James Levine is an endocrinologist who co-directs Obesity Solutions, a program of the Mayo Clinic in Scottsdale, Ariz., and Arizona State University. He is author of the book *Get Up!* (Palgrave Macmillan, 2014). (*Scientific American* and Palgrave Macmillan are affiliates.) Levine invented a treadmill desk but gains no financial benefit from sales.

Killer Chairs

Standing more, even at a desk job, could lower risk for obesity, illness and death, studies suggest

Chairs: we sit in them, work in them, shop in them, eat in them and date in them. Americans sit for most of their waking hours, 13 hours every day on average. Yet chairs are lethal.

This grim conclusion may surprise you, but 18 studies reported during the past 16 years, covering 800,000 people overall, back it up. In 2010, for example, the journal *Circulation* published an investigation following 8,800 adults for seven years. Those who sat for more than four hours a day while watching television had a 46 percent increase in deaths from any cause when compared with people who sat in front of the tube for less than two hours. Other researchers have found that sitting for more than half the day, approximately, doubles the risk of diabetes and cardiovascular problems. Overall, when you combine all causes of death and compare any group of sitters with those who are more active, sitters have a 50 percent greater likelihood of dying.

Sitting for long periods is bad because the human body was not designed to be idle. I have worked in obesity research for several decades, and my laboratory has studied the effect of sedentary lifestyles at the molecular level all the way up to office design. Lack of movement slows metabolism, reducing the amount of food that is converted to energy and thus promoting fat accumulation, obesity, and the litany of ills—heart disease, diabetes, arthritis, and more—that come with being overweight. Sitting is bad for lean people, too. For instance, sitting in your chair after a meal leads to high blood sugar spikes, whereas getting up after you eat can cut those spikes in half.

The public usually associates these health problems with eating too much, not with sitting too much. My experience with people who struggle with their weight has led me to think that sitting habits might be just as pernicious. Still, a sedentary way of life might be easier to change than eating habits.

Peter (not his real name), a client in one of my programs in Minneapolis, told me, "I'm stuck." He was 44 years old, 50 pounds overweight and had type 2 diabetes. His doctor wanted him to start insulin injections. I sent him to my lab at the Mayo Clinic. There he watched the data as we measured his metabolic rate: strolling at less than two miles per hour increased his energy expenditure by 200 calories an hour. Afterward, Peter and I walked and talked. "Just by conducting two of your daily meetings strolling like this," I explained to him, "you'll burn 400 extra calories a day."

Peter took the advice to heart and began these easy walks. He did not diet, yet in the first year after his assessment, he lost 25 pounds. He dropped 10 more the next year. Peter never needed insulin and—as happens in many diabetics who lose weight—stopped taking diabetes medications altogether. He took this "get up" message home: he started going on bicycle rides and art gallery strolls with his family.

Peter is not alone in his success. Many studies support the view that simple movement has dramatic health effects. What is more, the effects do not require thrice-weekly visits to the gym or daily jogs that people soon abandon when the regimens become inconvenient. Nonexercise motion, done for several periods a day, can do the trick. And workers, companies and schools have already begun to institute an array of measures that encourage employees to get up out of their chairs.

MAGIC UNDERWEAR

MUCH OF THE EVIDENCE for the benefits of simple standing and walking during the day grew out of studies my group has conducted since 2001 to compare people in agricultural communities with those, like Peter, who live in industrial, urban settings. To measure sitting and moving, we took Spandex underwear and added tiny posture and motion sensors that captured body movement in 13 directions every half a second for 10 days. Jokingly, my colleagues and I call this apparel "magic underwear," but it collects a serious amount of data. We asked villagers liv-

Illustration by Scott Brundage

ing around a banana plantation in Jamaica, city dwellers in the island's capital, Kingston, and urbanites in the U.S. to wear the togs for 10 days. Among our findings: People who live in rural areas in Jamaica walk twice as much as even lean people living in Kingston and modern cities in the U.S. Those in agricultural communities sit for only three hours a day, whereas office workers can sit for 15 hours a day. Because of this increased activity, as we noted in a 2011 summary of this research in *Urban Studies,* agricultural work burns 2,000 calories more a day than many office jobs.

I was intrigued by the idea that converting sitting time to walking time could use so many calories. I called this phenomenon "nonexercise activity thermogenesis," or NEAT. NEAT is the energy a person expends going about his or her everyday life. And I wondered if it made a difference in the weight of people with similar kinds of jobs and surroundings, not just our agricultural and urban workers.

For a hint, we compared lean and obese people in the U.S. who lived in similar environments and had similar diets and jobs. We had our subjects don the magic underwear, and it revealed that obese people sit 2.25 hours longer than their lean counterparts every day. These sedentary obese people expended 350 calories fewer a day through walking and other NEAT activities than did lean people.

The pattern was suggestive but not definitive. To see if low levels of these nonexercise activities could cause weight gain, we began what came to be known as the "Great Gorging Experiment." We asked 16 lean volunteers to overeat while we monitored them carefully. Every day for eight weeks, each volunteer received 1,000 calories a day beyond their normal energy needs.

Some of our volunteers were like those frustrating friends—we all seem to have them—who do not put on weight despite continuous doughnut consumption. These volunteers gained almost no body fat after eight weeks and a total of 56,000 extra calories. How did they stay thin? Our underwear sensors showed they increased their NEAT levels, although none of them said they made a conscious effort to do so. In contrast, other overfed volunteers deposited almost every extra calorie in their body fat. The reason that these volunteers gained so much fat was that they did not change their NEAT—they remained stuck to their chairs, as we reported in *Science* in 1999.

These people were ignoring a drive to move that is as biological as breathing. In animals, movement enables aggressors to chase, the threatened to flee, the forager to search, and the reproductive to find mates. Rodent experiments show that there is intricate brain circuitry that monitors and responds to calorie expenditure, activity and rest. It is located in an area called the hypothalamus, which also regulates such functions as temperature and sleep-wake cycles.

Moreover, investigators have determined over the past decade that part of the hypothalamus manages appetite and will make you hungry if you spend a whole day raking leaves. Meanwhile a feedback system from the muscles senses muscular overexertion and signals a person to sit and rest. The modern chair-based environment has overwhelmed this biologically driven balancing act.

WHAT CAN WE DO?

WE ARE NOT, however, prisoners of this environment. We can break free. Although technologies such as computers and video games have contributed to the allure of the chair, technology can also be a part of the solution. The cell phone, for instance, enables a seated conversation to become a walking talk. A host of popular activity-sensing gadgets enable people to measure how often they sit or stand or move. Newer video games, called Exergames, link computers to physical competitions; the Nintendo Wii, which encourages movement, was a game changer here.

Work can become more active as well. On behalf of some corporations, my lab has redesigned workplaces that release employees from their chair-based isolation. One company in St. Paul, Minn., encouraged walk-and-talk meetings by taping walking tracks to its carpets. A firm in Iowa discouraged workers from sending e-mail to their colleagues nearby by creating "'e-mail-free work zones"; computer networks can block e-mail to close-by desktops.

A decade ago I came up with the idea of a treadmill desk as a way to allow office workers to do their jobs while moving. The unit allows people to walk while conducting business. A computer is placed on a high table with a slow-speed (1 to 2 mph) treadmill underneath it. A person can stroll while typing, answering e-mails and taking phone calls. Naturally, as the inventor, I think the desk is a good idea, and I was pleased when a study, published in *Health Services Management Research* in 2011, demonstrated that it could be helpful. It reported that people who use the desks are slimmer, are less stressed, and have lower blood pressure and cholesterol levels. The desk, of course, is not the only way to incorporate more activity into your day.

As is true of offices, schools can become more active places. We helped to build a classroom in Rochester, Minn., where students practiced spelling while strolling and mathematics while throwing balls. In Idaho Falls a classroom was redesigned so that all the sit-down desks were replaced with standing desks that had a "fidget bar" for students to swing their legs on. Studies show that enrollees in schools that promote movement are twice as active as those attending traditional schools. Educational test scores also improve by about 10 percent, and their hormone levels were in healthier ranges.

Cities can be reimagined to encourage movement. Analyses conducted in San Francisco and the U.K. demonstrate that city districts can be rezoned to discourage car-based travel. Commute times increase by only a handful of minutes, air quality improves, and medical expenses drop. Chair-free living does not just promote health but also saves money.

We live amid a sea of killer chairs: adjustable, swivel, recliner, wing, club, chaise longue, sofa, arm, four-legged, three-legged, wood, leather, plastic, car, plane, train, dining and bar. That's the bad news. The good news is that you do not have to use them. Pat yourself on the back if you read this article standing up—and if you didn't, get up! SA

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