

## **Iron Meets The Road - Strength training for the long distance runner**

Years ago, the idea of a runner lifting weights was virtually unheard of. Today, weight training is gaining acceptance as a means to improving performance in many athletic areas. Yet there are still many runners and running coaches who think strength training is detrimental. When questioned, many will claim that it produces an increase in body weight, decreased flexibility and this will, ultimately, impede the runner's form.

The purpose of this article is two-fold. First, I will explore and attempt to unravel some of the common misconceptions held by the running community, and second, I will recommend a systematic approach to strength-training that will enable a runner to maximize his/her overall running performance.

### **Why Weight Train?**

Running. Those involved in this activity know first-hand the benefits that are obtained as a result of running. These are lowered blood pressure (1), increased lung capacity, strengthening of the heart, and, of course, loss of body fat. Does strength training actually help, and if so, where does it fit in ?

A intelligent strength training program will allow a greater workload to be carried out. It increases muscular strength which in turn decreases the chances of injury, and it increases connective tissues which allow the body to become a more durable support system.

As with any sport, injuries are an expected occurrence. Some of the common injuries runners suffer from are, Achilles tendonitis, back pain, calf strain, compartment syndrome, groin pull, hamstring injuries, iliotibial band syndrome, shin splints, plantar fasciitis. . .and the list goes on. As mentioned earlier, a properly organized strength-training regimen can decrease the risk, and the severity of running injuries (2,3).

Strength training also improves running performance (4,5) by changing intra-muscular coordination, that is, the capacity to recruit the muscle fibers more efficiently as one continues to weight train. This, in turn, results in an improvement in coordination, which translates into more efficient movement patterns. It also improves running economy, which is defined by an increase in the ability to consume oxygen at a steady state (a continuous movement for an extended period of time) (6).

Running involves multiple joint actions and requires a number of muscle groups to work synergistically in maintaining control and balance. The use of resistance training as a means to improve this control is an effective method for improving running quality. Examples of this are 1) a stronger push off, 2) an increased ability to resist the eccentric forces that occur when the foot comes into contact with the ground each time a stride is taken and 3) a stronger torso which promotes a more efficient running posture.

It should be noted that while performance enhancement in running through strength training is effective, one cannot train optimally for both at the same time. In other words, you cannot excel at both.

### **Myths And Misconceptions**

Contrary to popular belief, strength training does the runner's body good; however, runners and their coaches, for the most part, have shunned strength training. Within this reluctance lies an

abundance of misconceptions and myths related to the principles surrounding strength training and running. I would like to address some of the common misconceptions and myths often propagated by “experts” within the running community.

**Myth #1: Heavy weights will bulk you up.**

Muscle “bulk” is dependent on several variables which include adequate nutrition, an optimal stimulus in the form of progressively heavier loads and enough rest so that adaptation may occur. If the variables are not in place “bulk” will not occur. Saying that “heavy weights will bulk you up” is similar to saying that if you sprint too much, you will become too fast.

As it happens, most elite runners have an ectomorphic physique (a thin, non-muscular body type) that is attributed to genetics and seems to be resistant to significant weight gains. If anything, weight in the form of more muscle could be likened to adding more horsepower to a car. The car is still the same except with greater power. In light of their genetic predisposition to not gain appreciable amounts of muscle it becomes clear that heavy weights will not bulk up a long distance runner.”

**Myth # 2: Keep rest periods short between each set.**

The goal of resting between sets is to ensure recovery of the body systems. The major source of energy that is most important to a lifter is adenosine triphosphate (ATP), which is directly linked to training for strength, or, more specifically, to neural recovery (the main factor involved in increasing strength levels). Brief rest periods (30-60 seconds) are aerobic in nature, and antagonistic to strength development. Below is a chart that shows the recovery of ATP and the approximate time associated with the replenishment of this energy system.

**Figure 1**

<b>Number of Seconds/Minutes Elapsed in Rest Period</b>	<b>%age of ATP replenished</b>
30 seconds	50%
1 minute	75%
1 minute and 30 seconds	87%
2 minutes	93%
2 minutes and 30 seconds	97%
3 minutes	98.5%

As shown in the above chart, strength is optimally achieved through the use of rest periods of approximately 3 minutes plus between each set. The goal of a strength training program is not to keep one’s heart rate elevated at a steady level for an entire session. That is the goal of aerobic exercise. Do not waste time in the gym performing work that can be better performed outside.

**Myth # 3: Train with high reps.**

It’s often claimed (since distance running is endurance oriented) that the use of high reps should be incorporated into a runner’s weight training program. This couldn’t be further from the truth. Think of it this way, a strength trainer doesn’t go out for a run with dumbbells strapped to his arms and/or legs, so why would an endurance runner work on weight endurance in the gym? As long as running is being performed during the week, the need for cardiovascular training is bring met.

Strength improvements are derived by lifting a weight for a number of repetitions which are linked to the increase in maximal strength. “High reps,” usually defined as 15 repetitions or greater, work on muscular endurance. Below is a chart that shows the approximate guidelines describing what each repetition range effects.

**Figure 2**

<b>Program Goals</b>	<b>Endurance</b>	<b>General Fitness</b>	<b>Hypertrophy</b>	<b>General Strength</b>	<b>Maximal Strength</b>	<b>Power</b>
<b>Repetitions</b>	15 plus	10-15	8-12	6-10	4-6	1-5
<b>Rest Between</b>	15-30 seconds	1-2 minutes	30-60 seconds	2-3 minutes	3-5 minutes	3-5 minutes

### **Setting Up A Strength Training Program**

So how does one go about setting up an effective strength program to improve running performance? What type of equipment should be used (free weights or machines), how many reps and sets should be performed, what exercises should be selected, how hard should the training be and how often should it take place? The answers to these important questions depend upon a host of factors. To keep it simple, I’ve offered some guidelines.

#### **Guidelines**

**Build a base.** Every program needs a base of support, a phase in which the body (joints and soft tissues) becomes accustomed to the weight training exercises being introduced. An analogy to describe this phase looks at two houses. One is built on rock and the other on sand. Over time the base of support which acts to maintain the integrity of the structure will be tested. If the foundation is weak, then the structure will ultimately collapse. In the weight room, this collapse is known as injury.

When starting any strength program the body should go through an adjustment phase to adapt to the new demands being placed on it. The emphasis of this phase is not on the amount of weight lifted, rather it should revolve around the form and technique of the program exercises employed in the introductory phase. During this phase do not be surprised if strength levels increase, just remember to progressively move through this cycle. There is a tendency however, to want to move too quickly as one’s coordination and strength improve. Bear in mind though, that patience is a virtue and an injury can occur at any time.

**Training frequency, how often is too often?** Your training frequency should be keyed to the number of runs you perform in a week and their intensity. For example, if you run twice a week, strength training can be performed three, maybe even four times a week. If you run four or five times a week, training in the gym should then be limited to twice a week sessions. In other words, the frequency of training will vary according to your running schedule. Furthermore, if your runs are divided into various categories (light run, long run, hills or speed/interval training) resistance training needs to be adjusted to meet these demands. For example, if you are running three times a week and your runs are divided into three categories (long run on Monday, light run on Wednesday and interval training on Friday) then a workout in the gym would be placed on a light day before the run and on Saturday a day after an interval session. This would accomplish two things—first, allow for enough recovery time

between workouts so that the muscles can adapt and grow stronger as a result, and second, it would not interfere with the running schedule and compromise running performance. As already mentioned, training frequency should revolve around the running schedule.

**Does equipment selection make a difference?** The controversial topic of the superiority of machines versus free weights is often raised. For a beginner there's no significant difference in results. The main goal is to introduce any form of strength training into the individual's routine so that they may reap the benefits of a stronger body. For an intermediate or advanced trainee the difference in results may be noticeable.

There are two categories of machine resistance, "Functional Resistance Machines (FR)," and "Non Functional Resistance machines (NFR)." FR (free weights, cables, pulleys) equipment offers the user a resistance that is movement-specific to their particular sport or activity while NFR (machines) equipment offers a general resistance that is not conducive to the movement patterns related to a sport or activity. For an intermediate or an advanced trainee neuromuscular (use of the muscles and nervous system together) coordination is greater and an increase in coordination will translate into more refined movement patterns (stride length, improved running form, stability), and so, the use of FR is advised. Although NFR equipment does play a role in an individual's program, it should be relegated to that of a supplementary role.

The main disadvantage of NFR is that it is unable "to provide the same degree of multi-dimensional full range neuromuscular and musculoskeletal training as free weights or functional machines." (7) NFR equipment forces the user to sit or lie which minimizes the training effect on the major stabilizing muscles of the body and restricts the movement of joints involved in the motion that is specific to the individual.

As a result, there's a modification of the wiring involved in relaying messages back to the brain which reduces the capability and the execution of the muscles used in the activity or sport. Based upon this, the primary use of NFR should be deemed a deficient means of training the body for specific movement patterns.

**The optimal number of sets.** The number of sets that are performed in a session is inversely related to the rate of work (intensity) that is used. In easy-to-understand terms this means that as the number of sets are increased the rate of work will decrease. An example would be two people who are lifting weights with the first person performing 6 sets while the second does 3. Both individuals lift the same amount of weight. The first individual will start to see a decline in their strength as they continue into their sets. The second will be able to lift the same weight or see a smaller drop in loads lifted compared to the other individual because their total number of sets for that particular exercise is low.

Some of the factors that need to be addressed when selecting the optimal number of sets for a long distance runner embarking on a program are: the number of strength training sessions that will be performed each week, the number of exercises utilized per muscle group, the number of muscle groups exercised per session, and the type of routine used (split routine or whole body). Once these areas are addressed, the selection of sets becomes more specific and goal-oriented.

**Repetition selection.** Choosing an effective repetition range is something that goes beyond the scope of this article. However, for a long distance runner, once a base has been created and the body subjected to increasingly heavier loads, working primarily with repetitions of 6-10 will suffice. That's not to say that repetitions employing a lower range or even higher, for that matter, cannot be used.

**Periodize your routine.** A good program will usually be periodized in some way. Periodization, simply put, refers to the long term planning or organization of a program and the variables that influence it.

A type of periodization often used in programs is “Linear periodization.” This is where there’s a linear progression of reps and an increase in weights as the program progresses. As mentioned earlier, with regards to choosing the right number of sets, linear periodization takes into account the inverse relationship between volume and intensity. You will find that the program I’ve designed (further along in the article) incorporates this style of periodization.

**Exercise selection.** This part of a long distance runner’s program design should focus on the training history/age of the individual. If they are at the beginning stages, then the selection of equipment should start at the basic entry level. An intermediate (1 year or more of training) will move on to more complex movement until, finally, as an advanced trainee (3 plus years) they will be using complex movements requiring a great deal of coordination and stabilization throughout the entire body. Below I have listed the exercises that can be used in each category and show the progressive increase in complexity of the movements in each stage.

	<b>Beginner</b>	<b>Intermediate</b>	<b>Advanced</b>
<b>Lower Body</b>	Leg press machine	Bodyweight or Barbell squat	Dumbbell Lunge
<b>Lower Body</b>	Seated or standing calf raise	Standing and seated calf raise	One legged dumbbell deadlift
<b>Chest</b>	Chest press machine	Barbell bench press	Dumbbell chest press or standing cable press
<b>Lower Back</b>	Hyper extension	Stiff legged dumbbell or barbell deadlift	Reverse hypers
<b>Upper Back</b>	Vertical row machine	Seated cable row	Chin ups
<b>Upper Back</b>	Lat pull down machine	Lat pull down	Standing bent over dumbbell row
<b>Arms</b>	Bicep curl machine	Barbell curl	Alternating dumbbell curl
<b>Arms</b>	Tricep machine	Tricep cable pressdown	Standing dumbbell tricep extension
<b>Shoulders</b>	Shoulder press machine	Standing dumbbell shoulder press	Standing alternating dumbbell shoulder press
<b>Abs</b>	Ab machine	Weighted swiss ball crunches	Standing cable crunch
<b>Abs</b>	Ab bridge	Standing medicine ball oblique twist	Cable wood chop

**Train the “core” muscles.** Although a faddish term often used to describe the muscles of the midsection, the core muscles are not limited to the abdominal region. The core muscles involve the upper body as well as the muscles of the lower body which all serve to stabilize the skeletal structure.

During a run/race, fatigue will set in at some point. It is at this point that one’s core strength plays a crucial role in determining performance during the later stages of the race. Regardless of how strong each individual muscle is, if it does not work together to support the body and maintain running form,

performance will suffer. The ability to strengthen the torso along with the rest of the body will serve to hold one's running posture together so that the body may perform like a well-oiled machine. Consider how a fish moves—it's fins and tail do not move separately from the body, instead they move together to create a graceful movement. You're only as strong as your weakest link so don't neglect the core muscles.

### The Program

The following program can be used during a long distance runner's off season. (5km, 10km, half marathon). As mentioned, I have created a base phase, followed by a period where heavier loads, less repetitions and rest periods are incorporated.

	Repetitions	Sets	Rest Periods
Week 1	20	1	1 min
Week 2	15	2	1 min
Week 3	15	3	1 min 30 sec
Week 4	15	3	1 min 30 sec
Week 5	12	2	2 min
Week 6	12	3	2 min
Week 7	10	2	3 min
Week 8	10	3	3 min
Week 9	8	2	4 min
Week 10	8	3	4 min
Week 11	6	2	4 min
Week 12	6	3	4 min

### Intermediate/Advanced Program

	Repetitions	Sets	Rest Periods
Week 1	20	1	1 min
Week 2	15	2	1 min
Week 3	15	3	1 min 30 sec
Week 4	12	2	1 min 30 sec
Week 5	12	3	2 min
Week 6	10	2	2 min
Week 7	10	3	3 min
Week 8	8	2	3 min
Week 9	8	3	4 min
Week 10	6	2	4 min
Week 11	6	3	4 min
Week 12	4	2-3	4 min

### Tips

**Start Slow.** As shown in the above program, during the beginning phase, use the outlined period of time to adjust to the exercises and movement patterns involved with each lift. This adjustment phase is not about how much weight you lift, but about how you lift the weight.

Properly performed exercises go a long way towards doing the joints and soft tissues good. Think of it as a body investment; great technique and form pay dividends.

**Prioritize.** For intermediate and advanced trainees, various weaknesses within the body should be apparent and should be prioritized accordingly. It makes no sense to continually strengthen the strong muscles while the weaker muscles play catch up. If the arms are a weak muscle group, then train them first so that they are no longer a weak link.

**Progressive Increases.** The goal of a strength routine is to increase the stresses placed upon the muscles in every work-out. This does not mean that a heavier weight has to be lifted in every session. Variables such as repetitions, sets and rest periods are all areas that can be used to gauge whether progress is being made.

## Conclusion

There are no guarantees in life, however if you follow the outlined program, you will become a lot stronger than you would if you followed the generic “3 sets of 10 reps” program. In the end, your strength gains will translate into a better stride length, improved running performance, a better finish, more endurance and, of course, more strength to push your way through the crowds at the start of a race.

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