

[IMAGE]

Running Form: How Should Your Feet Hit the Ground?

By Thomas Michaud, DC

Despite the fact that the overwhelming majority of slow runners instinctively strike the ground with their heels, there is a growing trend among running experts to have recreational runners strike the ground with their mid- or forefoot. Proponents of the more forward contact point suggest that a mid- or forefoot strike pattern is more natural because experienced, lifelong barefoot runners immediately switch from heel to midfoot strike patterns when transitioning from walking to running.

Strike Patterns and Injury Potential

The switch to a more forward contact point is theorized to improve shock absorption (lessening our potential for injury) and enhance the storage and return of energy in our tendons (making us faster and more efficient). However, although appealing, the notion that switching to a mid- or forefoot contact point will lessen the potential for injury and improve efficiency is simply not true. Regarding injury, epidemiological studies evaluating more than 1,600 recreational runners conclude there is no difference in the incidence of running-related injuries between rearfoot and forefoot strikers.

Advocates of midfoot strike patterns cite a frequently referenced study showing that runners making initial contact at the midfoot have 50 percent reduced rate of injuries. The problem with this study is that the 16 runners involved were all Division I college runners who self-selected a midfoot strike pattern. While self-selecting a midfoot strike pattern is fine and is often the sign of a high-level athlete, it's the conversion of a recreational heel strike runner into a midfoot strike runner that is problematic.

running - Copyright â Stock Photo / Register Mark In my experience, the world's fastest runners who self-select midfoot strike patterns tend to be biomechanically perfect, with well-aligned limbs, wide forefeet, and neutral medial arches. Over the past 30 years, I've noticed that flat-footed runners who attempt to transition to forefoot strike patterns tend to get inner foot and ankle injuries (such as plantar fasciitis and Achilles tendinitis), while high-arched runners attempting to transition to a more forward contact point frequently suffer sprained ankles and metatarsal stress fractures.

In a detailed study evaluating the biomechanics of habitual heel and forefoot strike runners, researchers from the University of Massachusetts demonstrated that runners who strike the ground with their forefeet absorb more force at the ankle and less at the knee. The opposite is true for heel strikers, in that they have reduced muscular strain at the ankle with increased strain at the knee.

This is consistent with several studies confirming that the choice of a heel or midfoot strike pattern does not alter overall force present during the contact period; it just transfers the force to other joints and muscles. Midfoot strikers absorb the force in their arches and calves, while heel strikers absorb more force with their knees. This explains the much higher prevalence of Achilles and plantar fascial injuries in mid- and forefoot strikers, and the higher prevalence of knee pain in heel strikers.

This research proves that choosing a specific contact point does not alter overall force; it just changes the location where the force is absorbed. This is the biomechanical version of "nobody rides for free."

The research suggesting midfoot strike patterns are more efficient than rearfoot strike patterns is even more spurious than the research suggesting a forward contact point reduces injury rates. In an important paper published in the *Journal of Experimental Biology*, scientists calculated joint torque, mechanical work performed, and muscle activity associated with altering initial contact points at various speeds of walking and running. The results of this study confirmed that running with a mid- or forefoot contact provided no clear metabolic advantage over heel-first strike pattern.

In contrast, walking with a heel-first strike pattern reduced the metabolic cost of walking by a surprising 53 percent. That's a huge difference in efficiency and explains why almost all slow joggers (who often run just a little faster than walking pace) make initial ground contact with their heel. While some elite runners are efficient while landing on the forefeet, the overwhelming majority of slower runners are more efficient with a heel-first strike pattern.

Heel Strike and Metabolic Efficiency

The big question is, since the world's fastest runners often strike the ground with their forefeet, while slow runners strike with their heels, at exactly what speed do you lose the metabolic efficiency associated with heel strike? In a computer-simulated study evaluating efficiency, researchers from the University of Massachusetts showed that while running at a 7:36 minutes/mile pace, heel striking was approximately 6 percent more efficient than mid- or forefoot striking. Some experts believe that the 6-minute-mile pace is

the transition point at which there is no difference in economy between heel and midfoot strike patterns.

Given the clear metabolic advantage associated with heel striking at all but the fastest running speeds, it's not surprising that when asked to rate comfort between heel and midfoot strike patterns, recreational runners state that a rearfoot strike pattern is significantly more comfortable. Improved efficiency also explains why approximately 35 percent of recreational runners transitioning into minimalist footwear continue to strike the ground with their heels, despite the amplified impact forces: Heel striking is too efficient to give up.

The Bottom Line

Because midfoot strike patterns significantly reduce stress on the knee, they should be considered for all runners with recurrent retropatellar pain. This is especially true for faster runners with neutral arches, wide forefeet, and flexible Achilles tendons. Conversely, slower runners with a history of Achilles, forefoot and/or plantar fascial injuries should almost always make initial contact along the lateral heel, because contrary to what many running experts say, striking the ground heel first is safe and efficient.

Thomas Michaud, DC, is the author of *Injury-Free Running: An Illustrated Guide for Preventing and Treating Running Injuries*, the content of which forms the basis for this and subsequent articles. He is a 1982 graduate of Western States and practices in Newton, Mass., where he has treated thousands of recreational and elite runners.

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