



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 potentia-

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.

tion 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.

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 multi-sport 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 Lusía 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 prob-

ably 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!

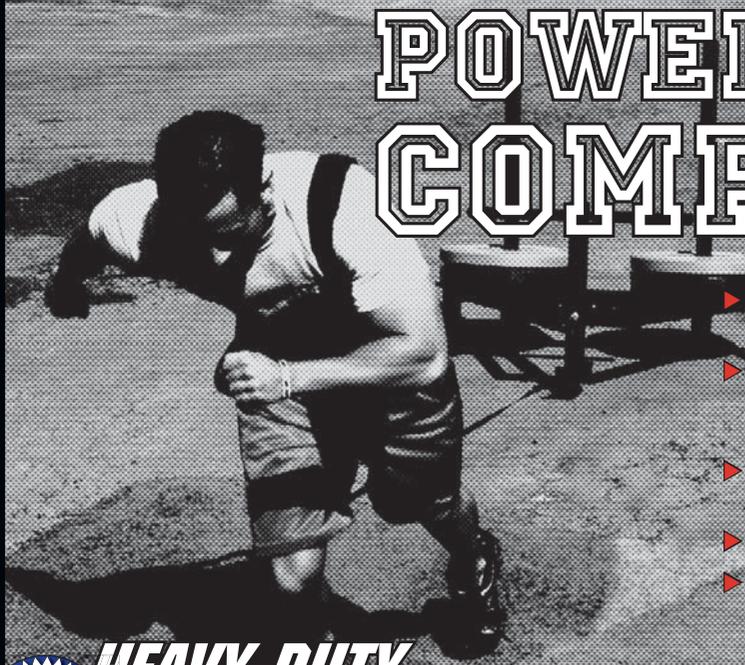
You don't want to push a sled for more than 25 yards, as you want to stay in the acceleration phase of running. As for the weight to use, that decision varies with the level of strength of the athlete – a good rule of thumb is to use the weight that gives the athlete the greatest kick when the athlete 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.



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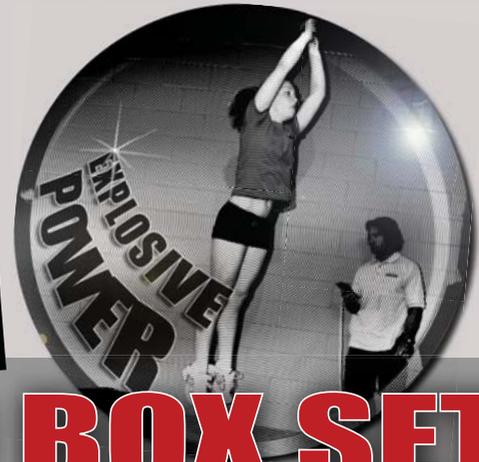
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