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Tara Parker-Pope on Health

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Phys Ed: Does Exercise Boost Immunity?

By [GRETCHEN REYNOLDS](#)

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Two recent experiments hit rather close to home at this time of year. In [the first, published last year in the journal *Brain, Behavior, and Immunity*](#), researchers divided mice into two groups. One rested comfortably in their cages. The other ran on little treadmills until they were exhausted. This continued for three days. The mice were then exposed to an influenza virus. After a few days, more of the mice who'd exhausted themselves running came down with the flu than the control mice. They also had more severe symptoms.

In [the second experiment](#), published in the same journal, scientists from the University of Illinois and other schools first infected laboratory mice with flu. One group then rested; a second group ran for a leisurely 20 or 30 minutes, an easy jog for a mouse; the third group ran for a taxing two and a half hours. Each group repeated this routine for three days, until they began to show flu symptoms. The flu bug used in this experiment is devastating to rodents, and more than half of the sedentary mice died. But only 12 percent of the gently jogging mice passed away. Meanwhile, an eye-popping 70 percent of the mice in the group that had run for hours died, and even those that survived were more debilitated and sick than the control group.

Is this good news or bad? This is a particularly relevant question as two important human events converge: the peaking of the fall marathon and other sports seasons and the simultaneous onset of the winter cold and flu term. Scientists are diligently working to answer that question, perhaps because they are as interested as the rest of us in avoiding or lessening the severity of colds and the flu. The bulk of the new research, including the mouse studies mentioned, reinforce a theory that physiologists advanced some years ago, about what they call "a J-shaped curve" involving exercise and immunity. In this model, the risk both of catching a cold or the flu and of having a particularly severe form of the infection "drop if you exercise moderately," says Mary P. Miles, PhD, an associate professor of exercise sciences at Montana State University and the author of [an editorial about exercise and immunity](#) published in the most recent edition of the journal *Exercise and*

Sport Sciences Review. But the risk both of catching an illness and of becoming especially sick when you do “jump right back up” if you exercise intensely or for a prolonged period of time, surpassing the risks among the sedentary. (Although definitions of intense exercise vary among researchers, most define it as a workout or race of an hour or more during which your heart rate and respiration soar and you feel as if you are working hard.)

Why exercise should affect either your susceptibility to catching an illness or how badly a particular bug affects you is still unclear. But it does appear that intense workouts and racing suppress the body’s immune response for a period of time immediately after you’ve finished exercising and that “the longer the duration and the more intense” the exercise, “the longer the temporary period of immunosuppression lasts — anything from a few hours to a few days has been suggested,” says Nicolette Bishop, an associate professor of sport and exercise sciences at Loughborough University and the author of [a review article about exercise and immunity](#) published in January.

A [telling new study](#), published in August in the Journal of Strength and Conditioning Research, looked at cellular markers of immune system activity in the saliva of twenty-four, Spanish, professional soccer players, before and after a strenuous, 70-minute match. Before play, the saliva of most of the players showed normal levels of immunoglobulins, substances that help to fight off infection. Afterward, concentrations of saliva immunoglobulins in many of them had fallen dramatically.

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If scientists aren’t sure yet why intense exercise temporarily depresses the immune system, however, they seem to be closer to understanding why, once you’ve caught a bug, intense exercise can make the symptoms and severity worse. In work at the University of Illinois, [reported last month in the journal Exercise and Sport Sciences Review](#), some of the same scientists who’d studied mice and flu looked at just what was going on inside the cells of the affected animals. They found that the leisurely jogging rodents showed signs of a very particular immune response to the flu. In general, and this is true in both mice and men, says Jeffrey A. Woods, a professor of kinesiology and community health at the University of Illinois and one of the scientists involved, viruses

evoke an increase in what are called T1-type helper immune cells. These T1-helper cells induce inflammation and other changes in the body that represent a first line of defense against an invading virus. But if the inflammation, at first so helpful, continues for too long, it becomes counterproductive. The immune system needs, then, at some point to lessen the amount of T1-mediated inflammatory response, so that, in fighting the virus, it doesn't accidentally harm its own host. The immune system does this by gradually increasing the amount of another kind of immune cell, T2-helper cells, which produce mostly an anti-inflammatory immune response. They're water to the T1 fire. But the balance between the T1- and T2-helper cells must be exquisitely calibrated.

In the mice at the University of Illinois, moderate exercise subtly hastened the shift from a T1 response to a T2-style immune response — not by much, but by just enough, apparently, to have a positive impact against the flu. “Moderate exercise appears to suppress TH1 a little, increase TH2 a little,” Woods says.

On the other hand, intense or prolonged exercise “may suppress TH1 too much,” he says. Long, hard runs or other workouts may shut down that first line of defense before it has completed its work, which could lead, Woods says “to increased susceptibility to viral infection.” So, if you have just completed a strenuous 20-mile training run and have, in consequence, a depressed immune response, avoid colleagues who are sniffing. Wash your hands often. “I would recommend everyone get the annual influenza vaccination and the new H1N1 vaccination,” Woods says. But if all of that has been for naught and you now feel the early stirrings of sickness, “listen to your body and be prudent in your exercise decisions,” Woods says. In general, moderate exercise, such as a leisurely jog or walk, may prop up your immune response and lessen the duration and severity of a mild infection, but be honest about your condition. “If you don't feel well, especially if you have fever or body aches, I would recommend stopping daily exercise until you are recovered,” Woods says. “It is okay to exercise if you have a simple head cold or congestion — in fact, it may improve the way you feel. I would avoid heavy, prolonged exercise with a head cold, though,” since it can unbalance that important T1 and T2-helper cell response.

And take comfort in the results of [the most recent study](#) to look at actual, practicing marathoners. In it, 1,694 runners at the 2000 Stockholm Marathon informed researchers about any colds or other infectious illness they developed in the three weeks before or three weeks after the race. Nearly one-

fifth of the runners fell ill during that time period. That's higher than the rates in people generally, but it still means that the overwhelming majority of runners didn't get sick.

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