The Science of Sprinting

Sprinters get a bad rap. I’m sure you’ve heard all the complaints before – they’re lazy, they rest too much, they don’t put in any mileage, and it only takes talent to succeed. The reality is that sprinting is a highly technical skill requiring extreme amounts of strength, speed, and power. The best sprinters in the world accelerate to speeds of over 27 mph (43 km per hour) with rotational limb velocities of hundreds of degrees per second. Top sprinters make contact and get off the ground in less than 0.09 seconds… all while overcoming impact forces that can exceed 4 times their body-weight.

So what does it take achieve these seemingly impossible feats? Is it just innate talent or is there something that we can do to enhance performance? The answer to the first question is a lot of talent and very good training program. That obviously means the answer to the second question is yes. This then begs the question of what type of training is most appropriate to develop the necessary strength, speed and power to succeed in the sprints. With this article, I’m going to try to clear up some misconceptions on the type of training that sprinters perform and lay out what sprinters need to be doing to compete at their best.

### Strength Development

Elite sprinters are among the strongest athletes pound for pound in the world. This is because extreme strength is necessary to accelerate to top speed. Strength is best developed using total body, multi-joint weight lifting exercises such as squatting, upper and lower body pulling, and upper body pressing. These types of exercises develop strength that is applicable to the athletic field and enhance training efficiency because they work many muscle groups at the same time. In general, ground-based exercises using free-weights tend to provide the best results.

### Plyometrics

As previously mentioned, sprinters have to be very powerful to compete at a high level. Plyometric, or jump training, helps to bridge the gap between the strength developed in the weight room and the speed and power needed on the track. Plyometrics are a form of training first implemented with much success by the Russians in the 1960s. The primary objective of plyometrics is to enhance leg stiffness by enhancing the stretch shortening cycle and tendon elasticity. Plyometric intensity is largely determined by the height from which the athlete drops. As such, the higher an athlete falls from (such as if they fall from a box or after jumping over a hurdle) the more intense the exercise will be. Having said that, lower intensity plyometrics play an important role in overall development and intensities should be progressed gradually.

### Sprint Training

To sprint fast you have to sprint fast. That’s a fairly simple concept but one which many people overlook. The key with this point is that the athlete should be given appropriate sprint distances, total workout volumes, and rest intervals that actually permit the athlete to sprint rather than just run.

### General Guidelines for Training for Speed, Strength and Power

When training for speed, strength and power, there are some rules that must be followed to ensure an optimal training response. The first thing to remember is that sprinting is a high intensity activity. For the purposes of this discussion, it’s important to understand that maximal intensity is not necessarily the same as a large effort. A high intensity activity is one in which the effort is of maximal or near maximal levels from the very start. This should not be confused with the vomit-inducing, endurance based efforts which are generally associated with the description of ‘high intensity’ or ‘working hard’. For a sprinter, working smart with appropriate intensities is more effective than “working hard” just for the sake of working hard. In training terms, this means a sprinter’s training needs to have small but frequent and regular doses of high intensity activity and a relatively low total volume of workload. The reason for the low volume is because the high intensity work places a much greater stress on the body than endurance based activities. Think of it like this- endurance based activities that permit lots of miles, reps, and laps with very short rest intervals are the training equivalent of hitting your body with a ball-peen hammer. That is, at such a low intensity, the body can easily take fairly high volumes. On the other hand, appropriate sprint training is like hitting your body with a sledgehammer – you can’t do it very often and expect to be ok, and you need to take fairly long recovery periods before you take another hit.

Based on these points, sprint training should have short bouts of work with long rest intervals to ensure that the quality of the work remains high. As soon as the quality drops off, so does the benefit. When the rest interval is insufficient or the workload is too great, the athlete is training endurance more than speed, strength or power. In the weight room, this means using either heavy loads (80+% of maximal) or moderate loads with an emphasis on speed. In either case, the rep ranges should be relatively low with sufficiently long rest intervals. This will help to minimize unnecessary weight gain (which can be detrimental to sprinting) as well as fatigue that could inhibit the quality of the work and increase the likelihood of injuries. A typical sprinters weight room workout might see them do 4-6 total body exercises for 3-7 sets per exercise and 1-5 repetitions per set. Rest intervals should be at least 1 minute and typically closer to 3 minutes to ensure a high intensity. Plyometric volume is often counted in foot contacts and appropriate volumes range from 15-100 foot contacts in a training session depending on the type of plyometric exercise employed and the athlete’s current level of fitness. For sprint training on the track, athletes should be doing all-out sprints of 15-200m with rest intervals between 2 and 20 minutes to ensure that the quality of work remains high.

In conclusion, if you want to train like a sprinter, add some high intensity lifting, plyometric and sprinting exercises to your program. High volume, low intensity, aerobic based workouts should not have a significant place in the training program of an athlete looking to maximize speed and power. Use the aforementioned guidelines to direct your training.