

Strength Training For Runners

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If you're an endurance runner, should you carry out regular strength-training workouts? Not a single published scientific study has linked resistance training with improved 5km, 10km, or marathon times, but running books and magazine articles extol the merits of strength training, and countless runners spend time in the weights room.

Proponents of strength training for endurance runners claim that the activity bolsters muscle power, raises tendon and ligament strength, and lowers the risk of both acute and chronic injuries. On the other hand, critics of the 'iron game' point out that most resistance exercises are mechanically dissimilar from running, and they complain that strength-training manoeuvres, most of which require just seconds to complete, can't possibly promote improved muscular endurance during a sustained, longer-duration activity like a 10km race or marathon. Sceptics also suggest that weight training may decrease flexibility and produce unproductive increases in muscle mass and overall body weight. They frequently call attention to the fact that highly successful runners tend to be small and reed-thin, the exact antithesis of the strength-trained athlete.

To date, much of the research exploring the link between strength training and endurance performance has focused on standard exercises such as leg extensions and curls, leg presses, and bench and shoulder presses. Along with double-leg squats, these are the same exercises which runners emphasise during their resistance training workouts. Overall, the exercises do a good job of developing generalised muscle tone and strength, but - despite their popularity - no research has ever determined that they improve endurance-running capability.

In fact, it's difficult to understand exactly how these standard resistance exercises would promote better endurance performances. Perhaps the bench and shoulder presses would help the marathoner who 'hits the wall' at the 20 mile mark and begins running on his hands, but running involves multiple joint actions and forces numerous muscle groups in the hips, legs, ankles, and feet to work concurrently to maintain control and balance, while weight-training tends to focus on isolated muscles and ignores the complex, coordinated motor patterns required for running.

Take a common resistance exercise employed by runners, for example - knee extensions. For this activity, runners remain in a seated position, their hips are relatively immobile, and their ankles are locked in position. True, the quadriceps muscles are active, but they work in almost total isolation from the rest of the leg - the exact opposite of what happens during running. Since knee extensions are totally non-weight bearing and have little specific resemblance to running, some faultfinders have scoffed that this traditional exercise will help you move faster - whenever you attempt to run sitting down!

The point is that knee extensions will make your quads stronger during knee-extension workouts, but they may not make your quads more powerful during a 10km or marathon, when the actual contractions of the quads are of a different magnitude and frequency, and the quads are forced to act in concert with the other muscles in the legs. If you carry out knee extensions, knee flexions, leg presses, and other isolated exercises in hopes of improving your running, you're as foolish as the symphony-orchestra conductor who works with the percussion, horns, woodwinds, and strings separately during rehearsals but never asks the various elements to play together before an important concert.

Since traditional resistance routines are of doubtful value because of their lack of similarity to running, what kind of strength training should you employ? To answer this question, it's important to remember that all competitive running events require the development and maintenance of speed over a specified period of time. Running speed is largely dependent on the amount of force applied to the ground during each foot strike - and the time over which that force is applied. The greater the force of a foot strike and the shorter its period of application, the higher the power of an individual step - and the faster the speed of a runner.

By increasing the power exerted during each step, runners raise the speed of their workouts and races. The power requirements for a marathon are lower (and running speeds slower), compared to a 5000-metre race, but both events require optimal power production during each foot strike.

A lot of the power produced during running depends on the mechanical 'energy-return' properties of a runner's feet and legs. The muscles and tendons of the lower extremities act like springs during running, mainly by storing energy just before and during the compression associated with foot strike and then releasing ('returning') this energy during take-off. This return of energy is influenced by both the elasticity of the muscles and tendons and by nerve cells which control muscle and tendon stretchiness.

Better nervous-system control of the muscles of the lower limbs should produce higher levels of elasticity and improved energy return. Resistance exercises aimed at improving running performance, therefore, should not just attempt to increase general muscle strength; they should enhance specific activities of the nervous and muscular systems which promote faster, more coordinated movements.

What's really needed is specific strength training for runners - exercises that target the muscles and neuronal pathways responsible for actual energy return during running. Although this sounds complicated, it shouldn't have to be in actual practice, and it isn't. In the paragraphs that follow, you'll find three key power-building exercises (The Power Triad) that are easy to carry out, won't take much of your time, and will rejuvenate your running - because they replicate key motor movements involved in the process of running.

The Power Triad

You should perform the three exercises in the order in which they are presented - and only when you are well rested. Specific strength training aims for positive adaptations of the nervous system as well as the muscles. Completing the exercises when you're over-tired leads to poor neuromuscular coordination and movements that are slower than desirable.

That means that this trio of specific exercises should be completed before a running workout, not after, and in fact the best-possible time is immediately before an interval, economy, or lactate-threshold session, not before a slower workout. While that may sound paradoxical (some might fear that strength training would slow down a subsequent training session), the truth is that positioning the exercises right before your high-intensity workout will help you run faster. In fact, at least five different scientific studies have shown that a high-intensity strength session activates the nervous system, increases the 'firing rate' of nerve cells which control muscles, and improves the overall 'recruitment' of muscle fibres during a workout.

IMPORTANT: perform the third exercise, 'One-Leg Hops in Place,' only on an aerobics floor, wooden gym floor, grass, a rubberized track, or any resilient surface which offers some 'give'. Hopping repeatedly on concrete or asphalt may increase the risk of overuse injuries to the lower leg and shin.

FREQUENCY: These exercises need only be carried out once per week.

REPETITIONS & SETS PER EXERCISE: As with your running you should start off small and build the number of repetitions and sets per exercise. Please contact a Tone Zone Runners coach (headcoach@tonezonerunners.org) to have them draw you up an appropriate programme for their use.

Here are the three key exercises:

1. The high-bench step-up

This exercise strongly develops the hamstrings, with complimentary development of the gluteals (the 'buttock' muscles) and the quadriceps. Simply begin from a standing position on top of a high bench (approximately knee height), with your body weight on your left foot and your weight shifted toward the left heel. The right foot should be free and held slightly behind the body. Lower the body in a controlled manner until the toes of the right foot touch the ground, but maintain all of your weight on the left foot. Return to the starting position by driving downward with the left heel and straightening the left leg. Repeat for the prescribed number of repetitions as shown in the training programme, and then switch over to the right leg. Maintain absolutely upright posture with the trunk throughout the entire movement, with your hands held at your sides (with or without dumbbells).

2. One-leg squat

This exercise strongly develops the quadriceps and gluteals, with a complimentary boost to the hamstrings. To complete one-leg squats in the correct way, stand with the left foot forward and the right foot back, with the feet about one shin-length apart (your feet should be hip-width apart from side to side). Place the toes of the right foot on a block or step which is six to eight inches high. As in the step-up exercise, most of the weight should be directed through the heel of the left foot. Bend the left leg and lower the body until the left knee reaches an angle of 90 degrees between the thigh and lower leg. Return to the starting position, maintaining upright posture with the trunk and holding your hands at your sides. Complete the prescribed number of repetitions with the left leg before switching to the right leg.

3. One-leg hops in place

This exercise builds strength and coordination in the entire lower extremity, including the foot, ankle, shin, calf, thigh, and hip. The resilient, bouncy nature of the exercise makes it the most specific of the three - extremely close to the actual movements involved in running. Simply start from the same position you used for the one-leg squat, with the toes of the right foot supported by a six- to eight-inch block. Hop rapidly on the left foot at a cadence of 2.5 to 3 hops per second (25 to 30 foot contacts per 10 seconds) for the prescribed time period as shown in the training programme. The left knee should rise about four to six inches, while the right leg and foot should remain stationary. The left foot should strike the ground in the area of the mid-foot and spring upwards rapidly - as though it were contacting a very hot plate on a cooker. The hips should remain level and virtually motionless throughout the exercise, with very little vertical displacement. After hopping for the indicated time on the left leg, switch to the right leg and repeat the exercise.

Why hop on one foot instead of bounding from foot to foot, as runners usually do during their drills? For one thing, it's very difficult to move fast while you are bounding, so bounding is not very much like sizzling through a 5km or 10km race. By contrast, you can move very quickly during the one-leg hops, so your power expands dramatically and your coordination during high-speed running improves greatly. Eventually you'll learn to move more quickly and efficiently.

For similar reasons, the one-leg squat is superior to runners' traditional exercise - the two-legged squat. While a much greater load can be hoisted on the shoulders during a two-legged squat, that weight is distributed through two legs, not one, so the actual resistance per leg is often less. In addition, the trunk of the body is often inclined significantly forward in a two-legged squat but remains nearly vertical in a one-leg effort, so the latter more closely parallels the form required for running. Plus, for purposes of maintaining balance, the feet are often angled outward during the two-leg squat, which is unnatural to running, while the feet point straight ahead during a one-leg effort. Overall, the one-leg squat has the added advantage of being safer, since less total weight is used.

The first exercise - the high-bench step-up - is like climbing hills in the comfort of your own home or gym. You're basically lifting your body repeatedly against the force of gravity and powerising your hamstrings, quads, and gluteals in the process. Like hill workouts, the step-up should improve your running economy.

Overall, the strength-building triad carries little risk of injury, takes little of your time, and is very specific to the actual act of running. The three exercises will improve both your coordination and leg-muscle power, and after several weeks you'll notice that your legs feel much stronger and that your stride length and frequency have improved. You'll move quickly and aggressively from one foot to the other as you run, and you'll reach the finish lines of your races in faster and faster times.