daily energy expenditure without triggering the caloric compensation effect," Braun wrote in the American College of Sports Medicine newsletter.

In a completed but unpublished study conducted in his energy-metabolism lab, Braun and his colleagues had a group of volunteers spend an entire day sitting. If they needed to visit the bathroom or any other location, they spun over in a wheelchair. Meanwhile, in a second session, the same volunteers stood all day, "not doing anything in particular," Braun says, "just standing." The difference in energy expenditure was remarkable, representing "hundreds of calories," Braun says, but with no increase among the upright in their blood levels of ghrelin or other appetite hormones. Standing, for both men and women, burned

multiple calories but did not ignite hunger. One thing is going to become clear in the coming years, Braun says: if you want to lose weight, you don't necessarily have to go for a long run. "Just get rid of your chair."

*Gretchen Reynolds writes the [Phys Ed column](#) for the magazine. She is writing a book about the frontiers of fitness.*