



Understanding Your Heart Rate

Your legs are burning, heart rate is pounding, breathing is rapid, talking has ceased and you're all wondering when you can stop. Sounds uncomfortable – well you're probably experiencing a sudden rise in lactic acid. Physiologists refer to this "point" in exercise where the muscles begin to produce lactic acid as the lactate threshold. Formerly called anaerobic threshold, the term lactate threshold is analogous to your car tachometer. When you reach "red-line", this is the lactate threshold. Yes, you can cross over the line many times, but eventually you'll burn too much fuel. Our human engines have the same response. Lactate threshold heart rate (LTHR) can be sustained between 5 minutes for the beginner up to 90 minutes for the world-class athlete. The idea for all cross-training aerobic athletes is to push this LTHR closer to your maximum heart rate (MHR). Typically, at the start of the season, the LTHR is approximately 20 (advanced), 30 (intermediate) and 40 (beginner) beats below your maximum heart rate. As your fitness improves, LTHR may go up 6-10 beats during the year. More importantly, your speed at LTHR will improve throughout the year. Simply, your efficiency improves around LTHR. Elevating LTHR is the key ingredient to a stronger triathlete.

As you begin to elevate the intensity, lactic acid levels begin to rise as you near LTHR. Simply, some of the muscles are not as efficient as others and begin to produce lactic acid before LTHR. Therefore, the training stimuli to elevate your LTHR economy is a heart rate range around LT. This is good news for all of you. In the LTHR workouts, I have integrated a blend of the three heart rate levels of LT (see chart). Depending upon your fitness level, the mixture of LTHR levels and the type of LTHR workloads are varied during each training season.

Physiologists determine LTHR by administering a sub-maximal stress test. Measuring workload, perceived exertion, ventilation and blood lactate, LTHR can be determined. Throughout my coaching years, I test all of my athletes using a non-invasive or field test. Testing LTHR once every three weeks in all of the three sports assists in evaluation of training objectives and establishes heart rate zones. These LTHR tests will be implemented into your workout program depending upon your ability and goals.

Understanding your heart rate zones creates another evaluation tool in your training routine. If you have never used a heart rate monitor and I still haven't convinced you to try one – that's ok. Perceived exertion (PE) and speed are the other two tools in providing feedback. (Please see Part 1 and Part 3 – Exercise Intensity Evaluation). Intertwining the three training variables, HR, PE and speed will allow you to totally monitor and evaluate your program. Now, back to heart rate.

There are six heart rate zones that I'll use in monitoring your intensities. Following is an overview of the six zones.

•**Maximum Heart Rate (MHR)** is the highest heart rate that can be attained during a short (3 to 7 minute) exercise period. Strength, power and motivation play a key role in elevating your MHR. MHR may vary 20-30% between similar sex, age, and fitness levels of two athletes. Simply it is not an indicator of fitness. However, it is important to try to elevate the anaerobic power of all athletes. As your anaerobic capacity and technique improves you may see a slight increase in MHR. I do not believe it is important to actually determine MHR. Why kill yourself on one effort when it's not the true indicator of fitness.

•**Aerobic Capacity** - commonly known as your maximal oxygen uptake or $\dot{V}O_2$ Max.. $\dot{V}O_2$ is measured in ml/kg of body weight. The easiest way to elevate your Max $\dot{V}O_2$ is to lose body weight. The leaner the machine, the easier it is to transport and circulate O_2 . During aerobic capacity exercise the common symptoms are labored breathing, tingling of the arms and legs, acute concentration and an extremely high heart rate. This $\dot{V}O_2$ intensity has a finite capacity during an intense exercise session because the physiological requirements are quite demanding. It is a helpful indicator of aerobic potential, but not the best indicator. (Lactate threshold heart rate is #1). The physiological advantage of a high $\dot{V}O_2$ is that your heart will pump a larger volume of blood per beat, called the stroke volume; getting more oxygenated blood to the working muscles. It is one of the key ingredients to "super" aerobic fitness. Developing speed endurance, which stresses the aerobic and anaerobic energy systems is aerobic capacity exercise. In fit athletes, the aerobic capacity HR is typically 4-10 beats below your MHR and commonly 4-12 beats above your lactate threshold HR.

•**Lactate Threshold Heart Rate (LTHR)** - (Refer to narrative above)

•**Aerobic H.R.** - The greatest stimulus in establishing and maintaining your aerobic "plumbing" is training in the aerobic zone. Ideally, the body should not produce any lactic acid (or very low levels) in the aerobic zone. This conserves muscle glycogen. There is a heart rate "gap" between LTHR and the aerobic zone. Stay out of it during training! Training in this zone depletes muscle glycogen stores and does not elevate aerobic efficiency. (see chart) The aerobic zone is approximately 20 beats below LTHR.

• **Cruise Zone** - This is typically used for light exercise. Quite often after a long session or more intense LT workout, exercising in the cruise zone is ideal. The benefit aerobically is still beneficial in the cruise zone. Cruise intensity will enhance aerobic plumbing but more importantly allow a psychological reprieve from training. Additionally, this zone is used during recovery between hard anaerobic endurance, $\dot{V}O_2$ and anaerobic power repeats. This zone is approximately 30 beats below LTHR. (Humidity will dramatically slow the descent.)

• **Recovery, Warm-Ups & Cool-Down Zone** - Self-explanatory. Allowing your body during warm-up to elevate the skin and core temperature typically takes 8-15 minutes. The warm-up should reach 40 beats below LTHR before beginning any higher level exertion. Frequently on slow recovery sessions of 15-30 minutes a recovery zone HR assists in flushing by-products from your system. Lastly, when cooling down to a stop, allow your HR to drop into this zone.

HEART RATE ZONES

<u>*Max Heart Rate</u>	<u>Zones</u>	¹ <u>Easy to Remember</u>
Anaerobic Stress	+3 beats above LTHR up to Max	+5 beats to Max HR
LTHR 3 levels of LTHR	Level 3 = +4 to 3 beats below LTHR* Level 2 = 5 to 8 beats below LTHR Level 1 = 9 to 12 beats below LTHR	Near LT -5 below LT -10 below LT
Aerobic H.R.	18-25 beats below LTHR	-20 below LT
Cruise	25-35 beats below LTHR	-30 below LT
Recovery	35-45 beats below LTHR	-40 below LT

¹An easy way to approximate and remember your heart rate zones

*LTHR = Running LTHR is typically 4-8 beats higher than cycling and swimming is another 4-8 beats lower. This varies for each individual based on level of fitness and background in each activity. Therefore, it is vital to establish LTHR for all events. I use LTHR "pace" or speed in swimming and rarely use HR. (See workouts on establishing LTHR for each activity)

LACTATE THRESHOLD HEART RATE ZONES

	<u>Early Season</u>	² <u>Competitive Season</u>
Level 3	-4 beats below LT to +3 beats above LT	-3 to +5
Level 2	-5 beats to -8 beats below LT	-4 to -6
Level 1	-9 beats to -12 beats below LT	-7 to -10

²As the season progresses, your ability improves in re-synthesizing lactate and tolerating repeated doses of lactic acid. The three levels of training for LTHR shifts from 12 below to 3 above in early season to 10 below and 5 above during the competitive season.