

# Increase anaerobic threshold with tempo runs

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Have you ever been running hard in a workout or race and begun to feel as though acid is eating through your leg muscles? That's because acid *is* eating through your muscles.

The culprits are positively-charged hydrogen ions, which accumulate in the muscle tissue at higher running intensities. As they do so, these hydrogen ions lower the pH of your muscles (literally making them more acidic) and interfere with muscle contractions, which hastens fatigue and causes that burning sensation, known as "muscular acidosis."

Hydrogen ions are byproducts of glycolysis, or the anaerobic breakdown of glucose for energy. Glucose is broken down both aerobically (with oxygen) and anaerobically during running. At lower intensities, the energy contributions of glycolysis are small, because this process is less efficient than glucose oxidation. But as the intensity increases, the energy contributions of glycolysis become ever greater, because this process is faster than glucose oxidation.

The muscles have clever ways of getting rid of hydrogen ions, but once your running pace reaches a certain level, these mechanisms become overwhelmed and "acidosis" begins in earnest.

The running pace at which this limit is reached is referred to as anaerobic (or lactate) threshold pace. Anaerobic threshold pace is one of the strongest predictors of distance-running performance. The faster you can run while maintaining a manageable level of muscle acidity, the faster you can race. One study found that anaerobic-threshold pace explained 87 percent of the variability in 3,000m running performance in a group of high-level runners.

## Tempo runs and cruise intervals

Tempo runs are sustained efforts at or very near anaerobic threshold intensity. They're a very effective means of increasing anaerobic threshold pace, and an even more effective means of increasing the amount of time you can sustain this pace before fatiguing.

The basic tempo run format is about 20 to 40 minutes of running at a comfortably hard pace sandwiched between a warm-up and a cool-down. When tempo runs are first introduced in the training cycle, they should be short -- 20 minutes or little more. Gradually increase their duration from one session to the next.

Forty minutes is a suitable ceiling for runners and triathletes of all levels. Some runners do so-called tempo runs lasting an hour or more, but they're fooling themselves if they think they're maintaining their true anaerobic threshold pace the whole time. If you actually did maintain this pace for 60 minutes in a workout it wouldn't be a workout, it would be a time trial, and your training for the next two or three days would be compromised.

Some runners divide their tempo runs into long intervals of six to 10 minutes and do two to four of these with moderate aerobic running between them. These broken tempo runs are called cruise intervals. They're a little easier than tempo runs that involve an equal amount of anaerobic threshold pace running without breaks.

Consequently, it's useful to alternate tempo runs and cruise interval sessions from week to week as you gradually increase the total amount of anaerobic threshold pace running over the course of a training program, as shown in the table below. One such workout per week beginning at the end of your base building phase and continuing until the end of the competitive season is a good dosage.

It's best to do your tempo runs in conditions that allow you to maintain a consistent intensity level. There's no better environment for maintaining a consistent intensity level than a 400m track, and many runners do most of their tempo runs on the track. For those runners who find the track boring, it's okay to do tempo runs on flat roads instead.

So, how do you determine your anaerobic threshold pace? Your current 10K-race time can help you find it. If your 10K-race time is about 60 minutes, your anaerobic threshold pace per mile should be exactly the same.

If your 10K-race time is in the range of 50 minutes, your anaerobic threshold pace is your 10K pace plus 10 seconds per mile. And if your 10K time is 40 minutes or faster, your anaerobic threshold pace is your 10K pace plus 12 seconds per mile. Your anaerobic threshold pace will gradually increase over the course of the season, even as the effort level remains the same.

### **Twelve-week tempo run build-up**

This table provides an example of how to develop your tempo run training between the end of base training and an important race.

Week 1	Tempo 0:20
Week 2	Cruise Intervals 2 x 0:12
Week 3	Tempo 0:24
Week 4 (Recovery Week)	Cruise Intervals 2 x 0:10
Week 5	Tempo 0:28
Week 6	Cruise Intervals 2 x 0:15
Week 7	Tempo 0:32
Week 8 (Recovery Week)	Cruise Intervals 2 x 0:12
Week 9	Tempo 0:36
Week 10	Cruise Intervals 2 x 0:16
Week 11	Tempo 0:40
Week 12 (Taper Week)	Cruise Intervals 2 x 0:10