8 Ways to Improve Distance Running Performance

By Jason Karp • For Active.com

Maximizing speed and performance in distance running can be achieved by improving lactate threshold and running economy. While VO_2max—the maximum volume of oxygen your muscles can consume per minute—has received most of the attention among runners and coaches, a high VO_2max alone is not enough to attain competitive performances.

A high VO_2max simply gains one access into the club, since a runner cannot attain a high level of performance without a high VO_2max. But, while you can improve your VO_2max, it is largely genetically determined.

The other two major physiological players of distance running performance—lactate threshold (LT) and running economy (RE)—influence your performance more, and are more responsive to training.

From the time of the classic study published in *Medicine and Science in Sports and Exercise* in 1979 by some of the most prominent names in exercise physiology—Farrell, Wilmore, Coyle, Billing and Costill—research has shown that the LT is the best physiological predictor of distance running performance.

LT is an important physiological variable that demarcates the transition between running that is almost purely aerobic and running that includes significant oxygen-independent (anaerobic) metabolism. It represents the fastest speed you can sustain aerobically. Since the LT represents your fastest sustainable pace, the longer the race, the more important your LT.

What is LT Pace?

LT pace is about 10 to 15 seconds per mile slower than 5K race pace, or about 10K race pace for runners who take 40 minutes or more to complete 10K. If using a heart-rate monitor, the pace should be about 75 to 80 percent of your maximum heart rate.

For highly trained and elite runners, LT pace is about 25 to 30 seconds per mile slower than 5K race pace, or about 15 to 20 seconds per mile slower than 10K race pace, and corresponds to about 85 to 90 percent max heart rate. The pace should feel “comfortably hard.”

How to Improve LT?

Sample workouts to improve lactate threshold include:

- Continuous runs at LT pace, starting at 3 miles and increasing up to 7 to 8 miles, or about 45 minutes for marathoners
- Intervals at LT pace with short rest periods, such as 4 to 6 x 1 mile at LT pace with 1 minute rest
- Shorter intervals at slightly faster than LT pace with very short rest periods, such as 2 sets of 4 x 1,000 meters at 5 to 10 seconds per mile faster than LT pace with 45 seconds rest and 2 minutes rest between sets
- Long, slow distance runs with segments run at LT pace (for marathoners), such as 12 to 16 miles with the last 2 to 4 miles at LT pace, or 2 miles + 3 miles at LT pace + 6 miles + 3 miles at LT pace

How Running Economy Makes Running Easier

Running Economy is the volume of oxygen consumed at submaximal speeds. In 1930, David Dill and his colleagues were among the first physiologists to suggest that there are marked differences in the amount of oxygen different athletes use when running at the same speeds, and that these differences in "economy" of oxygen use are a major factor in explaining differences in running performance in athletes with similar VO_2max values.

For example, research has shown that, while Kenyan runners have similar VO_2max and LT values as their American or European counterparts, the Kenyans are more economical—possibly due to their light, non-muscular legs that resemble those of thoroughbred race horses. The heavier your legs, the more oxygen it costs to move them.

RE is probably even more important than the LT in determining distance running performance because it indicates how hard you're working in relation to your maximum ability to use oxygen.

For example, if two runners, Jack and Martin, have a VO_2max of 70 milliliters of oxygen per kilogram of body weight per minute and a LT pace of 7 minutes per mile, but Jack uses 50 and Martin uses 60 milliliters of oxygen while running at 7:30 pace, the pace feels easier for Jack because he is more economical. Therefore, Jack can run faster before using the same amount of oxygen and feeling the same amount of fatigue as Martin.

I have yet to see a runner who has superior RE who does not also have a high VO_2max and LT.

4 Strategies to Improve Running Economy

Despite its importance, RE seems to be the most difficult of the three physiological players to train. While many runners and coaches think that RE is a reflection of running form, it is more influenced by those microscopic structures that influence oxygen delivery to and use by the muscles—capillaries and mitochondria, the densities of which are both enhanced with high mileage.

- Research has shown that runners who run **high mileage**—more than 70 miles per week—tend to be more economical.

In addition to increasing mitochondrial and capillary density, the greater repetition of running movements may result in better biomechanics and muscle fiber recruitment patterns and a synchronization of breathing and stride rate, which may reduce the oxygen cost of breathing.

- RE may also be improved by the **weight loss** that often accompanies high mileage; the change in body weight lowers oxygen cost.

Since VO_2max plateaus with about 70 to 75 miles per week, improved RE may be the most significant attribute gained from running high mileage. However, it's not entirely clear whether high mileage runners become more economical by running more miles or they're innately more economical and can therefore handle higher mileage.

- **Intervals and tempo runs** can also improve RE since, as VO_2max and LT improve, the oxygen cost of any submaximal speed is also likely to improve.

However, it is possible to become more economical without improving VO_2max or LT, as research on power training with very heavy weights and plyometrics has shown.

- **Power training** focuses on the neural, rather than metabolic, component of muscle force development to improve RE.

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