

Running Form – The Good, The Bad and The Ugly

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It is surprisingly controversial amongst runners and coaches whether you should tinker with running form. I believe that you should try to improve form.

The best runners in the world show a lot of similarities in form.

Benefits of improved running form

- Reduces injuries – a lot of runner's injuries are related to poor form – 65% or more of runners are injured each year – enough that they lost training time
- Increase running economy – economy is the amount of energy used as you run at a particular pace – with improved form you can run at the same pace using less energy
- Increase running speed



Running with good form requires half the energy it would take if just the muscles were used for propulsion. Runners make use of elastic recoil energy.

The Achilles tendon returns 93% of energy when it is stretched and release.



In the first picture the runner is balanced nicely over the support leg. In The second he is stretching the Achilles tendon and the foot. In the next photos he is getting the elastic energy return from the Achilles and the foot to propel him forward. The angle of the push-off leg determines the angle of the force

pushing him vertically and horizontally. As much as possible he wants a horizontal push. When attached to the rest of the body, the Achilles returns about 34% of energy and the foot (primarily the plantar fascia) returns about 17% of the energy of running. This is a source of free energy available by using good, efficient running form.

An example of good running form.

The runner on the right is balanced over the support leg, stretching the Achilles and foot. You can see both runners have the elbows held at about 90 degrees, looking forward, relaxed through the shoulders with a slight forward lean. Both have hands relaxed in loose fists with the thumbs up.



We think of the central part of the body affecting the periphery – swing your arms and the hands are moved – but it also works the other way. You see people running with the palms facing down and the wrists flapping. Try this experiment – bend your elbows, thumbs up and swing the arms from the shoulder as if you are running. Feel how easy it is to move the arms. Now turn the palms down and try moving the arms the same way. You will feel the motion is restricted. Restricting the range of motion in the upper body causes a reduced range of motion in the legs – what happens in the upper body is reflected in the lower body. So – keep those thumbs up.

You also see in the runner on the right that he is bringing the free leg through with the knee bent. This makes it easier to move the leg. You can try that for yourself by swinging a long arm vs swinging an arm bent at the elbow. The shorter arm is easier to move.

The runner on the left is displaying tremendous flexibility through the hip flexors – you can see the angle between his thighs. This gives him a long stride length. You can also see the angle of the push-off leg which is giving him a good amount of horizontal motion.

Some form faults we will look at:

- Landing on heel / overstriding
- Short stride - not using feet/butt
- Foot placement
- Seated running
- Twisting trunk/rotating shoulders
- Hip drop

How to Correct Form Faults

Gradually!!!!

I do not believe in a runner going to a one-day clinic and changing their form that day. I also do not believe a runner should come to me to get videotaped and change the form the next day. That is a cause of injuries.

I believe that most form faults are as a result of an imbalance of strength and flexibility. If you can determine what is causing the bad form, you can work on the solution through strength and stretching. Both of these take time to develop – it takes weeks and months to make the changes. Be patient!

...You can use drills to work on improving form. With drills you break down the running stride into components and work on them bit by bit. Just like practising shots in hockey or scales on the piano you work on a piece at a time and then put them together for an improved whole.

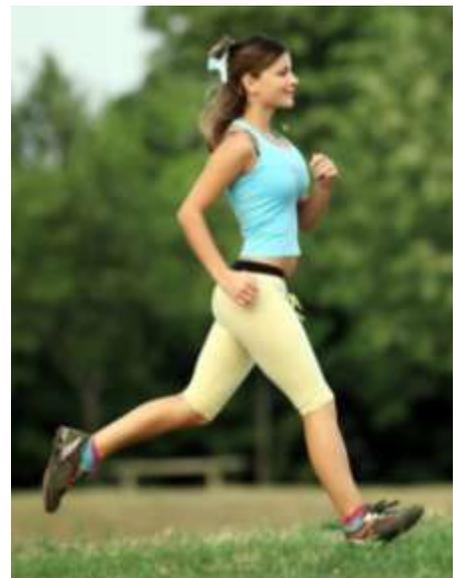


Some running form problems can be improved just by being aware of them – like the thumb up vs palm down issue. But again, don't try to make the change all at once.

Landing on the heel/overstriding

There is a lot of talk recently about heel-striking vs midfoot vs forefoot. Most elite runners are “heel strikers” but that just means landing near the back of the foot rather than the drastic heel striking I’m speaking of here.

This is some people’s idea of what a good runner looks like. Yikes! You can see that she is landing high on the heel well forward of her centre of gravity. If you picture the force of her landing you can see that she is braking her stride. It is like driving with the parking brake on. Very inefficient. You can also see that she is landing with quite a straight knee. The knee should bend to cushion some of the force of landing (2.5 - 3 x body weight in a runner) but with this straight knee, the force is pushing up into her hips and back. She is also stuck behind the support leg so to move forward she has to either vault over that leg or drag herself forward using her quadriceps in a way they were not meant to be used. Running this way causes injuries and lower economy.



You may say that real runners don't run like this. Well, check out this runner.

And these from the Boston Marathon. Lots of heel striking going on.



And the fellow below – look at that foot position – flat while still well ahead of the body. It is like shoving a wedge under a door. It's braking his movement pretty effectively.



A solution to overstriding is to increase stride rate. Try to get up to 170-180 steps per minute. This does not give you time to get that foot way out in front.

Another benefit to an increased stride rate is that you get more elastic energy return from the Achilles. The Achilles tendon is very elastic but it is attached to muscle which has visco-elastic properties – a combination of elastic and fluid – a bit like putty. So imagine you have an elastic attached to a lump of putty. If you pull and release the elastic quickly you get a good amount of energy returned. If you pull the elastic and just hold it for a bit, the putty will start to ooze and stretch and you will lose some of the stretch on the elastic. Same thing happens with the Achilles. You can prove this to yourself by squatting and jumping up right away. It's fairly easy to do. Now squat down and hold it for a minute. Now try to jump up. It's much harder because you have lost some of the stretch on the Achilles and you are not getting as much benefit from the elastic recoil effect.

Seated Running



This can be related to overstriding. Here the runner sits down behind the support leg. It could be that she has bent the knee after overstriding. It could be that she is very tight through the hip flexors or weak in the core and cannot stay up over the support leg. Again there is braking on each step. In addition the body is being supported on a leg out on an angle so the quads are working harder than they should be. And to move forward the runner had to pull herself past that support leg.

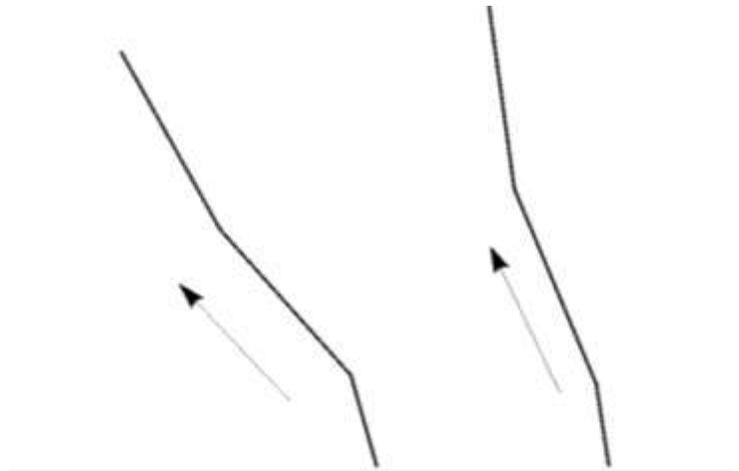
People with desk jobs or who sit a lot through the day tend to be tight through the hip flexors. Cyclists have the same problem and seated running is commonly seen amongst triathletes.

Runners should work on core strength and on stretching the hip flexors (exercises later in this article). They can also think about running tall – think about pulling up through the hips rather than slumping down behind the support leg.



Short Stride/Not using the butt and feet

The diagram shows legs – foot, lower leg and thigh. The one on the left is angled nicely forward so the runner will get a good amount of horizontal push. The one on the right is providing a much more vertical push. The idea of running is to go forward as efficiently as possible so this vertical push is not useful.



This can be because the runner is tight through the hip flexors or is not using the large gluteus muscles or the pop off the feet to get that leg more back on each stride. Below are some examples of the push-off being too vertical.



Stretching

Here are some stretches that work on tight hip flexors. This can help with several of the form faults seen above.



Twisting trunk/rotating shoulders



Here you see the three women who competed for the US in the 2008 Olympic marathon. You can see the rotation in the shoulders of two. Deena on the other hand is very strong through the core and her arms are swinging from the

shoulders rather than the shoulders rotating.

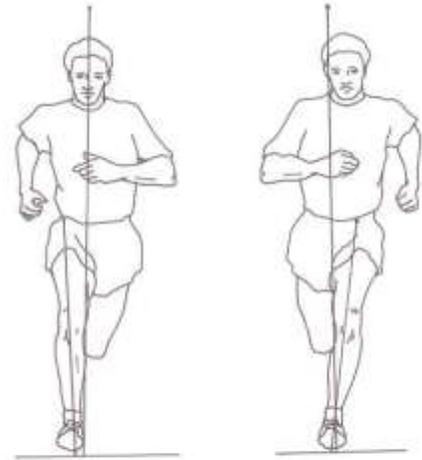


Figure 19.1 Excessive upper body torque, which pulls the legs across the midline of the body, is a frequent cause of running injury.
Reprinted from Psichard (1984).



Remember that what happens in the upper body is reflected in the lower body. An excess rotation in the shoulders will be reflected in a rotation in the hips which is inefficient and may cause injuries. In the runners above you can see the restricted range of motion in the arms which will limit the range of motion in the stride. In addition, the legs are being pulled across the centre line of the body which can cause injuries through the hips, IT band, knees, ankle and feet. The runner to the left is landing (with 2.5-3 x body weight) with a spine twisted dramatically. Can you imagine the stresses going through his spine?

Part of the problem could be a lack of flexibility through the chest or a weakness in the upper back. Stretches and strengthening as you see below can help.





Foot Position

You can see this runner toeing out. This shows various problems when he bends the knee to cushion the landing, the knee and hip are angled outwards. The force of his forward motion will be pushing through the joints at an angle they are not built to handle. This can lead to injuries.

Now think about the elastic recoil assistance from the achilles. When it is released, what direction will it go? It pushes the runner further outwards instead of forward.

Another problem is that the stride length is decreased just because of the angle of the foot.



Loss of distance due to foot position

Angle of foot	10°	20°	30°
Loss of distance over 1K	2.5m	10m	23m
Loss of distance over marathon	105m	422m	970m



Steve Cram losing 50 cm per 100m of race due to foot position. He also suffered a lot of lower leg injuries during his career.

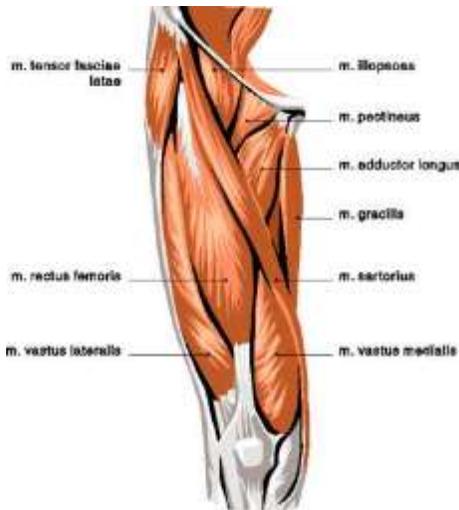
From Martin and Coe, Better Training for Distance Runners

Figure 1.11 Lower-limb running mechanics in three of Britain's best 1500-m runners. Note the optimal foot orientation parallel to the path of movement in Seb Coe (326) and Tom McKean (351), but excessive lower-limb rotation in Steve Cram (326).



Barefoot running does not automatically mean good form. In this case there is no support from shoes to prevent overpronation due to foot position.

One cause of the turned-out foot can be weakness in the adductors or tightness across the butt. You can work on the weakness with various strengthening exercises like the one to the right below.



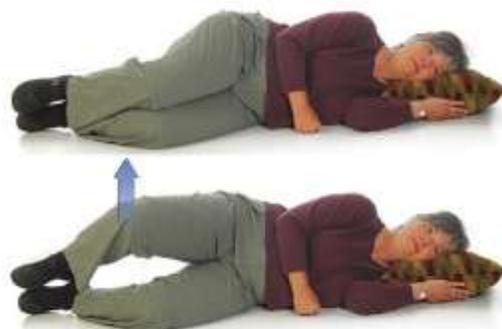
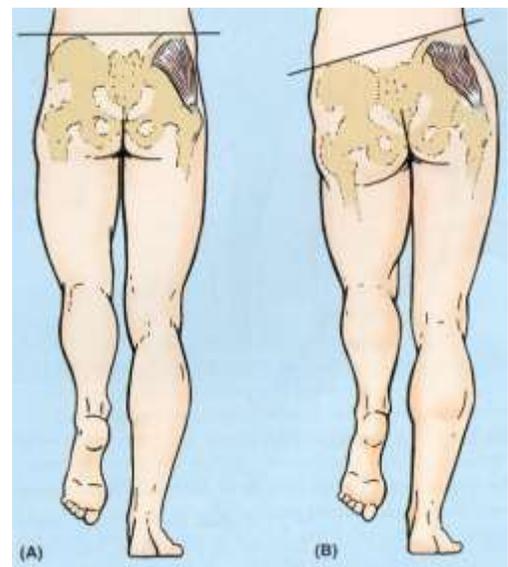
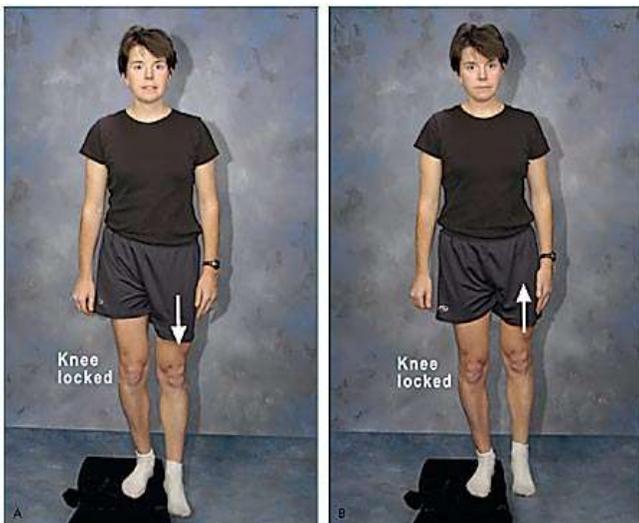
Hip Drop

When supported on one leg, it should be possible to keep the pelvis horizontal like the runner to the right. Many injuries are related to this hip drop. In the runner below to the left you can see the angle on the pelvis, and how much lower one knee is than the other. In the runner to the right below you can see the compensation in the spine for the hip drop. Injuries can include IT band, knee, ankle and foot.



The hip drop is caused by weakness or overflexibility in the gluteus medius muscles up the side of the hip.

Below are some exercises (hip hikers to the left and clam shells to the right) that can help strengthen the muscle.



This runner will have short career if he keeps running with that form. A few years ago I videoed a young woman, a very good runner who ran a bit like this. She had suffered three spiral stress fractures of the lower leg over two years. She was planting her foot turned in then twisted out from the hip. The stress was taken in her shin and resulted in the stress fractures.

Bad running form can cause injuries. By working gradually to improve it you may prevent injuries, increase economy and running speed.

