



Training Feature: Hills and Strength Development

by Steve Manning

WHAT IS STRENGTH TRAINING

Running success and improvement is achieved by optimising various abilities. The most important areas with regards to conditioning are Endurance, Speed and Strength. Endurance is developed through long runs, total mileage and experience. Speed is developed with speedwork and racing. Strength is developed primarily by overloading with hill training.

Running speed is a factor of stride length and stride frequency or cadence. By developing greater strength runners are able to increase stride length and so run faster. Increased strength helps generate greater force more quickly. Improvements in power are achieved by overloading the muscle. That is, by making the muscle cope with a greater resistance or load than it is used to.

In a flat marathon race it takes a short time to accelerate up to average speed for the distance. Once acceleration is complete energy demands drop as momentum is being maintained. As soon as the runner encounters a hill energy demands climb steeply. This is because running uphill is like constantly accelerating. Suddenly the runner must lift their bodies weight against gravity rather than moving it across the pull of gravity. By increasing strength a runner will be able to cope with hills in a race and will also be able to increase the force exerted towards the ground to run faster.

OBJECTIVES OF STRENGTH TRAINING

The first major goal of strength training is to achieve greater **Maximum Strength**. Consider maximum strength to be like the heaviest weight you could possibly lift with your legs. There is a direct relationship between maximum strength and power

Strength training can improve response time or power. **Power** is acceleration or time taken to reach maximum force. The sooner that optimum power is attained the longer that amount of power can be sustained within each stride.

When most people think of the goal of increasing strength they usually think of **Strength Endurance**. It is the ability to run faster longer and to maintain form resisting fatigue. There is a power to weight ratio which becomes important. Increased strength requires greater muscle mass (hypertrophy), but that extra weight must be carried and demands an energy cost. If your arms are getting tired at the end of races it might be that you are not lacking strength but have too much unproductive weight to carry around. In this case weight training may be counterproductive if hypertrophy occurs. The goal is to increase strength while maintaining weight.

Strength training gives greater **Coordination** and control out of the normal range of motion. Distance runners usually look like they are shuffling and lift their legs very little to conserve energy. The duration of high mileage training tends to reinforce this tendency. This becomes a problem when a greater range of motion is required such as on hills or when responding to a surge. These runners then lose their efficiency completely. There are two aspects of Strength coordination. The first is the coordination of the different muscles and summation of their forces. The second is the number of fibres able to be utilised within each muscle.

The repetitiveness of distance running causes many overuse injuries. **Injury Prevention** is one of the major benefits of increased strength. Greater control out of range of motion and greater strength to deal with problems helps avoid injury. Small niggles can be compensated for by

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other stronger muscle fibres so that those problem areas can recover rather than progressing into an injury.

Hills give runners **Variety and Recuperation**. Because strength is normally developed in the transition and preparation stages it serves to rest mental energies because no specific times can be compared to races. Every runner needs a break after their major goal race and strength training is something different from what they have been doing during the competition phase.

One very important goal of hill training is the development of **Specific Hill Skills**. If you are going to run in hilly races then you must do hill training. Efficiency and a smooth physiological response to the greater demands of hills will have a major impact on your race performance. You must be prepared to cope with the specific demands of any race and know that you are up to the challenge.

WHEN TO TRAIN FOR STRENGTH

Some amount of strength training should be included during all phases of the training season. Strength training for increased strength should not be done during the specific competition phases or just before a major goal race. Hill training might be necessary if a hilly race is your major goal but increases in strength should have been achieved early in the preparation phase.

Progression of strength sessions is necessary and will plateau in around six weeks. After this time strength can be maintained with much less effort while smaller improvements in strength will come at the risk of injury and overtraining. Cross country racing is the best way of maintaining strength without compromising the competition season.

The other time when strength training is required is when you are injured and a specific exercise is targeted to help in rehabilitation.

INJURY and STRENGTH

Increasing strength will help with injury prevention. Unfortunately strength training is also one of the easiest ways of getting injured. Anytime you overload your system there is an increased injury risk. Gains in conditioning will not occur without some stress overload. The most effective forms of strength training also carry the greatest risk. Other than long runs plyometric sessions have the greatest potential to cause injury. When you are injured you should avoid strength training that is not geared specifically towards overcoming that injury.

Beginners must be especially careful with running over hills. Connective tissue is softer and weaker when you first start running. Downhills can inflame shin pains which almost every beginning runner experiences. Cushioned footwear in good condition which you are not slapping in is essential for running over hills.

HOW TO TRAIN FOR STRENGTH

Strength sessions can vary widely with regards to duration, recovery, frequency and intensity. A general rule is that they will have less duration and number of repetitions than speed sessions because the intensity is easily increased due to the resistance. Recovery will be high early in a strength phase and decrease in preparation for greater stamina later in the program.

Strength training can be divided into specific and supplementary categories. Specific strength training involves running against a resistance such as gravity up hills. Supplementary strength training does not involve normal free running but serves to strengthen the muscles involved in running. Weight training is perhaps the best known of these supplementary strength sessions.

SUPPLEMENTARY STRENGTH SESSIONS



I am often asked by my athletes whether they should be doing weights as a way to develop greater strength. The drawback of **weight training** is that it is never specific to the running action no matter what kind of program and exercises you perform. The best training effect will occur when whatever you do closely simulates the demands of competition. For this reason I believe that hill training is a much better way to achieve strength as it uses the runners own body weight as resistance. While running uphill the muscles are required to cope with greater total force than on the flat but the action is nearly the same.

Where weights can be beneficial is when there is an injury caused by a muscle imbalance and specific exercises are used to target the imbalance until the factors causing the injury are no longer active. Weights can also be useful when an athlete has reached their training potential and something new is required for them to improve.

Cross training is an excellent way of developing supplementary strength. If you go to a triathlon you will easily see the difference in size and strength between trained triathletes and their scrawny relatives the distance runner. Triathlons can be a diversion for an athlete during the summer months. The big risk is that it will be a permanent diversion because those bulging biceps and shaved sculpted legs can be addictive.

A less known form of strength training is **water running**. Normally used when injured, water running is running without the resistance of gravity but with the increased resistance against the water. Strength gains may occur with less pounding and if form is maintained they can be transferred to the land.

SPECIFIC STRENGTH SESSIONS

Specific strength sessions can further be divided into passive and active sessions. **Passive sessions** are when you are doing a normal run but it is over hilly terrain. It is not necessary to surge the hills because strength gains are achieved even at an easy pace. Passive sessions are a good way to start a strength phase. **Active sessions** are planned controlled sessions with set goals and resistance.

Fartlek while surging the hills is a introductory strength session. It is the next step up from passive hills. You can have set timed repetitions over varied terrain or use a circuit or set of hills. Recovery can be anything from slow jogs to maintaining a steady pace. It is best to do varied distance, times and pace for this type of session.

Plyometrics drills are the most effective way of developing specific strength. Plyometrics are bounding drills with eccentric muscle contractions followed immediately by concentric muscle contractions. This causes muscle tension which greatly increases the possible force. Bounding up hills, using exaggerated action and depth jumps are all proven ways of developing strength quickly. Sebastian Coe had a vigorous regime of Plyometric exercises which took him to two Olympic gold medals and numerous world records in the early 80's. For most runners they should be done sparingly and when other training stresses are low. They can also be used to improve your running form.

Pulling weights along the ground, running through shallow water and even running against a stiff wind or pulling a small parachute are used by sprinters to develop strength.

Hill Repetitions are the easiest way to develop strength. Depending on the goal of the session and the demands of your future races you can vary the grade of the hill, the length of the hill, your recovery, and your pace.

Long Hill Reps of beyond two minutes are a great way to get into oxygen debt. The legs and lungs start burning before too long so give yourself good recovery and do not do too many reps.

Steep hills can really improve strength fast. Make sure they are not too steep to maintain race pace. Keep them short enough that you do not slow down during the repetition.

Another good session is running up a moderate hill then maintaining effort over the top of the hill. This is a negative split session because the pace increases in the second half of each repetition.

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We often do a continuous hill session where sets of three hills are run with a steady recovery down a more gradual slope. The total distance is more than a kilometre and each set should be progressively faster by running the recovery quicker.

My favourite hill session is where we do three surges of increasing length up the one hill. There is only about 50M recovery between each surge and it must be done at a brisk pace while still running up the hill.

While not a specific strength session I find that mental strength can be developed by a **Positive Split Session**. I usually run this in a 10km race where I do the second kilometre at as fast a pace as I can. I then try to recover while maintaining close to my 10km race pace. This fatigues the primary muscle fibres calling on the recruitment of secondary fibres to maintain pace. This then strengthens these secondary fibres. It is best to do this with a heart rate monitor recording every kilometre. Whatever your heart rate stabilises at will be Anaerobic Threshold pace and heart rate.

MAINTAINING STRENGTH - CROSS COUNTRY

After the strength development phase some form of strength work should be done to maintain the strength gains. The easiest and best way of maintaining strength is through running the cross country season. Without some strength training you will lose almost all your gains within about five to six weeks. Too much strength work will compromise the rest of your training program and prevent you from reaching your potential in your major competitions.

By racing cross country you can maintain strength in a way that is most complementary to your goals on the road. Cross Countries are generally on Saturday afternoons so you are still able to do a long run the day after. This is much safer with much less injury risk than following a Saturday long run with a Sunday race. Long races can still be done on the Sunday but they should be seen as steps up to your goal race rather than major goals in themselves.

Besides the hills the major strength gains of cross country is from running on a softer surface. There is little energy lost when running on hard surfaces such as a road. Running on grass requires much greater force over a longer time of contact to maintain the same speed. Even this slight difference serves to strengthen the power of your stride.

Strength can be helpful when you start to struggle at the end of a long road race. At this time many of your muscle fibres are depleted and you are able to recruit more fibres more effectively if you have greater strength. Strength is just one element of a successful training program but is perhaps most likely to be left out. Develop your strength early on and maintain it with cross country and then see the difference at the end of your marathon and half marathons.

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