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JOURNAL ARTICLES

Endurance Training

Decreased Training Time & Increased Work Capacity

Brian MacKenzie

In reflecting on the CrossFit Certification seminar I recently attended at North Santa Cruz, these words still ring in my ears like Christmas bells: “Increased work capacity across broad time and modal domains, increased work capacity across broad time and modal domains, increased work capacity across broad time and modal domains.”

The same weekend as the cert, three of the athletes I train were running the New York Marathon. They all finished and felt as though they had not really done a marathon, unlike many marathoners who train only long distances for long hours. At my training business, we start with technique with everyone we train. We teach each of them to squat, deadlift, snatch, and jump. It does not stop there. We look at their ability to keep a foot underneath themselves when running and how quickly they can “pull” it up off the ground as they move forward. This is the most effective approach to improving running that I have found, and as their speeds and paces get more impressive, the better the athletes get at correcting their technique in all sports as they begin to adjust to the neurological patterns associated with proper form.

Once we are comfortable with the technique we increase the work capacity. It's about power! Time to get serious. Typically, soreness follows, which is to be expected but often comes as a surprise to the non-weightlifting individual. I always laugh at this, because most endurance athletes don't connect that soreness with their other experiences. For example, when their legs are shot at the end of a marathon, they tend to

think it is somehow “aerobically” related. So, even though they could not be more wrong, they typically respond by increasing training miles to try to get muscle and tissue breakdown to stop. However, we go in the opposite direction: we CrossFit them! Then, once we've increased work capacity, we can focus on results, because if we are going to train someone for something that is ultimately what we are looking for, right?

Sample endurance training program

Since my first article on endurance training in the November 2007 issue of the CrossFit Journal, I've received numerous questions and inquiries from people who'd like more information on the what and how of our philosophies and using CrossFit in training for longer-distance events. I wish I could have some program that would look at each individual and spit out a tailor-made program. Unfortunately I don't have that and I can't just put out a month-long program based on your needs and your energy and what you can and can't handle without looking at what happens to you in training.

What I can do here, though, is to break down the last five weeks of training we used for an athlete preparing to run a hilly 50k (that's 31.2 miles, with 5,490 feet of climbing) as his first long-distance race. This particular guy—we'll call him “Rookie”—was a newcomer to these kinds of distances. The longest run he had ever done was 15 miles, and before beginning this program, he was not even actively a runner. We implemented the plan below for the last five weeks of training before race day, and, on November 18, he completed his 50k with no problems.

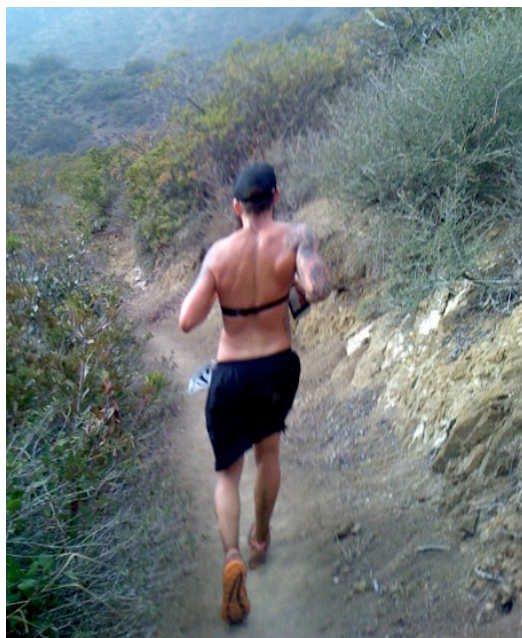
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Endurance Training (continued...)

Please keep in mind that this program is not developed specifically for you: it is developed for this particular person. You will need to look at what you can handle. This means several things. Can you make your intervals (speed and recovery); are you losing strength, power, speed, flexibility; are you sleeping, eating, and feeling good? (Negative replies in these areas are all indicators of overtraining.) If not, you have to change something! Please beware and understand that this program is for someone who has been conditioned to handle CrossFit and a running program.

We started Rookie off by figuring out how much running he could handle in terms of speed, pace, and hill work. The Tabata run substituted for hill training in the end, but we started out using 100-meter hills that were run fast, with a very high cadence. Then we started having him do 1.2-mile hill climbs at about a 6 percent grade. The speed work is based off of time trials he did in the beginning and throughout the training. Each time his PR went up in a specific run, or when he could recover in less than 1:15 from intervals and hill repeats, we increased the intensity/paces.

If you do Tabata runs, leave your ego out of it. Start slow and scale up. I've had people fly off the

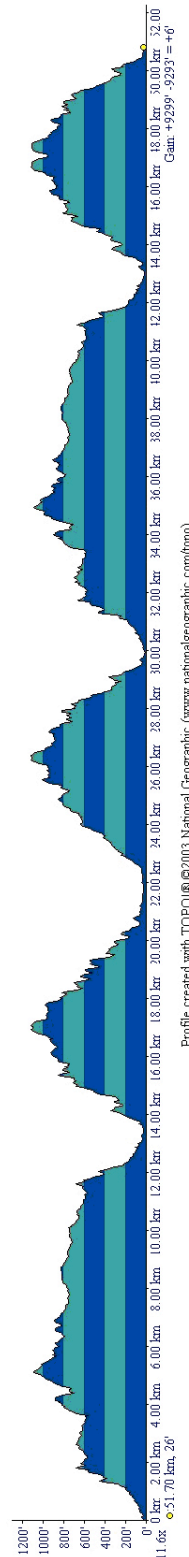


backs of treadmills trying to prove something and failing miserably. Running at a 12 percent grade on a treadmill at 10 miles per hour will crush anyone if they are not ready for it and their form is off. The key to the Tabata run is to keep your cadence incredibly high (110+ foot strikes per foot per minute). To calculate this, you just multiply by 6 the number of times either your left or right foot strikes in 10 seconds. (Or buy a [tempo trainer](#) and try to hold your cadence with the beat.)

The CrossFit workouts in the program above can follow the WOD posted on the CrossFit website, or you can tailor it to your needs to try to get the response you need. This is about progression and increasing work capacity for this sport. If you are not making gains, adjust it. Don't do more, though, under the assumption that you need additional aerobic training. Aerobic levels increase when work capacity increases. Fact! The beginning of your training cycle should be where you develop your basic aerobic capacity, and it shouldn't take three months. It should take no more than a month to get you up to handling a couple hours of aerobic activity.

Unfortunately, our approach has not been well received in the endurance world yet. However, we are making strides, and those who are familiar with CrossFit have given us the warmest welcome we could have ever gotten. The endurance community seems to be a little upset that someone has the audacity to say that what the masses are doing—and the popular magazines recommending—isn't the only way to train for going long. I am still baffled at the lack of questioning and the sheer blind determination of those who believe they need to train all day to achieve their goals.

As I sift through articles and books I come across something that makes what I am doing seem to make more and more sense. Dr. Mel Siff, a highly regarded sports scientist and author of the book *Facts and Fallacies of Fitness*, points out that "twentieth-century scientists have raised the heart onto a pedestal, where it remains relatively unchallenged by any other bodily system.... Fascination with the heart has



The course profile of the 50k that Rookie ran. (It isn't flat!) This is what most ultras look like.

Endurance Training (continued...)

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Week 1	<p>1. CrossFit: Heavy powerlifting/Oly movements: squat, deadlift, clean, snatch, and bench, <10 reps x 3-5 sets</p> <p>3+ hours later:</p> <p>2. Run 4 x 1k at less than best 5k pace, recovering to 120 heart rate in less than 2 minutes</p>	<p>1. Tabata run in the a.m.: 20 sec work/10 sec rest x 8 sets, 12% grade, 9 mph</p> <p>2. CrossFit: Metcon/ gymnastics mix</p>	<p>Run 5-10k at best half-marathon pace or faster</p>	<p>1. CrossFit: Bodyweight/ gymnastics ("Angle" is good)</p> <p>3 hours later:</p> <p>2. Tabata run (on treadmill): 20 sec work/10 sec rest x 8 sets, 12% grade, 6-10 mph (depending on ability)</p>	<p>CrossFit: Oly day: clean, snatch, jerk combos with box jumps, burpees, etc., medium weight</p>	<p>Run 15-mile trail run, heart rate below 160</p> <p>(This is the longest run "Rookie" has ever done.)</p>	<p>1. Run 5 x 1k at 10 seconds below best 5k pace, recovering to 120 heart rate in less than 2 minutes</p> <p>2. Strength recovery: Basic innervation exercises based around hips, 3 sets to burn so that we can go heavy or hard tomorrow</p>
Week 2	<p>3+ hours later:</p> <p>2. Run 4 x 1k at less than best 5k pace, recovering to 120 heart rate in less than 2 minutes</p>	<p>1. Tabata run in the a.m.: 20 sec work/10 sec rest x 8 sets, 12% grade, 9 mph</p> <p>2. CrossFit: Metcon/ gymnastics mix</p>	<p>1. Run 5-10k at best half-marathon pace or faster</p> <p>3+ hours later:</p> <p>2. CrossFit</p>	<p>1. Tabata run (on treadmill): 20 sec work/10 sec rest x 8 sets, 12% grade, 6-10 mph (depending on ability)</p> <p>3 hours later:</p> <p>2. Long hill repeats x 2: Hills 1.2-miles long and at 6% grade, recovering to 120 heart rate in less than 2 minutes before repeating</p>	<p>CrossFit: Oly day: clean, snatch, jerk combos with box jumps, burpees, etc., medium weight</p>	<p>1. 3.1-mile trail run, heart rate below 165</p>	<p>1. Run 4 x 1k at 10 seconds below best 5k pace, recovering to 120 heart rate in less than 2 minutes</p> <p>2. Strength recovery: Basic innervation exercises based around hips, 3 sets to burn so that we can go heavy or hard tomorrow</p>
Week 3	<p>1. CrossFit</p> <p>3+ hours later:</p> <p>2. Run 5 x 400 meters at below best mile pace, recovering to 120 heart rate in less than 2 minutes</p>	<p>1. Tabata run in the a.m.: 20 sec work/10 sec rest x 8 sets, 12% grade, 9 mph</p> <p>2. CrossFit</p>	<p>1. Run 5km easy</p> <p>3+ hours later:</p> <p>2. CrossFit: "Frian" at 80% effort</p>	<p>1. Tabata run (on treadmill): 20 sec work/10 sec rest x 8 sets, 12% grade, 6-10 mph (depending on ability)</p> <p>3+ hours later:</p> <p>2. Long hill repeats: Hills 1.2 miles long and at 6% grade, recovering to 120 heart rate in less than 2 minutes before repeating</p>	<p>CrossFit</p>	<p>Run 13.1-mile trail run, heart rate below 165</p>	<p>1. Run 4 x 1km at 10 seconds below best 5k pace, recovering to 120 heart rate in less than 2 minutes</p> <p>2. Strength recovery: Basic innervation exercises based around hips, 3 sets to burn so that we can go heavy or hard tomorrow</p>
Week 4	<p>1. CrossFit</p> <p>3+ hours later:</p> <p>2. Run 4 x 1k at below best 5k pace, recovering to 120 heart rate in less than 2 minutes</p>	<p>1. Tabata run in the a.m.: 20 sec work/10 sec rest x 8 sets, 12% grade, 9 mph</p> <p>2. CrossFit</p>	<p>Run 10 miles at a pace that is 4-7 minutes above your fastest 10-mile time (e.g., 1:07.1:10 if your best 10-mile time is 1:03)</p>	<p>Tabata run (on treadmill): 20 sec work/10 sec rest x 8 sets, 12% grade, 6-10 mph (depending on ability)</p>	<p>1. Tabata run in the a.m.: 20 sec work/10 sec rest x 8 sets, 12% grade, 9 mph.</p> <p>2. CrossFit</p>	<p>One-hour jog</p>	<p>1. Run 8 x 200m at best mile pace, recovering to 120 heart rate in less than 2 minutes</p> <p>2. Strength recovery: Basic innervation exercises based around hips, 3 sets to burn so that we can go heavy or hard tomorrow</p>
Week 5	<p>1. CrossFit</p> <p>3+ hours later:</p> <p>2. Run 8 x 200 meters at best mile pace, recovering to 120 heart rate in less than 2 minutes</p>	<p>Day off</p>	<p>CrossFit: Power: --Hang snatch 3 x 10-20 reps at 25% of max squat --Kettlebell swings 3 x 10 at same weight as snatch --Push jerk 3 x 10 reps at 25% of max squat --Box jumps 3 x 10-20</p>	<p>Jog 30 minutes easy</p>	<p>Day off</p>	<p>Drills and warm-up</p>	<p>50k race</p>

Endurance Training (continued...)

also spawned an industry which has captured the attention of health entrepreneurs and the public—long, slow distance (LSD) athleticism. Cardiac health and prolonged longevity came to be regarded as the consequence of ‘aerobic’ exercise.” Sound familiar? Moreover, he points out, all non-aerobic exercise has been deemed of little consequence in promoting cardiac health. Siff responds to that contention by citing study after study of anaerobic training and its effects on the heart (see, for example, Ralph Paffenbarger’s studies of longshoremen and stair climbers). Astonishingly enough, hardly any studies have been conducted to show that “aerobic” (LSD) exercise is superior to any other form of exercise for preventing heart disease. So could the LSD/endurance community have it wrong? Well, let’s just say there’s more than one way to skin a cat!

I realize that the vast majority of you probably already know this stuff. My point is that even in the above training plan for endurance running, there is very little aerobic training because I am not willing to have athletes do a ton of aerobic training when it means a loss in everything else. Also, it has been my experience that when they train stamina, strength, flexibility, power, coordination, agility, balance, and accuracy in addition to cardiovascular endurance and speed, my athletes make much larger gains.

More often than not, I question everyone and everything, and for this I make some enemies, but I also make some serious new friends. I have found a family in CrossFit, largely because we are pursuing the same thing. Although my background is in endurance and CrossFit is about overall fitness, there is just too much common ground in our philosophies not to work together to “increase work capacity (power) across broad time (short duration to long duration) and modal domains.”



	Benefits	Drawbacks
Aerobic training	<ul style="list-style-type: none">• Increased cardiovascular function (as measured by VO_2 max)• Decreased body fat until plateau	<ul style="list-style-type: none">• Decreased muscle mass• Decreased strength• Decreased power• Decreased speed• Decreased anaerobic capacity
Anaerobic training	<ul style="list-style-type: none">• Increased cardiovascular function• Decreased body fat• Increased muscle mass• Increased strength• Increased power• Increased speed• Increased aerobic capacity	<ul style="list-style-type: none">• Might require an aerobic foundation depending on sport

Table 1. Benefits and drawbacks of aerobic vs. anaerobic training

Brian MacKenzie is an expert in strength training for endurance athletes as well as a coach for Multisports Orange County. He currently holds a double certification through the International Sports Sciences Association (ISSA, CFT, and SSC) and is a level-2 POSE-certified running coach. In addition to owning [CrossFit Newport Beach/Genetic Potential](#), Brian founded and operates one of the only internship programs for professional trainers in California.