

Pounding Pavement by Heel or Toe

By [GRETCHEN REYNOLDS](#)

Heel strike or toe strike?

With the fall marathon-training season in full stride, it is time once again to argue about running form. How a runner's foot should strike the ground incites passionate debate among athletes and coaches, despite scant persuasive evidence to support either position.

But a noteworthy new study may help to quell the squabbling, by suggesting that each style of running has advantages and drawbacks, and the right way to run almost certainly depends on what kind of runner you already are.

For the new study, published in [June in Medicine & Science in Sports & Exercise](#), researchers at the Tampere Research Center of Sports Medicine in Tampere, Finland, began by using motion capture technology to determine the running form of 286 young adults from the area who played team sports. None competed in distance running. All wore their normal running shoes during testing.

The testing showed that 19 of the women and 4 of the men struck first with their forefeet while striding.

These small numbers tally with other reports, most of which have found that an overwhelming majority of modern runners, whether male or female, slow or swift, are heel strikers. In a telling [study](#) published in May in The International Journal of Sports Physiology and Performance, almost 2,000 runners participating in a recent Milwaukee Lakefront Marathon were filmed midway through the event and their form analyzed. About 94 percent proved to be heel strikers, including quite a few of the fastest runners.

Similarly, when researchers in New Hampshire [studied middle-of-the-pack runners during a marathon](#) there, they found that almost 90 percent were heel-strikers according to filming conducted six miles into the event. Interestingly, of the remaining 10 percent, most had shifted to a heel-strike form when filmed again near the race's end, as they tired.

Regardless, some running coaches and other experts question the wisdom of heel striking, noting that [when runners don't wear shoes](#), presumably the most natural way for humans to run, many, although not all, adopt a forefoot-strike running style. This suggests, enthusiasts say, that forefoot striking is the inherently right way for humans to run.

If so, however, forefoot striking should lessen the odds of a running-related injury. And it was that possibility that the Finnish researchers hoped to explore.

So they next matched the 19 forefoot-striking female runners with an equal number of female heel strikers of similar age, height, weight, and running pace. (There were too few forefoot-striking men to include them.)

The women were fitted with additional motion-capture sensors and filmed again while running. They also underwent measurements of leg and hip strength.

Plugging the resulting data into formulas validated in other experiments, the researchers determined just how much force the women were creating with each stride and, of greater interest, where that force was hitting hardest.

In general, the knees, ankles and Achilles' tendons are the sites of most running-related injuries, previous studies have found. And in this experiment, many of the women runners jarred their knees, especially when they landed on their heels. That running form resulted in about 16 percent more force moving through the knee joint than when women landed near their forefeet. The elevated forces were particularly evident along the heel strikers' kneecaps and the medial or inside portion of their knees, where the joint is known to be particularly vulnerable to overuse injuries.

But the forefoot strikers' legs were not immune from force. They simply absorbed it differently, with almost 20 percent more force moving through their ankles and Achilles' tendons than among the women who hit with their heels.

In essence, the findings show that you can't escape the cumulative impact of running, however you stride, said Juha-Pekka Kulmala, a Ph.D. student, now at the University of Jyväskylä, who led the study. Hit with your heels and you stress your knee, possibly leading to conditions such as patellofemoral stress syndrome. Strike near the ball of your foot and you'll jolt your ankle and Achilles' tendon, potentially increasing the risk of such injuries as Achilles' tendinopathy, plantar fasciitis, and stress fractures of the foot.

There is, in other words, no one invariably right and painless way to run.

However, Mr. Kulmala said, the results also indicate that strategically altering how you land could be advisable for some runners. "People suffering from knee problems can benefit from forefoot striking," Mr. Kulmala said. "Those who have Achilles' tendon complaints can benefit from rearfoot striking."

Switching form is not simple, though, as countless runners who have tried will attest. "I think that experienced runners are able to change stride pattern" relatively easily, Mr. Kulmala said. "But nonexperienced runners find it more difficult." Consider contacting a local coach for advice, and have an obliging friend or spouse film you running, so you can document how your foot hits the ground. Incorporate any changes slowly, Mr. Kulmala cautioned.

And if you have little experience with injury and are comfortable with your stride, then by all means, stick with it, as is. The best running form, Mr. Kulmala said, is any that keeps you moving regularly.