

# Understanding Running Gait!

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We all love to run and the benefits are many- improved cardiovascular function, reduced risk of stroke and heart disease, improved blood pressure, improved bone density, improved immune functioning, weight management, and mental alertness, to name only a few. But do we know what is actually happening to our body on a biomechanical level while we run? Here's a glimpse into what your body is going through while you are out there pounding the pavement with the Burlington Runners.....

Running gait, with its repetitive nature, can be broken down into two basic phases: stance phase and swing phase. Stance phase occurs when the foot is in contact with the ground, while swing phase occurs when the foot is in the air. By definition, running is characterized by the fact that at some point in the running cycle, both feet are in the air simultaneously, no matter how fast or slow we are moving! With walking, however, one foot is always in contact with the ground. The stress of landing on one foot from an unsupported position is one of the reasons that running is more physically demanding than walking. With every footfall, the forces of nearly three times your body weight are transmitted throughout your lower limb!

## **Stance phase**

(while the foot is in contact with the ground) can be further broken down into three components: heel strike, mid-stance, and toe-off.

1. **Heel strike:** Ideally, your heel should strike the ground on the back outside edge. If you take a look at the outside sole of your running shoes, chances are you will notice extra wear and tear at this location. At the point of heel strike, your foot is in a position of supination, meaning your foot is in a high-arched position. Supination provides a stable base of support for your body to absorb the demanding forces of landing one-footed on the ground.
2. **Mid-stance:** Once your foot has landed on the ground, your foot begins to roll inwards and your arch flattens out, into a position of pronation. Pronation is not the four-letter word that some runners think it to be! Everyone needs a certain level of pronation to

allow your body to absorb the ground reaction forces and to bring your body into the most biomechanically-efficient position. It is when someone over-pronates, that problems can arise.

3. **Toe-off:** When your midfoot rolls inward during mid-stance, your toes also go along for the ride. It is your big toe that leaves the ground last and is used as a source of propulsion to move you forward. It could be argued that the large joint in your big toe is the most important joint in your body for proper and efficient running form- normal gait requires approximately 70° of dorsiflexion to provide an effective toe-off. During toe-off, your arch heightens again to put your foot back into a stable supinated position, providing a stable base for your toe to effectively "push" from. It is very important to have the proper running shoe to support these motions- good footwear can really help with injury prevention.

**Swing phase (while the foot is in the air) can be divided into the two components of internal rotation and external rotation.**

1. **Internal rotation:** Assuming that your foot has experienced proper toe-off, your foot will leave the ground with your leg in the position of internal rotation. That is, your toes are pointing towards the midline of your body. While your leg is moving forward through the air, your hip, knee, and ankle, must all rotate outwards to allow your heel to land again on its outside edge.
2. **External rotation:** As your leg moves forward and crosses the plane of your other leg, it should be in a position of external rotation, meaning that your toes are pointing slightly away from the midline of the body. This allows your heel to strike the ground on the outer edge (in a supinated position, remember?) and the whole cycle of gait begins again. And again. And again.....

During gait, your upper body is very important as well. Your right arm is connected to your left leg and your left arm is connected to your right leg, both on a neurological and anatomical level. Anatomical studies are now revealing tissue connections (fascia) crossing at the pelvis in both the front and the back- this means your left arm and right leg literally are connected! As you can imagine, it is very important to utilize your arms for proper running form. Do not waste energy by swinging your arms horizontally across your body. Instead, swinging your arms front to back will help to propel you forward and make you more of an

efficient runner. A strong core is also important to minimize twisting for injury prevention and energy efficiency.

If nothing else, I hope that this article may provide you with a few thought-provoking moments during your next run! Happy training!

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