

# How to sit

Far from being a fast track to ill-health, sitting can be good for us, find **Herman Pontzer** and **David Raichlen**.  
The trick is how you do it



**A**NOTHER blistering afternoon in northern Tanzania, another high-stakes game of musical chairs. Stumbling back into camp to escape the sun, desperate for a seat, we glanced at each other and then at the single unoccupied camp chair. In the other, grinning, sat Onawasi, a respected elder with a mischievous bent. He seemed to be enjoying this.

We were spending our summer with the Hadza community, one of the last populations of hunter-gatherers on the planet. Hadza men and women manage to avoid heart disease and other diseases of the more industrialised world, and we wanted to understand why. Our small research team had come in two Land Cruisers loaded with tech to measure every movement made and calorie burned as Hadza men and women scoured the landscape every day for wild game, honey, tubers and berries.

After a long morning, we felt drained by the inescapable heat and humidity. All we wanted to do was sit. Onawasi seemed to feel the same way. He had spent the morning hunting, and certainly deserved the chair more than we did. But this was getting out of hand. Our precious camp chairs that we took into the bush despite their weight were Hadza magnets. Every visitor to our little research area seemed drawn to them like moths to a porch light.

We knew we had a lot to learn from the Hadza about staying physically active. It turns out they also had something important to teach us about resting. Together, over the next 10 years, we would come to understand why chairs are so irresistible, and why they seem to make us ill.

In a simpler time, before Brexit, Donald Trump was US president or covid-19, way back in 2012, the world was alerted to a new and insidious danger, an invisible pandemic. I-Min Lee, an epidemiologist at Harvard University, analysed mortality data from

heart disease, diabetes and cancer and found a common culprit: sitting. In a landmark paper in *The Lancet*, Lee and her colleagues concluded that prolonged periods of inactivity killed more than 5 million people every year globally, making the health risks “similar to... smoking and obesity”. In the media, sitting became the new smoking. Even more alarming for those of us who spend our lives in front of a screen, exercise doesn’t fully undo the dangers of sitting. Long hours spent in a chair or on the sofa steal years from our lives, even if we hit the gym religiously. Sitting is different, and maybe worse, than just a lack of exercise.

Priests and public health workers have warned us against the sin of sloth for millennia. But the familiarity of the public health advice to get moving obscures a curious evolutionary puzzle. Why is inactivity bad for us even if we exercise? How could evolution produce an organism that responds so poorly to rest? As Charles Darwin articulated so clearly more than 150 years ago, natural selection favours strategies that direct an organism’s resources towards survival and reproduction. Any effort that doesn’t ultimately pay off in reproductive success is wasted. Natural selection, the amoral accountant, pays attention only

to the number of offspring produced. It would seem to follow that our bodies should be well-adapted to rest whenever possible, sparing resources for future use.

Countless other species seem to be on board with this philosophy. In the ocean, some predators will rest for more than a day waiting for prey to float by. Numerous reptiles and amphibians slip into dormancy to wait out periods of tough weather or limited food. Bears, bats and a handful of other mammals spend their winters in hibernation, showing no ill effects when they wake up in the spring. Even our evolutionary cousins, the great apes, spend hours every day sitting and lying about like hungover spring breakers on the beach.

## The perils of inactivity

And despite people’s assumption that hunter-gatherers are more active than people in more industrialised societies, we also know from our own experiences with the Hadza community and scientific accounts of other populations that they spend lots of time sitting and resting, too. There aren’t a lot of standing desks in Hadzaland. In the heat of the day, when they are back at camp after a foray, men and women invariably find a shady place to sit while they tend the fire, prepare food and socialise. But unlike with people in the more industrialised world, sitting doesn’t make them sick. What was their secret? How had we managed to screw up something as simple as sitting?

The first clues that sitting for long stretches caused disease in the industrialised world came from a ground-breaking study of London transport workers published in 1953. Epidemiologist Jerry Morris noticed that bus drivers sat for most of the day while conductors stood and climbed the stairs of the iconic double-deckers. Morris and his colleagues followed about 31,000 men in

**“How could evolution produce an organism that responds so poorly to rest?”**

JASON RASH



Kneeling engages the muscles much more than sitting

KARL-JOSEF HILDEBRAND/PAICOVER IMAGES

these roles over two years and found that drivers were about 30 per cent more likely than conductors to develop coronary heart disease, and to do so at a younger age and with worse outcomes. Later research comparing postal workers who delivered the mail with their sedentary office mates showed similar results.

Summarising the findings, Morris focused on the importance of physical activity in preventing heart disease, helping to kick off the modern exercise movement. But beginning in the 1990s, researchers started to wonder whether sitting itself could be leading to problems. Indeed, studies began to show that people had an elevated risk of heart disease and of dying at an earlier age when they reported sitting for long periods while, for example, watching television.

This line of thinking was bolstered by data from attempts to mimic the effects of space travel on the body. As the space race heated up in the 1950s, NASA became concerned with how a lack of gravity might affect astronaut health. The agency began a series of bed-rest studies, where volunteers would lie down for long periods, sometimes more than two months. Their bones thinned and muscles weakened, but there were other, unexpected effects, too. Subjects had higher levels of fats called triglycerides in their blood and

## “Chairs and beds allow us to turn our muscles off and sag into the cushions”



other risk factors for cardiovascular disease.

As the evidence for the dangers of inactivity grew, a hypothesis began to develop for why it was so harmful. When we stand and walk, we engage the muscles of our legs and core to hold us upright. Chairs and beds allow us to turn those muscles off, sagging like wet dishcloths into the contours of the cushions. Perhaps muscle activity was the key.

Normally, medical researchers like to test their ideas in rodents, but convincing a rat to sit in a chair and watch television didn't seem a viable option. Undaunted, Marc Hamilton at the University of Missouri and his colleagues suspended rats' hind limbs off the floor by tying their tails to a swivel on the roof of the cage. With no need to support the body, the rats' hind limb muscles switched off and stopped burning fuel. This in turn led to reduced levels of an enzyme needed to provide fuel to working muscles: lipoprotein lipase. This enzyme acts like a triglyceride vacuum cleaner, breaking the molecules into fatty acids that can be burned in the muscles, and thus removing them from the bloodstream.

In Hamilton's rats, triglycerides built up in the blood because the muscles didn't need them and didn't produce the lipoprotein lipase to break them apart. The translation to humans seemed obvious: prolonged sitting allows us to switch our muscles off and causes triglycerides to climb.

Studies in humans have provided support for this mechanism. In several controlled trials, people forced to sit for long periods developed elevated triglyceride levels. Importantly, if the sitting time is broken up with light activity, even a bit of slow walking, triglyceride levels are greatly reduced. In fact, people asked to reduce sitting by spending more time walking and standing over a four-day period saw a 32 per cent drop in triglyceride levels. Sitting for long, uninterrupted periods also alters the walls of blood vessels in ways that make them stiffer and more prone to coronary heart disease, but breaking up sitting with light activity restores vessel function.

Perhaps societies like the Hadza avoided the dangers of inactivity by resting less each

day, or perhaps they broke up their sitting time with more frequent bouts of standing or walking. That idea certainly had intuitive appeal: it was hard to imagine a Hadza man or woman logging as many hours on their butt each day as a typical US citizen. But our experiences with Onawasi and the irresistible attraction of a nice chair hinted at another, deeper explanation. Perhaps chairs, those sirens calling out to us, were the problem.

Material evolution is a curious phenomenon. Innovations tend to build on one another, as simple solutions give way to more sophisticated designs. Nonetheless, simple and elegant ideas often stay undiscovered for millennia. The ancient Britons who built Stonehenge were wise

## “We have found evidence of squatting dating back nearly 2 million years”



People in the Hadza community often rest by squatting, like this man in the Lake Eyasi region of northern Tanzania

DAVID RACHLEN

enough to track the sun and clever enough to move 20-tonne boulders, but never imagined the wheel. Chairs are another surprisingly recent invention. They first appear in the archaeological record less than 5000 years ago, well after the emergence of farming, towns and metallurgy. Our Palaeolithic hunter-gatherer ancestors never had them.

Even today, the Hadza don't use chairs. A Hadza man or woman can manufacture an impressive array of things, from powerful bows and arrows to breezy, weatherproof houses, and summon fire on demand. But they don't make furniture. The closest thing you will find in a typical Hadza household are animal skins for sleeping on the ground.

Without chairs or other furniture, how do we rest? Anthropologist Gordon Hewes was interested in this topic, having spent time teaching in Tokyo in the mid-1950s where seiza-style kneeling was often used as a rest posture in formal settings. Hewes amassed a worldwide compendium of nearly 1000 human postures. In societies with little furniture, Hewes found that resting often involved squatting or kneeling on the ground.

These postures are an ancient part of the human repertoire. Deep squatting flexes the foot upward, pressing the talus, a small bone in the ankle, into the end of the shin bone, or tibia. If it is done often enough, these postures leave a mark on the tibia, called a squatting facet. Palaeoanthropologists have found these facets on fossils of human ancestors going back to *Homo erectus*, nearly 2 million years ago.

### Resting squats

In the Hadza community, we noticed that people of all ages spent much of their resting time in a deep squat, heels on the ground, bottoms resting on the back of the ankles. If you don't grow up doing it, you have probably lost the flexibility to squat that deeply (go on, give it a try). Even if it is second nature, as it is for the Hadza, the posture would seem to require more muscle activity than lolling about in a chair. Here, then, was a third hypothesis for how the Hadza avoid the perils of inactivity: rather than sitting less ➤



**Chairs and sofas mess with the way we evolved to sit when we relax**

10'000 HOURS/GETTY IMAGES

or breaking up their sitting into shorter bouts, perhaps the secret was in the way they sit.

Armed with these insights, we headed back to Hadzaland a few years later with an array of small, wearable sensors to record muscle activity and body position. We used the sensors to track the resting behaviours of 28 Hadza men and women for a week, calculating both the average number of hours spent inactive each day and the frequency with which they broke up long periods of sitting to stand up or walk around. We also conducted a set of controlled studies to measure muscle activity in various resting postures, including squatting and sitting in a chair.

The results surprised us. Hadza men and women spent nearly 10 hours every day resting, almost identical to the numbers for people in the US, Netherlands and Australia. The number of breaks was similar across populations as well. Hadza adults switched from resting to active postures like standing or walking roughly 50 times per day, on par with data from Europeans.

Still, Hadza blood profiles and blood pressures showed they were remarkably healthy, with low levels of triglycerides and other markers of heart disease. The Hadza were much healthier than their desk-bound counterparts in industrialised

## “Hunter-gatherers rest for 10 hours a day, identical to people in the US”

countries, but not because they rested less or got up to stretch their legs more often.

Instead, the big difference we found was in muscle activity during rest. Squatting forces you to keep the body balanced over the feet, requiring between five and 10 times as much muscle activity in the legs as sitting in a chair or on the ground, and sometimes even more muscle activity than we would expect from light activity. Sure enough, when we tallied the resting postures used around camp, we found that Hadza men and women were squatting and kneeling nearly one-third of this time. Putting the evidence together, we think that the use of “active resting” postures, like squatting and kneeling, might maintain enough muscle activity to prevent

triglyceride build up and avoid disease. If our ancestors also used these more active rest postures, then the negative health effects of sitting make perfect sense: our physiology never experienced long periods of quiet muscles, so our bodies never evolved a protective response.

In the end, how could we blame Onawasi, or anyone, for wanting to sit in our camp chairs? We wanted them for the same reasons: chairs are an indulgence, allowing us to rest our tired muscles. The allure of a good chair has held our collective attention ever since they sprang into our material world. But chairs, once invented, let us rest in ways that are comparatively new to the human body. That novelty is both the draw and the danger.

Should we abandon our chairs? Unless you have been squatting since childhood, forcing yourself to do it may cause pain and discomfort. And Hadza men and women also spend much of their rest time in postures like sitting and lying down that entail low muscle activity, so maybe we don't have to avoid sitting altogether. But, our work suggests that you can improve your cardiovascular health by sitting less, and by breaking up your sitting into shorter bouts to increase muscle activity throughout the day. As our Hadza friends showed us, it is likely that quiet muscles are the enemy. So, while we are sheltering in place, working from home or watching more TV than ever before, let's try to break up the couch time into smaller bits. Get up, move around and if you are limber and feeling adventurous when you turn on Netflix, trying squatting just like the Hadza, in an active resting posture. Your heart will thank you. ■



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