Roy Benson's Coachly Wisdom: Elbows, Knees and Feet

How your arm carriage affects your footstrike

By Roy Benson
As featured in the Web Only issue of Running Times Magazine

All this excitement about bare feet, minimalist footwear and foot strike is overlooking an important component of your form. What role does your arm swing play? Well, perhaps surprisingly, it can definitely have a role in the biomechanics of your footstrike. If so, how should your arms be working when you're running? Should they be pumping with hands coming up to and in front of your shoulders? Or swinging across the front of your ribs to the body's midline? How about the angle of the forearm and the upper arm at the elbow? Acute or 90 percent or obtuse? Is there a relationship between this angle of rotation and stride length and hence also with footstrike?

Before you consider changing your footwear, it's good to understand that the wrong choice of shoes isn't the only cause of knee pains and other strains and injuries to the rest of your legs. As a coach, I firmly believe that most problems are caused, pure and simple, by training mistakes. The reason that you hear over and over again to not go too far or too fast too soon is because there's truth in the warning.

The next cause of leg injuries, after poor decisions about workouts, is the common problem of overstriding. Most experts agree that overstriding happens when your foot touches down about 10-12 inches ahead of your center of gravity, and this can happen whether you land midfoot or heel first. The degree to which the braking effect and the resulting force of 1.5 to as much as 3 times body weight depends mostly on your stride length. Your particular set of biomechanical givens, as well as your speed, can be much more important than your foot wear in determining if such is the case when you touch down. Landing heel first or on the ball of your foot isn't as important as avoiding touching down with your knee locked and your leg straight. (Sprinters going full speed may be a different story, but let's ignore their biomechanics here and continue to focus on distance running.)

Granted that switching from a heel first to a mid foot strike can help you avoid overstriding; so can changing the angle of your arms at the elbow. Surprisingly, one way to change your stride, and thus your foot strike, is to change the way you swing your arms. Why? Because there's a relationship between the tempo of your arm swing and your foot strike. And changing this relationship can affect the point of contact with the ground even in heavy training flats.

For example, let's say that you are long-legged with a split of your height strongly in favor of your legs (no matter how tall you are). If so, and if you carry your arms low, i.e., with greater than a 90-degree angle at the elbow with your forearms swinging back and forth down at hip height, you're probably making your long legs take a long, slow stride. Thus, there's a good chance that you're overstriding, no matter what part of your foot touches down. Running like this can be highly inefficient even though the footstrike is midfoot and right under the center of gravity.

All this brings up a conundrum about the relationship between the turnover rate of your legs and the tempo of your arm swing as a sort of chicken-or-egg dilemma; which comes first? Do your arms swing merely as a counterbalance to your stride turnover, or can they tell your stride to shorten or lengthen? By changing the angle at your arms at your elbow, you can change your stride length, and thus the contact of your foot strike.

Since overstriding is the cause of a greater body weight force and thus greater stresses and strains throughout the entire body, let’s focus on how to shorten your stride so you can land with your knee bent closer to your center of gravity. To see how tightening the angle at your elbow will make your arms swing through their range of motion quicker, picture a pendulum like the one in a grandfather clock as it swings back and forth with a counterweight attached. The length of the arc of the pendulum swing will depend on the center of gravity of the pendulum, and that’s determined by the position of the counterweight. The lower the center of gravity, the longer the arc and hence the more time the clock takes to record each swing. Thus, If the clock is too slow, by raising the counterweight, you’ll raise the center of gravity and thus shorten the arc of the swing back and forth. In short, the clock speeds up and runs faster.

And, if you are an overstrider, so will you, if you raise the center of gravity of your arms by tightening the angle of rotation at your elbow. Make your arms swing faster and your legs will have to follow by taking a shorter stride. If, after you push off your trail leg, this helps you come down to earth with more of an angle at your knee closer to your center of gravity, maybe your shoes aren’t the problem.

Running safely is all about efficiency at every pace, on any kind of surface, in all kinds of equipment. Like all scientific answers to problems, it’s all about cause and effect. And, like running, the experiments go on and on and on. Nothing is simple.