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Why You Should Sprint Train

Tony Leyland

Last month I talked about rest periods during interval training and said I would discuss high-intensity sprint and peak power workouts further. One of the things I talked about is the need for relatively long rest periods during short-duration, peak-intensity work that lasts less than 10 to 15 seconds. I also noted that when it comes to sprint workouts that train short, maximal-effort running intervals, many CrossFitters—always trying to push the intensity envelope—seem to want to reduce the rest period as much as possible. However, this changes the focus and stimulus of the workout—and not necessarily for the better. We have all heard of "adrenaline junkies"; these athletes are "lactic acid junkies," harboring the misconception that unless you are close to a visit from Pukie, you haven't worked hard enough. Wrong. As I stated last month, it depends on what you are working on. Pure strength workouts generally don't get you to the state of lying on the floor, gasping for breath, feeling absolutely wiped out and ready to throw up, and neither should a sprint workout where the focus is really on sprint technique and high power output.

When you work predominantly type-2b muscle fibers using the phosphagen system, little to no lactic acid is produced. So, when you work on low-rep Olympic lifts, train for the *CrossFit Total*, or do short sprint interval work, you should not produce much lactic acid. You will start to tire after repeated efforts (those muscle fibers

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will take a beating) and you may be a little sore the next day or two, as the muscles have worked hard, but you shouldn't feel any significant lactic acid burn.

In contrast, consider the CrossFit workouts "Kelly" (five rounds for time of a 400-meter run, thirty 24-inch box jumps, and thirty 20-pound wall ball shots) or "Nancy" (five rounds for time of a 400-meter run and fifteen 95-pound overhead squats) or even good old "Cindy" (20 minutes of rounds of five pull-ups, ten push-ups, and fifteen squats). Cindy will take 20 minutes, Nancy will take anywhere from 12 to 24 minutes for most people, and Kelly will take me all day! For all three, then, much of the energy comes from the oxidative system. (See *CFJ* issues 56 and 10 if you need to review energy systems.)

Despite the "look" of these workouts, they really are not interval training workouts; they are circuit training workouts. By definition, interval training is a series of periods of exercise and rest. These three workouts do not have any rest periods incorporated into their design; you are meant to storm through as fast as you can. Granted, if you aren't strong enough and fit enough to move through them without breaks, you will end up working in intervals and will use more of the phosphagen and glycolytic systems during the work phases and then use the oxidative system to recover. However, stronger athletes (or ones who scale the weights down) who can work continually during these types of workouts will be obtaining the majority of their energy via the oxidative system. These athletes are working sub-maximally at each individual effort. (If you can do "Fran" in 3 to 5 minutes, 95 pounds is by definition nowhere near your one-rep max thruster weight.)

These types of workouts challenge the oxidative system and hence your cardiorespiratory fitness. But these CrossFit circuits also challenge the muscular endurance of every muscle group; improve your skill, and develop balance and core stability. In "Performance and Health" in *CFJ* issue 55, I argued that CrossFit programming is protective of one's health precisely because it does develop all components of fitness, and these kinds of intense, no-rest circuit training sessions are an integral part of that programming.

However, these longer workouts are not about improving your 400-meter sprint performance. The metabolic hit these workouts deliver to the oxidative system (and a very large number of muscle groups) is very strong, so you fatigue and the 400-meter runs are like a jog (or maybe a cruise for the fitter athlete); they are certainly not 400-meter maximal sprints. Not so long ago, one circuit WOD included 100-meter runs, but it was a 20-minute multi-round workout with two other exercises, so the runs would have to be performed at less than maximal pace due to fatigue. However, the WODs I discussed last month that required ten 100-meter sprints or three 800-meter sprints are true interval workouts. You must rest between the bouts of exercise.

Although the circuit training WODs rely predominantly on the oxidative system, if you really push for a good time or high number of rounds you will also finish with high lactic acid concentrations, so the glycolytic system will certainly have been stressed and you might feel like Pukie is knocking on the door. But these kinds of workouts do not target type-2b muscle fibers and the phosphagen system. For that you need heavy lifts and maximal sprints… and relatively long rest intervals.

Don't worry if when you do a sprint workout, a CrossFit Total, or some heavy overhead squats you do not feel like you worked as hard as the circuit training type of workouts. Remember this part of the CrossFit definition of fitness: "Five or six days per week mix [various kinds of functional exercises] in as many combinations and patterns as creativity will allow. Routine is the enemy. Keep workouts short and intense."

Per Astrand, a world-renowned exercise physiologist, argues that major adaptations for human survival "were consistent with habitual physical activity, including endurance and peak effort alternated with rest." We evolved performing lots of endurance activities such as tracking animals, moving with the seasons, gathering food and materials, building shelter, etc. However, we also required very short-duration outputs of peak power during fights and sprints (to chase, or flee, an opponent or animal). Hence, sprinting distances of 10 to 40 meters is probably one of the most fundamental physical survival skills we ever developed as humans. If you were fleeing a more powerful animal you probably would be sprinting a short distance to safety or shelter. If you were too far away from safety you would have to turn and fight. Either way, you needed to be powerful…. and the outcome, good or bad, was probably decided in a matter of seconds.

But all good coaches know that a 10-meter sprint is very different from a 40-meter sprint and different

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again from a zig-zag agility sprint. Let me discuss this further. Ben Johnson and Carl Lewis contested many 100-meter sprint races in the late 1980s. Who was the faster runner out of Johnson and Lewis? The answer is Carl Lewis despite the fact that Ben Johnson, at his best, would consistently beat him at 100-meter races. How come? Lewis had a fractionally faster top speed, but Johnson was a better accelerator; he came out of the blocks quicker and reached his top speed sooner. So by the time Lewis reached his, slightly higher, top speed, Johnson was far enough ahead to hold on for the win. In the 100-meter sprint, acceleration over the first 10 meters can make the difference in who wins. For a solider or police officer or firefighter it may be the difference between life and death.

Maximal sprinting is also crucial in sport. In my sport of soccer, for example, players sprint at top speed an average of 15 meters (mostly between 5 and 30 meter) every 90 seconds on average. They cover around one kilometer sprinting at maximal speeds and a further two kilometers at fast speeds, but this is achieved in intervals over 90 minutes of game time. Running in soccer—like efforts in many other sports—consists of short sprints (phosphagen system predominating) and then slower movements (cruising, jogging, backing up, walking) where the athlete has time to recover (oxidative system predominating). The ratio of time spent in high-intensity and low-intensity activity is between 1:10 and 1:20. Football, baseball, basketball, volleyball. rugby, hockey, racket sports, surfing, weightlifting, combat sports, and many if not most other sports also have patterns of quick bursts of maximal or near-maximal power outputs (1-5 seconds in duration) followed by lower-intensity activity periods which allow for a certain amount of recovery.

Not all short-distance sprinting targets the same components of physical performance. One study looked at the correlation among acceleration (a 10-meter sprint from a stationary start), maximum speed (a 20-meter timed sprint from a 30-meter run-up), and agility (time over a 20-meter zig-zag course consisting of four 5-meter sections at 100-degree angles to each other). Obviously the results were correlated, and many of the athletes scoring well in one test scored well in another. However, the authors concluded that the correlation wasn't total and that "acceleration, maximum speed, and agility are specific qualities and relatively unrelated to one another." This highlights, on a micro level, one of CrossFit's fundamental critiques of many standard training programs—that single-sport athletes are narrowly specialized, at the expense of other components of fitness and athleticism.

Does CrossFit target type-2b fibers and the phosphagen system; does it help with your power, your acceleration? Yes it does, most definitely. To be fast and strong, you need a good strength base—strength training and heavy lifting is the way to achieve this. To develop this strength into high power, Olympic-style lifts are king (cleans, jerks, snatches, and their variations, etc.). One study showed measured power in the jerk drive ranging from 2,140 watts (2.9 horsepower) in the 56-kg class to 4,786 watts (6.4 horsepower) for a 110-kg lifter. The same researcher calculated that during the second pull, the average power output, from transition to maximum vertical velocity, was 5,600 watts for a 100-kg male and 2,900 watts for a 75-kg female. Peak power over a split second would be higher still. Average power outputs for powerlifting events are: bench, 300 watts; squat, 1,000 watts; and deadlift, 1,100 watts. The numbers are much lower because the lifts are performed slowly. They also show that the term *powerlifting* is a misnomer and highlight the need to include fast, explosive movements such as the Olympic lifts and maximal sprints in your training. Powerlifting is essential in developing a strength base, but you have to work fast as well.

However, while Olympic weightlifting develops excellent vertical acceleration, the principle of specificity means that translating that power into horizontal acceleration and sprint capacity requires practical application and practice. The soldier, law enforcement officer, and football, basketball, rugby, tennis, and soccer player (to name just a few) also need to do specific work to translate the vertical power they develop in the gym into horizontal acceleration of the body. Like the Olympic lifts, sprinting is very technical, and optimizing your sprinting technique requires focused work at that skill.

As you know, CrossFit uses exercises and information from specialist coaches in powerlifting, Olympic lifting, gymnastics, kettlebell training, rowing, etc. The essence of CrossFit is to develop routines that use these excellent training methods but not to specialize in any of them. By this I mean an athlete who is a powerlifter is going to do a lot more powerlifting than a CrossFit athlete, an Olympic weightlifter is going to do more Olympic lift training, etc. So while we may not want to specialize in sprinting, we should learn what we can

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from sprint coaches. So I suggest that you include in your workouts some 10-yard accelerations and some 20-yard, 30-yard, and 40-yard sprints. Add in some zig-zag and other agility patterns also. Each type of distance and movement pattern has a slightly different focus.

CrossFit loves to have workouts that are measurable which really helps to challenge and motivate the athletes. Unfortunately, very short sprints are really hard to measure accurately enough to determine improvement (or drop off). Obviously, monitoring progress in Olympic lifting is easy—you know the weight you are lifting. But a 20-yard sprint may take 2.82 seconds, and improvements may come in increments of hundredths of seconds. So it is tough to measure progress on short sprints because you obviously can't time yourself and any improvements in time will be very small and hence the reaction time using a stopwatch has to be as consistent as possible. However, if you have a coach or training partner who is always the one running the stopwatch, you can get a decent sense of your progress. But you can't do a 20-yard sprint with one friend as timer and a month later have another friend time you, as the differences in their stopwatch technique will likely be greater than any improvements.

So I admit it is tough to have very short sprints as a measurable WOD. But don't let that stop you; you need to work at short sprints especially if you are not involved in sports that challenge this component of fitness. One possibility is to do some short sprints after your CrossFit warm-up and prior to the main WOD. You could do some three-quarter-pace sprints as an additional warm-up and then do some maximal sprints. Maybe only six 20-yard sprints with a minute break in between. You will not feel particularly fatigued at this point, but this is very explosive work, and, with regular use, the benefit will carry over into other aspects of your performance. It may take a slight edge off your work output for that day's WOD, but the benefits gained far outweigh that inconvenience.

Studies and text cited in this article:

Åstrand, P. O. 1992. "J. B. Wolffe Memorial Lecture. 'Why Exercise?'" *Medical Science and Sports Exercise* 24(2): 153-162

Baechle, T. R., and E. W. Earle, eds. 2000. *Essentials of Strength Training and Conditioning*. 2nd ed. Champaign. Ill: Human Kinetics.

Garhammer, John. 1993. "A Review of Power Output Studies of Olympic and Powerlifting: Methodology, Performance Prediction, and Evaluation Tests. *Journal of Strength and Conditioning Research*. 7(2): 76-89.

Little, Thomas, and Alun G. Williams. 2005. "Specificity of Acceleration, Maximum Speed, and Agility in Professional Soccer Players. *Journal of Strength and Conditioning Research* 19(1): 76-78.

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