Running Faster:
The Tools You Need

How to use contrast training to develop speed

A sprint chute is a speed-training product (introduced to the US by a Russian track coach) that creates resistance without affecting running technique.

Being able to run fast is a key athletic quality that virtually all athletes want to develop, especially those who play field sports such as football and soccer. Strength and endurance are certainly important in such sports, but they take a backseat to being able to get from point A to point B in the shortest amount of time. With our priorities in place, let's take a look at a few proven training methods that develop speed.

One of the most effective ways to develop speed is called *post-tetanic potentiation* (PTT). PTT refers to the theory that a more powerful muscular response can be elicited if it is preceded by a strong muscular contraction. For example, if a baseball player swings a heavy bat immediately before going up to the plate, that athlete will be able to swing the regular bat faster and therefore hit the ball harder. Or, if an athlete performs several sets of heavy squats and then tests their vertical jump, they probably will be able to jump higher than if they had tested their vertical jump before that squat workout. Here's how it works.

Let's say an athlete is lifting boxes that weigh about 50 pounds each. As they do this, they are activating the powerful fast-twitch muscle fibers. After lifting about five boxes, say they pick up a 10-pound box – they may find that the box nearly flies out of their hands. What has happened is that although they don't need to use the most powerful fast-twitch muscle fibers to lift the lighter box, their nervous system has been conditioned to anticipate that it still needs to activate those fibers with the

A pulling sled will help develop speed by increasing the amount of force an athlete puts into the ground.

lighter box. The result: greater speed and power.

Although post-tetanic potentiation is the term used by sport scientists, *contrast training* is the term many coaches use for the training methods that elicit this response. This makes sense because you are "contrasting" one workout method, such as heavy weight training, with another, such as plyometrics.

One of the most practical methods for contrast training uses a pulling sled; you could have your athletes perform it on the Tuesday/Thursday speed and plyo workout on the BFS system. Let's look at some details.

First, one common mistake many athletes make when pulling a sled is using too much resistance, which is unwise because using too much weight alters running mechanics. This is especially true when using inferior harnesses that have a rope or cord attached only around the waist, which encourages the athlete to bend forward excessively from the waist. Of course many powerlifters use sled dragging with extremely heavy weights to improve their squatting and muscular endurance, and this is fine for strength training. For sprint training, however, an athlete needs to use much lighter weights.

A good starting weight for beginners, or for athletes with low strength levels, is to use only 10 percent of their bodyweight (including the weight of the sled) when pulling a sled. Another mistake is pulling the sled for too long. You want athletes to use the sled for developing the drive phase, so the maximum distance is about 20 to 25 yards.

Just pulling a sled will help develop speed by increasing the amount of force an athlete puts into the ground. One reason older sprinters are able to run faster is not because they are increasing their leg turnover, but because they are increasing their stride length by increasing leg power. However, you can add another speed dimension by having athletes alternate between sled dragging and sprint training. For example, after a warm-up, an athlete could perform 3-5 sets of sled dragging alternated with 3-5 sets of short sprints. More specifically, the athlete would pull a sled for 20-25 yards, then sprint for 20-25 yards; repeat 3-5 times.

Consider that 10 total sets of this type of work are extremely demanding and may be too much for a beginner. The guiding principle would be to stop

the workout when the athlete starts slowing down, a point that is often referred to as the *critical drop-off point*. Using an electronic timing system, such as the BFS Jump and Run, is a practical way to determine when the athlete reaches the critical drop-off point.

The Next Step in Contrast Training

One of the most popular methods of developing muscular endurance is by pushing a special sled designed for this purpose, such as the BXI Dog Sled. Rather than alternating between sets of resistance running and sprinting, an athlete can use a push sled to perform contrast training within the set. Here's how to do it so you can show the method to your athletes.

Grasp the vertical handles, holding them near the top of the handles so you are in a more upright position, and push the sled for about 10-15 yards. Instead of stopping, you would release the handles, step to the side of the sled and take off in an all-out sprint for another 15-20 yards. You'll find that when you release the handles, you will experience a sudden burst of speed, as if someone were pushing you from behind. You could have your athletes perform several sets of this type of training, followed by regular short sprints – it's an amazing workout!

As for the weight to use, that decision again varies with the level of strength and athletic ability of the athlete – a good rule of thumb is to use the weight that gives the athlete the greatest kick when they let go of the sled. Also, consider that this type of training is very taxing on the nervous system, so it should seldom be performed more than twice a week to avoid overtraining. One sound plan could be to use the BFS Push/Pull Sled on Tuesday, and then perform a regular sprint workout on Thursday.

The BXI Dog Sled, shown here, enables an athlete to perform contrast training while running. Contrast training, as described in this article, enables an athlete to run faster than they could otherwise.

One advantage of the push sled is that there is little eccentric overload during the exercise. *Eccentric* means that the muscle encounters resistance as a joint lengthens, such as when an athlete descends into the bottom of a squat or lowers a barbell to their chest in the bench press. When athletes push or pull a sled, there is less eccentric loading, so they will experience little soreness from this type of training (and this is why athletes can perform heavy box squats the day before a game without being sore the next day). If you have a game on Friday, your athletes could do a short push-sled workout on Thursday without having soreness that could affect performance.

Another type of speed training works to develop the speed needed after the drive phase in running, when the athlete is upright. This requires the use of a sprint chute, a product that was introduced to the US by Ben Tabachnik, PhD, a Russian track coach. The sprint chute is a parachute that provides a small amount of drag to create an overload on the muscles without affecting technique. The BFS sprint chute has a quick-release harness that enables the athlete to perform contrast training during a run. After hitting top speed with the chute, the athlete releases the chute; the resulting kick will enable them to run faster. For example, after performing several sets of regular sprints, an athlete could perform 3-5 sets of short-to-medium sprints (say 30-40 yards), releasing the chute halfway through the sprint.

Contrast training can be a valuable method to help get athletes to the next level of physical ability. In many sports speed is king, and contrast training with the speed tools discussed here is a proven method to quickly get athletes faster. BFS

Developing Athletic Superiority with

Contrast Training

The BFS Push/Pull Sled is ideal for performing contrast training, one of the most effective ways to improve running speed.

How to use the science of motor learning to make athletes faster and more powerful

BY **KIM GOSS**

One of the first things I look at when I visit a coach is their personal library. And while the books on competition strategy and sports drills usually have pages that are dog-eared and full of Post-its, margin notes and highlighted passages, those that deal with motor learning are usually in mint condition. In fact, one coach had such a college textbook on the subject that was still in shrink-rap – I guess he was saving it for a three-day weekend? This subject neglect is unfortunate.

Of course, the writers of these books must share some of the blame here, as they often present the material in a bland manner that brings up

images of Ben Stein doing his boring-teacher role in those commercials for eye drops: "The contextual interference effect is apparent when contrasting and comparing the effectiveness of controlled random-practice studies and…blab, blab, blab…." It's like these writers are daring us to learn!

What's unfortunate is that these textbooks on motor learning often have much to offer in the world of strength and conditioning. While most textbooks focus on how we learn skills, there are hidden jewels of knowledge that can make a difference in athletic performance. One such jewel is the concept of *post-tetanic potentiation*.

Post-tetanic potentiation refers to the theory that a more powerful muscular response can be performed if it is preceded by a strong muscular contraction. For example, if a baseball player swings a heavy bat immediately before going up to the plate, that athlete will be able to swing the regular bat faster and therefore hit the ball harder. Or if you were to perform several sets of heavy squats and then test your vertical jump, you would probably be able to jump higher than if you tested your vertical jump before that squat workout. Here's how it works.

Let's say you are lifting boxes that weigh about 50 pounds each. As you do this, you are activating the powerful fast-twitch muscle fibers. After lifting about five boxes, say you pick up a 10-pound box and you find that the box nearly flies out of your hands. What has happened is that although you don't need to use the most powerful fast-twitch muscle fibers to lift the lighter box, the nervous system was conditioned to anticipate that it still needed to activate those fibers with the lighter box. The result: greater speed and power.

Although post-tetanic potentiation is the terminology used by sport scientists, *contrast training* is the term coaches use for the training method used to elicit this response. In effect, you are "contrasting" one workout method, such as heavy weight training, with another, such as plyometrics. Let's look at some practical applications of contrast training.

PHOTO: JOHN BROZ

The squat is a great exercise to stimulate the powerful fast-twitch muscle fibers, which are the type of muscle fibers activated in contrast training. Shown is teenager Pat Mendes, who has squatted 700 pounds and cleaned 464 pounds.

Wave Loading

The origins of wave loading can be traced back to Doug Ivan Hepburn, a Canadian strongman who won the 1953 World Weightlifting Championships. Hepburn was the first man to bench press 500 pounds, eventually lifting 545, and could Olympic press 445 pounds, squat 750 and deadlift 705. Hepburn would often start his workouts with heavy singles, stimulating the nervous system to activate the most powerful fast-twitch fibers, followed by the same movements but with slightly lighter weights and more reps.

I first learned about wave loading in the late '80s when Bulgarian weightlifting coach Angel Spassov visited me when I was a strength coach at the Air Force Academy. Coach Spassov said the Bulgarians would pyramid their weights so that each peak used heavier weights. For example, a power clean workout for someone with a best of 200 pounds might look something like this:

Wave 1: 135 x 3, 155 x 3, 175 x 2, 185 x 1, 195 x 1, 200/miss

Wave 2: 175 x 2, 185 x 1, 195 x 1, 200 x 1, 205 x 1, 210/miss

Wave 3: 185 x 1, 195 x 1, 200 x 1, 205 x 1, 210 x 1

Because so many sets are prescribed (17 in this example), usually only one exercise per workout is performed using wave loading – often, Bulgarian weightlifters would train five times a day using this system. One US athlete who has been using such training over the past year is 19-year-old Pat Mendes, who this May cleaned 464 pounds in an exhibition at the National High School Power Clean Championships in Las Vegas. Mendes trains about 30 hours a week, and now his sole sport is weightlifting. Obviously, such intensive training would be impractical for most multisport high school athletes because it would result in the athlete having to compromise on other aspects of conditioning.

Jump Training

At BFS clinics, we provide a practical demonstration of contrast training using the vertical jump test. Our clinicians will have an athlete perform a vertical jump, then a heavy box squat, and then try the vertical jump again. To everyone's surprise, without fail the athlete will jump several inches higher. The box squats will stimulate the nervous system to activate the powerful fast-twitch fibers without creating excessive fatigue in the athlete, and those fibers will be still be activated during the vertical jump.

In the weightroom, if there is enough open space to allow for it,

Performing plyometric exercises, such as box jumps and jumps over barriers, is one effective method of performing contrast training. Shown jumping over the barriers is soccer player Keisha Rogerson, and shown jumping on the plyometric box is volleyball player Lusia Angilau. Both athletes attend Hunter High School in Salt Lake City, Utah.

an athlete could perform several reps of box jumps after each heavy set of squats. Or for the upper body, the athlete could do some Marine push-ups (clapping at the top) between sets of heavy bench presses – or step outside the weightroom and perform some chest passes with a medicine ball. Again, safety and practicality will determine if such training is possible.

If you decide to use this method of training, consider that research has shown that it is not very effective for those athletes with low levels of strength. If an athlete is struggling to squat bodyweight, they will probably receive little benefit from using this type of training. Also, the system will not work if the athlete is tired. For example, performing a set of box jumps after completing a 5x5 squat workout on the BFS program will do little good, as the nervous system is too fatigued.

Sled Training

One of the most practical methods to use for contrast training is sled training, which could be performed on the Tuesday/Thursday speed and plyo workout on the BFS system. For this, the ideal training device is the BFS Push/Pull Sled.

To use contrast training, you would grasp the vertical handles and push the sled for about 10-15 yards. Then you would release the handles, step to the side of the sled and take off in an all-out sprint for another 15-20 yards. You'll find that when you release the handles, you will experience a sudden burst of speed, as if someone were pushing you from behind. The result is that you will run faster than you could otherwise. You could perform several sets of this type of training, followed by regular short sprints – it's an amazing workout!

You don't want to push a sled for more than 25 yards, as you want to stay in the acceleration phase of running. As for the weight to use, that decision varies with the level of strength of the athlete – a good rule of thumb is to use the weight that gives the athlete the greatest kick when the athlete lets go of the sled. Also, consider that this type of training is very taxing on the nervous system, so it should seldom be performed more than twice a week to avoid overtraining. One sound plan could be to use the BFS Push/Pull Sled on Tuesday, and then perform a regular sprint workout on Thursday.

Contrast training can be a valuable method of helping to take athletes to the next level of developing physical superiority. Other methods may be impractical for most high school athletes, such as extensive use of wave loading; and others may involve safety issues, such as performing box jumps in a crowded weightroom. Those methods might best be reserved for college-level athletes. But performing contrast training with a BFS Push/Pull Sled is certainly a simple, practical and safe method of making athletes faster. And who knows, such success may encourage some coaches to dust off those old textbooks and discover many other valuable training methods. BFS

The BFS Push/Pull Sled is the perfect device for implementing contrast training to run faster. After pushing the sled for 10 to 15 yards, the athlete releases the handles and then sprints ahead for about 15 to 20 yards.