

Heart rate monitoring basics

Heart rate can be a valuable piece of information for the coach and the athlete. At certain sub maximal running intensities (less than 100% of VO₂ max) it will be a direct indication of how much work you are doing at that moment. Heart rate will take into account the environmental factors, your state of rest prior to the workout, nutrition, hydration and of course your fitness. To use heart rate monitoring effectively you will need to obtain three pieces of information.

1. Resting heart rate
2. Maximum heart rate
3. Heart rate zones for your running goals

Resting heart rate

Monitoring your resting heart rate can be a valuable tool for evaluating your fitness and performance goals in running. The heart is a muscle that with training will be able to provide adequate blood to the body at rest with a lower number of beats per minute. Since the amount of blood the heart is moving will stay the same at a resting level, the fitter heart is able to snap out more blood on each beat after the effects of training have been absorbed by the body.

How to take resting heart rate: To take a resting heart rate count your pulse on your wrist or neck for 15 seconds and multiple by 4. Do this before rising at the same time each morning. If unfeasible to do before rising in the morning lie down at the same time each day and relax for 20 minutes. At the end of this rest period take the pulse rate on a 15 second count. Document this value in your training log each day. Note: A resting heart rate 5 or more beats above normal is an early indication of overtraining, stress or impending illness. By catching the symptoms early you or your coach can modify training as needed to alleviate larger problems resulting in more time away from running.

Sean Coster applies education in exercise physiology with his experience coaching runners to enable his athletes to realize their potential in running.

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Regularly monitoring resting heart rate is a simple and effective way to prevent overtraining. By ensuring enough recovery between workouts you will be less likely to become injured or chronically fatigued because of your training load and life stresses.

Maximum heart rate

To obtain a value for your maximum heart rate you can either use an equation to estimate your maximum heart rate or conduct a field test to stress the body into a state which will produce a maximum heart rate value and record it. Since by nature such a stress test is requiring your to get to 100% of your maximum heart rate this is very intense and not recommended unless you are an experience runner with a racing background. Therefore begin by using an equation to estimate maximum heart rate. I recommend the following equation.

$$\text{HR max} = 205.8 - (0.685 * \text{age}).$$

Although no equation will accurately predict your maximum heart rate, this equation was shown to have the lowest range of error (+/- 6.4 beats per minute) when evaluated against 43 other calculations for maximum heart rate.¹

If you insist on conducting a field test to determine your maximum heart rate I recommend the following.

First off do NOT perform the stress test if you have any of the following apply to you:

- you have suffered from any cold, flu, stomach bug or other illness in the last six to eight weeks. The body in this period could still be fighting the last of the infection and the effort of a stress test could leave you prone to a more serious infection. If in any doubt check with your doctor
- you have raced in the fourteen days prior to a stress test and at least four to six weeks following a marathon or more if you have not yet fully recovered from your efforts. A tired heart and body will not achieve maximum
- you have any hint of an injury. Ensure all old injuries are fully repaired before deciding to undertake stress test
- if you have less than one years running experience and are sport active for less than three hours a week. It is possible you will not be fit enough to take the strain of a stress test let alone achieve a reliable result.

Stress Test

The test requires you to wear your heart rate monitor (HRM) and preferably one that is capable of recording your heart rate. It is best to record your heart rate as

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often as possible - preferable 1- 5 seconds. If your HRM does not have a record facility, it will be necessary to keep glancing at your monitor to find your highest heart rate. For both these tests, it is important to warm up thoroughly. See the warm up section for details on how to do this.

For this test you need a good hill. The hill needs to take you about two minutes to run up it and of sufficient gradient to ensure you are breathing hard at its summit. (6-8%) The test begins around five minutes running time from the hill. Gradually accelerate towards the hill achieving 85% MHR (for the first time) at the base of the hill. As you hit the hill, maintain your speed by increasing your effort. Your heart rate will rise and you will tire. Without falling over, keep an eye on your monitor and make a mental note of your highest heart rate as you work towards the top of the hill.

A stress test should be carried out every six months to ensure ongoing accuracy of your training zones. Many athletes do not achieve their actual MHR at the first attempt as they are either not fit enough or are running tired.

It is worth noting you will have different maximum heart rates for different endurance sports, such as cycling. This is due to the number and size of the muscle groups used. Running uses the largest muscle groups in the body and therefore has the highest heart rates associated to it. Cyclists will need to carry out a maximum stress test for that sport to obtain their cycling maximum.

Heart rate zones

Along with an accurate maximum heart rate, resting heart rate can be utilized to develop heart rate training zones specific for your current level of fitness. To use your resting heart rate to accurately hit a goal heart rate zone follow these steps

- a. Maximum heart rate – Resting heart rate = Heart rate reserve
- b. Heart rate reserve x Goal exercise intensity (%) = % of heart rate reserve
- c. % of heart rate reserve + resting heart rate = Goal heart rate for workout

Employing heart rate training zones that utilize a known resting heart rate along with an accurate maximum heart rate will ensure you are

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training at the proper intensities for your current level of fitness. Training intensities that do not take into account your resting heart rate will be significantly less accurate.

Using heart rate to monitor exercise intensity is most useful at the lower running intensities and should be used in conjunction with your corresponding training paces. Here are general guidelines for the training benefits for each heart rate training zone.

Heart rate zone	Training benefit
Zone I	Improving aerobic endurance
Zone II	Improving stamina and endurance at lactate threshold
Zone III	Improving aerobic capacity and speed at lactate threshold
Zone IV	Improving aerobic capacity and top end speed

Heart rate training zone calculator

To get started using your heart rate data to train more effectively visit <http://crpusa.com/v/hearttratecalc.htm> to receive heart rate training zones for you.

Disclaimer: If you are over the age of 35 you should obtain permission from your doctor to begin a fitness program and conduct a stress test in the presence of your physician.

Long may you run,

Sean Coster
Head Coach
Founder-Complete Running Programs

ⁱ Robergs and Landwehr. The Surprising History of the “HRmax=220-age” Equation. *Journal of Exercise Physiology online*. 2002; 5:1-10.

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