



## Measure Training Intensity to Maximize Cycling Success©

### Par 2 of 3: Maximizing Your Cycling Success

By Sally Edwards

Cycling event coming up? In this article, the second in a three-part series, learn how measuring training intensity is essential to a periodized training plan

The sun is shining, the morning is cool, the air is clear... it's a perfect day for a ride. Fifteen miles out and fifteen miles back. On the way out, barely a whisper of a breeze, but on the way back, the clouds blow in and a disconcerting wind smacks you right in the face. Same number of miles, but on one leg of the journey, you're working a lot harder. How much harder? Well, if you know how to measure training intensity, you can say for sure.

Even more importantly, if you take that knowledge and learn to vary your training intensity over the course of your training program—in other words, periodize your training—then you can unleash the true power of periodization.

### What is Training Intensity?

Training intensity is the sum total of how hard your body is working while on the bike. It isn't just time on the bike, or distance ridden, or how hard you're breathing; rather, it's a multi-dimensional combination of how hard, for how long, and how often you're putting your body under the stress of training.

There are several ways to measure training intensity, including

- Perceived exertion
- Heart rate zones
- Heart rate zones in combination with time ("training load")

### Perceived Exertion

Most club athletes are familiar with the classic or modified Borg Scale of Rate of Perceived Exertion or RPE. The Modified Borg Scale uses a scale of one to ten, with ten being the most intense. The Borg Scale quantifies a rating of perceived exertion on a moment-by-moment basis. Keep in mind, however, that moment-by-moment perceptions are very subjective. Your RPE may or may not be consistent with your actual physiology at that moment.

Despite the problems with RPE, a subjective rating scale can be a beneficial beginning benchmark. Try, for example, the Post Workout Rating Scale (PWRS), created by Carl Foster, Ph.D., Director of Exercise Physiology at the University of Wisconsin-La Crosse. The Post Workout Rating Scale quantifies perceived exertion for an entire workout session. Dr. Foster suggests that you rate yourself thirty minutes after completing a workout.

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## Heart Rate Zones

Measuring heart rate is simple, and thanks to heart rate monitors, very accurate. Heart rate is measured in beats per minute, abbreviated bpm. Training intensity measurements are based on one particular kind of heart rate, maximum heart rate, which is the highest number of beats per minute that your heart can contract or beat. Maximum heart rate is your cardiac fingerprint—it doesn't change as you improve your fitness.

The first step in accurately assessing your training intensity is determining your maximum heart rate, the anchor point from which you set your training zones, also known as your Heart Zones™.

### Finding Your Maximal Heart Rate

Professional and performance athletes often seek their maximum heart rate in an exercise physiology lab. During this test, an athlete increases his or her heart rate 5 beats per minute every 15 seconds until he or she can no longer increase heart rate. In other words, the athlete exerts until he or she reaches the point of utter exhaustion.

### A Better Way: Sub-maximal Testing

Thankfully, maximum heart rate testing to exhaustion isn't the only choice. Instead, you can use one of the many sub-maximal ("sub-max") tests available that keep your heart rate well below its maximum rate, and still give you a fairly accurate measure of your maximum heart rate. The following test used the Foster Post-Workout Rating Scale above.

#### Sub-max test for determining your maximum heart rate

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**Step 1.** Begin by warming up adequately for 5-10 minutes.

**Step 2.** This is the "easy" part of the test. Select any cardiovascular activity that you enjoy such as walk-jog-run. Do that activity for 2 minutes or one lap around a track at a "very, very easy" to "easy" effort (a Rating of 1-3.)

Record your "easy" peak heart rate at the end of 2 minutes: \_\_\_\_\_ bpm

**Step 3.** This is the "moderate" part of the test. Do the same activity for the next 2 minutes or one lap and increase your effort to a level that feels like you are working on levels 4, 5, or 6 on the Verbal Descriptor Scale: "moving with purpose," "hard, rhythmic," or "harder and challenging."

Record your "moderate" peak heart rate at the end of 2 minutes: \_\_\_\_\_ bpm

**Step 4.** This is the "hard" part of the test. Do the same activity for 2 minutes or one lap and increase your effort to an intensity level that feels like you are working on levels 7 or 8 on the Verbal Descriptor Scale: "harder" or "at my limit!"

Record your "hard" peak heart rate at the end of 2 minutes: \_\_\_\_\_ bpm

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**Step 5.** Enter your “easy,” “moderate,” and “hard” peak heart rates into the equations below to arrive at three separate estimates of your maximum heart rate.

Your “easy” maximum heart rate = \_\_\_\_\_ + 60 = \_\_\_\_\_ (estimate #1)

Your “moderate” maximum heart rate = \_\_\_\_\_ + 40 = \_\_\_\_\_ (estimate #2)

Your “hard” maximum heart rate = \_\_\_\_\_ + 20 = \_\_\_\_\_ (estimate #3)

**Step 6.** Average your three estimated maximum heart rates to arrive at a single estimate:

est #1 \_\_\_\_\_ + est #2 \_\_\_\_\_ + est #3 \_\_\_\_\_ = \_\_\_\_\_ (sum) ÷ 3 =

This number is your estimated maximum heart rate from the easy-moderate-hard test.

Your coach or athletic trainer can provide you with other submax tests, as well. You should try to do at least three different types. Averaging the results from all the sub-max tests you take will give you a reliable estimate of your maximum heart rate.

## Strange But True: Maximum Heart Rate is Sport-specific

This may sound strange, but it’s true: Maximum heart rate is sport-specific. For example, triathletes must measure their maximum heart rate in each of their sports. Maximum heart rate in swimming is not necessarily the same as it is for running or cycling. Different sports activities use different muscle groups that place different demands on your cardiovascular system. For example, running uses upper and lower muscles in the body, whereas bicycling uses mostly lower body muscles. Thus, a running maximum heart rate is generally slightly higher than a cycling maximum heart rate because running uses more muscles. If you train in different sports, you need to take sub-max tests for each sport.

## Heart Zones™ Give Context to Heart Rates

Heart rate numbers mean nothing without some context. When considering training intensity, heart rate zones provide the context for heart rate numbers. A heart rate zone is a range of heart beats per minute, and in the Heart Zones™ system, developed and used by the authors, each zone represents a 10% range of your maximum heart rate.

How do heart zones related to training intensity? The higher the zone, the higher the intensity! Once you know your maximum heart rate and your personal heart zones, you can plan your training intensity by designing workout sessions that will keep you working in one or more pre-determined heart zones.

**Example:** Emilio’s maximum heart rate is 175 bpm. His Heart Zones are as follows:

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Heart Zone	% of Maximum Heart Rate	Emilio's bpm range for each Heart Zone base on maximum heart rate of
5	90-100%	157-175 bpm
4	80-89%	139-156 bpm
3	70-79%	122-138 bpm
2	60-69%	104-121 bpm
1	50-59%	87-103 bpm

So, if Emilio wants to keep his intensity level in the moderate range during a particular workout, he knows to maintain a heart rate of between 122 bpm and 138 bpm throughout the ride.

### Taking Intensity to the Next Level: Training Load

Heart rate is one indicator that serves as a nice proxy for how hard you're working during a ride, but to get a more accurate picture of the true amount of stress your body is experiencing, you need to take a multi-dimensional approach to measuring training intensity called *training load*.

Actually, athletes talk about training load in two ways. The first is internal training load; the Heart Zones method of measuring intensity works well for internal training load. The second way to think about load is external training load, which uses distance, speed, environmental factors, altitude, and much more. This discussion focuses only on internal load.

In the Heart Zones system, internal training load is the product of two factors: exercise intensity (as measured by heart rate) and exercise time (duration in each Heart Zone). Multiplying these factors gives you a measurement of your internal training load. Need a shorthand way to remember that? It's "LIT:"

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Load = Intensity x Frequency x Time, or  $L = I \cdot T$

In  $L = I \cdot T$ ,

- I is a Heart Zone (Heart Zones 1, 2, 3, 4, or 5).
- Time is the elapsed time in minutes that you spent in a particular zone.
- L, the measurement of training load, is given as a quantity of Heart Zones *Training Points*™.

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**Example:** Emilio rode three times in the last week, for 45 minutes each day. On the first day, he stayed in Zone 2, on the second day, he stayed in Zone 3, and on the third day, he spent 15 minutes in Zone 2, 15 minutes in Zone 3 and 15 minutes in Zone 4. So, combining the three rides, he worked in Zone 2 for 60 minutes, Zone 3 for 60 minutes, and Zone 4 for 15 minutes. How much training “work” did he do this week? In other words, what was his training load?

$$\text{Load} = (2 \times 60) + (3 \times 60) + (4 \times 15) = 360 \text{ Training Points}$$

Emilio can see the power of quantifying his training load: When he wants to increase his training work load in the coming weeks, he can plan rides that increase intensity, or time, or both.

### Combining Periodization and Training Load

Now that you have the ability to quantify your training intensity and calculate your training load, you have the tools to vary your training load over the course of your training program. Periodizing your training—varying the intensity levels of your training over time—will help you reach your maximum potential as an athlete no matter what your training goals.

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