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### **Interval Training: The How and Why**

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The specificity principle stipulates that training loads on the body need to reflect what is expected of it in racing. Most athletes understand that this means interval training is a necessary and important component of any training program designed to achieve peak conditioning. However, many athletes and even coaches don't understand the underlying nuances of interval training.

An interval workout is typically defined by the following attributes:

<b><i>Repetitions</i></b>	The number of efforts to be completed
<b><i>Work Interval</i></b>	How long each repetition should last (usually time but can be distance)
<b><i>Intensity</i></b>	The level of effort for each repetition, which can be governed by perceived exertion (RPE), heart rate or power
<b><i>Rest Interval</i></b>	The recovery period between efforts, can be expressed as fixed time, a ratio relative to the Work Interval, or a certain heart rate level



Which physiological systems are stressed during an interval session is a function of the defining attributes. It's rather obvious to most people that intervals of the same duration at very different Intensities will train different energy systems. But it's also true that intervals at the same intensity with significantly different Rest Intervals will likely result in very different training stresses. And to make matters even more confusing, a recent study showed very similar improvements in key performance metrics with two very different interval programs (one sub-maximal and the other supra-maximal). Hopefully, future studies on the optimization of interval training will shed new light on the subject. For now, we have to stick with what we "know."

### *Lactate Threshold Power Intervals*

Lactate threshold describes the point at which lactate begins to accumulate rapidly in the in the blood. The ability to put out a great deal of power at lactate threshold is the single best physiological marker for predicting performance in mass start endurance cycling events. Put simply, the bigger your engine, the less taxed you will be at a given effort and the more you will have left when the attacks start to fly in a race.

Consequently, lactate threshold power intervals (LTPI) should be an important part of any road cyclist's training program.

While there are a number of different definitions for lactate threshold used among the scientific community, for our purposes we can approximate it by establishing certain



metrics with a simple field test. Make sure you are rested and then on a safe stretch of road perform an all-out 30-minute time trial in training. If you have a heart rate monitor, average your heart rate for the last 20 minutes of the test to estimate your lactate threshold heart rate (LTHR). If you have a power meter, your average power for the entire 30 minutes is a reasonable estimate of your lactate threshold power (LTP). We advocate repeating this test every four to six weeks to monitor your progress.

It is our experience that many athletes try to do lactate threshold intervals at an intensity that is harder than necessary. The intensity for LTPI should be at or just below actual or estimated current LTP. While the workout is difficult, it shouldn't be a struggle to finish.

Use these guidelines to help you set the Intensity:

- If you train by power, do these at *current* LTP (your current actual or estimated maximum average power for 30 minutes, not your personal best).
- If you train by heart rate, then ride at a steady intensity so that you reach within a few beats of LTHR for the last third of the effort on the initial Repetition. You will likely see higher heart rates during each subsequent interval. This may take some trial and error.
- If you train by RPE, you should *begin* to feel the burn in your legs by about five minutes.



The table below illustrates three different LTPI workouts that produce effectively the same training benefits:

Short format	8 reps x 5 minutes @ LTP with 1-minute recoveries
Medium format	4 reps x 10 minutes @ LTP with 2-minute recoveries
Long format	2 reps x 20 minutes @ LTP with 3-5-minute recoveries

Why might you choose one format over another? Your suitable training routes may cause you to prefer one format. We also find it may be easier psychologically for some athletes to begin with the shorter format and progress to the longer format as their fitness improves.

We advocate incorporating LTPI one to two times per week as early as mid-Base (i.e., Base 2). You should increase the intensity appropriately as your fitness improves. Once your improvement plateaus, you can reduce the frequency of LTPI to once every ten days or so and turn your interval focus to the higher intensity sessions described below.

#### *Velocity at $VO_2max$*

Another important marker for endurance performance is  $VO_2max$ , a measure of the peak amount of oxygen the body can consume during all-out endurance exercise. While  $VO_2max$  in experienced endurance athletes is not as responsive to training as LTP, you



can improve your velocity at  $VO_2\text{max}$  ( $vVO_2\text{max}$ ); that is, you can become faster at  $VO_2\text{max}$ .

Again, we can use a field test to establish a reasonable proxy for your  $vVO_2\text{max}$ . Because  $vVO_2\text{max}$  intervals are relatively short in duration, it's a real advantage to use a reliable power meter. Perform an all-out six-minute effort in training. Use your average power for the entire six minutes as your  $vVO_2\text{max}$ . If you don't have a power meter, you can measure your average speed during the six-minute effort. Bear in mind though that wind and road conditions will have a big impact on your speed so you'll need to use a combination of speed and perceived exertion.

An effective general approach for  $vVO_2\text{max}$  intervals is to make the Work and Recovery intervals equal (1:1) in duration (e.g., two-minutes "on" followed by two-minute recovery interval). We like to have athletes start at one-minute durations and then graduate them to longer durations of up to three-minutes as they become more fit. We have had good success using a descending interval format as well. Start at three-minutes and then reduce the Work Interval by one-minute each time you cannot sustain the target Intensity. Notice, you're decreasing the duration of the Work Interval, not the Intensity. Alternatively, you could do longer Work Intervals of four to five minutes separated by five-minute Recovery Intervals.



We typically target 10 to 15 minutes of total work time but the session should be stopped sooner if the intensity drops below 95 percent of the target on any two consecutive efforts.

These sessions are intense and should not be overused. We recommend up to two sessions per week for up to eight weeks approaching a planned peak, but many athletes will realize their full improvement in about six weeks.

#### *Anaerobic Endurance Intervals*

Anaerobic intervals, sometimes also referred to as “supra-maximal” intervals, help improve the ability to clear and tolerate high levels of lactic acid. RPE is the best governor for Intensity as these are all-out efforts of 30 seconds to one-minute.

The Recovery Interval has a dramatic impact on the systems trained during Anaerobic Intervals. Put simply, with each successive effort the role of aerobic metabolism increases and, by definition, Intensity must decline. It is important to have rest periods that are long enough to allow the creatine phosphate energy system to replenish itself. To that end, we recommend Recovery Intervals of four to five minutes between repetitions.



We recommend that you do no more than five to ten Repetitions. If you have a power meter, you can check your average power after each effort. When you can no longer sustain 130 percent of  $vVO_2\text{max}$ , it's best to stop the session.

Anaerobic Endurance intervals can be done up to two to three times per week for up to eight weeks leading up to a planned peak. Note, however that these intervals are less important for certain types of competitive cyclists, such as time trial specialists and mountain bikers.

Intervals workouts are taxing and require a lot of mental focus. Make sure you have a suitable stretch of road, as free from traffic as possible. And don't forget that your indoor trainer can be incredibly effective for interval workouts. Just make sure you have a high volume fan, plenty of water, and a couple of towels within reach.

*Eddie Monnier of Velo-Fit ®, LLC is an Ultrafit cycling coach. Joe Friel is the author of the newly revised Cyclist's Training Bible. For more information on interval training as described in this article, see the Articles section of [www.velo-fit.com](http://www.velo-fit.com) or contact Eddie at [eddie@velo-fit.com](mailto:eddie@velo-fit.com).*