



## Leg Strength

Leg strength is obviously very important to runners. Your legs are the main motion generating part of your body that you use to propel yourself forwards. Having strong legs will help prevent injury, make everyday activities easier, delay fatigue when you run and make you faster when you get to the hills!

When we talk about leg movement in running we are really three major joints in motion.

- The first is your hip joint. To provide forward motion you must flex your hip and then extend it backwards for the working phase of the motion.
- The second is the knee joint. The working phase is when you flex (or bend) the knee to provide forward motion.
- The third is the ankle joint. The working phase for running is what is called planter flexion (when you point your toes downward). This provides some additional forward motion but also vertical motion.

Of course there are other articulations such as the tarsal and metatarsals in the feet as well as some rotation motions but we are focusing on the primary movements which runners should be concerned about.

Now we know the three major movements involved in the legs producing a running motion, we need to look at which muscle groups are used to produce the movement of each. In kinesiology, we study the origin and insertion of the muscles (which bones they are joined to) and their impact on the movement of a joint. Each movement has an opposite movement so we need to look at the muscles in pairs to understand how to strengthen them. If one of the muscles in any pair is much stronger than the other or much tighter than the other, it will cause imbalance and alignment issues that will eventually lead to injury.

So back to the hip joint. The two major muscle groups for running associated with the hip are the Hip Flexors that provide forward motion of the upper leg and the Glutes that provide the rearward motion of the upper leg. The working phase is when you are pulling your upper leg rearward so the muscle used to do this are the Glutes. If you've ever looked at the physique of a sprinter, it's hard to miss the size of their Glutes. This is because they primarily use the fast twitch fibers of the muscles for explosive movements and fast twitch fibers increase in size when trained. The Glutes are one of the strongest muscles in the body and are often out of balance with the hip flexors. Most runners should be doing some additional training for their hip flexors to prevent injury as well as stretching their Glutes to ensure good flexibility and range of motion.

Some good hip flexor strengthening exercises are sit-ups, hanging leg raises, rubber bank kicks and lever hip flexion exercises. Look for exercises that bend you at the hip and bear weight as you flex the hip.

To strengthen your Glutes try lunges or squats. Ensure that when you do either of these exercises that the knee does not extend past the toes as this is a common



mistake that often leads to injury. Any exercise that bears weight as you extend (straighten) the hip is good.

The knee joint is probably the most troublesome for runners. The main muscles that articulate the knee are the Quadriceps that extend the knee and straighten the leg and the hamstrings that flex the knee and bend the leg. These two muscles do a lot of the work for runners and often are neglected when it comes to stretching. The hamstring is typically the stronger of the two but to help strengthen the knee, it's worth some investment in strengthening both. One of the most common injuries in runners is Patellofemoral Syndrome (Runner's knee) which is typically caused by a shortening of the quad muscle which then misaligns the tendons below the kneecap causing swelling and pain. Pulling a hamstring can also sideline a runner. So as well as strengthening these muscles it's particularly important to regularly stretch them both.

Hamstring exercises such as leg curls are very effective. To stretch your hamstrings sit on the floor with your legs extended forwards and bend your upper body towards your feet. The best way to stretch your hamstrings is to have someone help you extend them while lying on your back.

Quadriceps exercises include leg extensions, lunges or squats. Exercised that bear weight as you straighten your lower leg are good. Quad stretches can be done with a standing knee bend pulling your heel up towards your buttocks.

Lastly the ankle. Runners typically have well developed calf muscles that run up the back of the lower leg and underdeveloped Tibialis Anterior muscles. The Tibialis Anterior is the muscle you feel when you have shin splints and is used to pull the foot upwards. Usually shin splints are a result of suddenly increasing the workload on them such as running faster or longer without giving them a chance to adapt. So make sure you stretch the calves and strengthen and stretch your shins.

Calf exercises include any exercise where you push your toes downward such as standing on your tip toes or Calf raises. Stretch your calf by having the toes up against a wall, knee straight and leaning towards the wall.

Tibialis Anterior exercises include toe raises where you have weight as you lift the toes in an upward motion or reverse calf raises. Stretches that point the toes down will help this muscle.

As always the whole picture is much more complicated than the simplified version I've presented here and there are all kinds of collateral muscles that will aid and strengthen your legs so it's important to do a variety of exercises and movements to have strong legs.