



With *PhysioLink* - Physiotherapy and sports injury centre

Calculating your maximum heart rate & heart rate training zones

This article was prompted by a conversation I had with a fellow club member who wanted to use his heart rate monitor to enhance his training. However, no matter how hard he worked in his training sessions he could not get close to his maximum heart rate (MHR) which he had calculated using the traditional method of 220 minus his age.

The problem He was having was that although this method is ok for the average person, it becomes inaccurate for the trained individual especially if that person has been fit for many years or has a long history of continual sport. This means that the regular athlete or runner not only will have resting heart rates much lower than the untrained, more sedentary person but will also have maximum heart rate levels that nowhere match figures calculated using the old method mentioned above.

There are however much more accurate methods that the fit or trained individual can use to predict their MHR and therefore their individual training zones and I will outline several of these methods below.

Ok, so why do we need to know our MHR in the first place. Well for anyone using a heart rate monitor in their training, all the important training “zones” which we all need to train within to enhance our fitness, are based on a percentage of our MHR.

Of course a lot of us do this the unscientific way and base these “zones” or our “running intensity” for a particular workout on perceived effort and experience.

The heart rate monitor helps take the guesswork out of what effort to train at, whether this be a recovery run, a quicker paced run or an intense interval session. A heart rate monitor can also help us avoid over or under-training and act as an early warning system for an oncoming illness or injury.

The various zones and the benefits they have for improving our fitness will be included at the end of this article, but for now back to how we can accurately predict our own individual MHR.

The most accurate method involves performing a stress test and there are many variations of this test.

Stress tests are exactly what they sound like - extremely stressful and although fairly short in duration they require you to push your body and heart to the limit, therefore certain guidelines should be considered before undertaking one of these tests and you should be certain of the following:

- *that you have not 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 GP.*
- *that you have not 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.*
- *in the final week before a stress test it is important to recovery run - that is 70% maximum of your current age adjusted heart rate.*

Do not undertake a stress test :

- *with 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.*

Also anyone who is overweight or over the age of 35 is advised to see their GP before undertaking a stress test.

The tests require you to wear your heart rate monitor, preferably one that records your heart rate otherwise it is necessary to glance at your monitor every few seconds or so to find your MHR during the test. For all the 3 tests it is important to warm up fully beforehand.

◆ STRESS TEST (1)

Find a hill with a reasonable gradient which takes between two or three minutes to run. Starting the test about 5 minutes running time from the hill, gradually begin picking up the pace and accelerating as you approach the hill.

The aim is to reach around 85% of your estimated MHR for the first time as you hit the base of the hill. Maintain your speed, which will require increased effort as you run up the gradient. Your heart rate will increase and you will tire quickly, but keep glancing at your monitor as you work towards the top and note the highest heart rate achieved.



◆ STRESS TEST (2)

On the running track, run 800m, the first 400m(one lap) at around 90%-95% of your estimated MHR which you must achieve by the end of this first lap. Without stopping, really “go for it” for the second 400m . . . You should “max out” during this second lap.

Extremely fit athletes may need to repeat this test after a few minutes rest in order to achieve a true maximum

◆ STRESS TEST (3)

On a treadmill run as hard as you can for 3 minutes, recover by running for 3 minutes at a slow pace, then as hard as you can for a final 3 minutes. Keep glancing at your monitor and note the highest value achieved during this final phase.

All these methods can be made a little easier by having a training partner (on a bicycle for the first 2 methods) with the monitor on their wrist while you wear the belt. This saves the need to keep glancing at your monitor and could prevent a potential fall, allowing you to concentrate on the test.

It is worth mentioning a final method which can be used by those not willing to undergo a stress test. This is the “Biggest Number” method, quite simply you take the highest number you have ever seen on your heart rate monitor during your most intense sessions or when racing all out, as your MHR.



Once you have determined your MHR, you can now use it to calculate your heart rate training zones and these are explained on the next page.

Heart Rate Training Zones

Training zones are based on a percentage of your maximum heart rate. Within each training zone subtle physiological effects take place to enhance your fitness.

- ◆ The Energy Efficient or Recovery Zone - 60% to 70%

Training within this zone develops basic endurance and aerobic capacity. All easy recovery running should be completed at a maximum of 70 %. Another advantage to running in this zone is that while you are happily fat burning you may lose weight and you will be allowing your muscles to re-energise with glycogen.

- ◆ The Aerobic Zone - 70% to 80%

Training in this zone will develop your cardiovascular system, the bodies ability to transport oxygen to, and carbon dioxide away from the working muscles.

- ◆ The Anaerobic Zone - 80% to 90%

Training in this zone will develop your lactic acid system. One of the by-products of burning glycogen, is the runners worst enemy, lactic acid. There is a point at which the body can no longer remove the lactic acid from the working muscles quickly enough. This results in a rapid rise in heart rate and a slowing of your running pace. This is your anaerobic threshold. Through the correct training it is possible to delay this and increase your ability to deal with the lactic acid for a longer period of time.

- ◆ The Red Line Zone 90% to 100%

Training in this zone will only be possible for short periods of time. It effectively trains your fast twitch muscle fibres and helps to develop speed. This zone is reserved for interval running and only the very fit are able to train effectively within this zone.

Resting Heart Rate

To calculate these % values from your MHR you will need to determine your resting heart rate (RHR). Find somewhere nice and quite, lie down and relax. Position a watch or clock where you can see the second hand. After 20 minutes remain where you are, do not sit up, and determine your pulse rate (number of beats in one minute). This is your RHR. As you get fitter your heart becomes more efficient at pumping blood around the body. As a result you will find your resting heart rate gets lower so you will need to check your RHR on a regular basis (e.g. Monthly).

Calculating your % zone values

- (1) Subtract your resting heart rate from your maximum heart rate
- (2) Calculate the required % from this figure
- (3) Add this figure to your resting heart rate to get your % zone

EXAMPLE:

Say an athletes Maximum Heart Rate is 180 and Resting Heart Rate is 60. The athlete wants to find his 70% value.

- (1) MHR minus RHR = 180 minus 60 = 120
- (2) 70% of 120 = 84
- (3) 84 + RHR = 84 + 60 = 144 beats per minute

That's all there is to it, choose your MHR test method and do a quick calculation at the end, just repeat the calculation for all your training values percentages for your individual training zones.

Yours in training,

Eddie Fletcher, **PhysioLink**
BSc(Hons) State Registered and Chartered Physiotherapist