

The Power of exercise

The Power of a Daily Bout of Exercise

BY GRETCHEN REYNOLDS



PHYS ED

Gretchen Reynolds on the science of fitness.

This week marks the start of the annual eat-too-much and move-too-little holiday season, with its attendant declining health and surging regrets. But a well-timed new study suggests that a daily bout of exercise should erase or lessen many of the injurious effects, even if you otherwise lounge all day on the couch and load up on pie.

To undertake this valuable experiment, which was [published online in The Journal of Physiology](#), scientists at the University of Bath in England rounded up a group of 26 healthy young men. All exercised regularly. None were obese. Baseline health assessments, including biopsies of fat tissue, confirmed that each had normal metabolisms and blood sugar control, with no symptoms of incipient diabetes.

The scientists then asked their volunteers to impair their laudable health by doing a lot of sitting and gorging themselves.

Energy surplus is the technical name for those occasions when people consume more energy, in the form of calories, than they burn. If unchecked, energy surplus contributes, as we all know, to a variety of poor health outcomes, including insulin resistance — often the first step toward diabetes — and other metabolic problems.

Overeating and inactivity can each, on its own, produce an energy surplus. Together, their ill effects are exacerbated, often in a very short period of time. Earlier studies have found that even a few days of inactivity and overeating spark detrimental changes in previously healthy bodies.

Some of these experiments have also concluded that exercise blunts the ill effects of these behaviors, in large part, it has been assumed, by reducing the energy surplus. It burns some of the excess calories. But a few scientists have suspected that exercise might do more; it might have physiological effects that extend beyond just incinerating surplus energy.

To test that possibility, of course, it would be necessary to maintain an energy surplus, even with exercise. So that is what the University of Bath researchers decided to do.

Their method was simple. They randomly divided their volunteers into two groups, one of which was assigned to run every day at a moderately intense pace on a treadmill for 45 minutes. The other group did not exercise.

Meanwhile, the men in both groups were told to generally stop moving so much, decreasing the number of steps that they took each day from more than 10,000 on average to fewer than 4,000, as gauged by pedometers. The exercising group's treadmill workouts were not included in their step counts. Except when they were running, they were as inactive as the other group.

Both groups also were directed to start substantially overeating. The group that was not exercising increased their daily caloric intake by 50 percent, compared with what it had been before, while the exercising group consumed almost 75 percent more calories than previously, with the additional 25 percent replacing the energy burned during training.

Over all, the two groups' net daily energy surplus was the same.

The experiment continued for seven days. Then both groups returned to the lab for additional testing, including new insulin measurements and another biopsy of fat tissue.

cells seemed to have developed a malicious streak. Those cells, examined using sophisticated genetic testing techniques, were now overexpressing various genes that may contribute to unhealthy metabolic changes and underexpressing other genes potentially important for a well-functioning metabolism.

But the volunteers who had exercised once a day, despite comparable energy surpluses, were not similarly afflicted. Their blood sugar control remained robust, and their fat cells exhibited far fewer of the potentially undesirable alterations in gene expression than among the sedentary men.

“Exercise seemed to completely cancel out many of the changes induced by overfeeding and reduced activity,” said Dylan Thompson, a professor of health sciences at the University of Bath and senior author of the study. And where it did not countermand the impacts, he continued, it “softened” them, leaving the exercise group “better off than the nonexercise group,” despite engaging in equivalently insalubrious behavior.

From a scientific standpoint, this finding intimates that the metabolic effects of overeating and inactivity are multifaceted, Dr. Thompson said, with an energy surplus sparking genetic as well as other physiological changes. But just how exercise countermands those effects is impossible to say based on the new experiment, he added. Differences in how each group's metabolism utilized fats and carbohydrates could play a role, he said, as could the release of certain molecules from exercising muscles, which only occurred among the men who ran.

Of more pressing interest, though, is the study's practical message that “if you are facing a period of overconsumption and inactivity” — also known as the holidays — “a daily bout of exercise will prevent many of the negative changes, at least in the short term,” Dr. Thompson said. Of course, his study involved young, fit men and a relatively prolonged period of exercise. But the findings likely apply, he said, to other groups, like older adults and women, and perhaps to lesser amounts of training. That's a possibility worth embracing as the pie servings accumulate.

The results were striking. After only a week, the young men who had not exercised displayed a significant and unhealthy decline in their blood sugar control, and, equally worrying, their biopsied fat

