



## Heart Rate Monitoring

### How to Use HR to Train Fitness and Performance

1. Determine Max HR with the age predicted chart or stress test. See methods below
2. Determine Anaerobic Threshold. See methods below
3. Determine time to recover the below suggested % of the Max HR.
  - a. For Zone 4-5 training: when your time to recover to your desired % improves by 10s, you can recover to a higher % before starting the next bout of exercise.
  - b. For Zone 4-5 training: If it takes more than 1 min to recover 20 beats / min you must reduce the intensity of your current exercise. If you do not recover 12 beats in min see a physician immediately (you are at risk of death).
4. Training zones are typically used to monitor cardiovascular training but it is a great tool for all styles of training. This is particularly true if you are attempting to maximize recovery (low end of recovery zone) or stimulate metabolism (high end of exercise & recovery zone).
5. Note the training zone table is predominantly for longer activity >20s in duration. If the total activity elapsed time is less than 20 sec in length (i.e. short SAQ intervals) it is often possible to repeat after 12-15% of HR recovery from the Max obtained HR per interval. This is assuming max effort and represents a similar start point (i.e. 144 if 180 is Max).
6. Observe cardiac drift (progressive elevation of HR after each interval). This is an indicator that the athlete isn't appropriately recovering after each repetition. If this occurs, adjust the percentage your athlete uses as a monitor when performing that type of exercise.
7. Record your data. The participant only needs to know when to start again. Give him an expected Max HR for that style of exercise and a percentage recovery. He can easily make his own calculations for these #'s.

Note: these recommendations are for healthy individuals below the age of 40. For clients above age of 40, a doctor should be consulted and these calculations should be lowered before performing **any** all out effort (i.e. Zone 4 or 5 training).

### Determining Anaerobic Threshold (AT)

In preparing to do scientific cardio training, it is important to approximately determine the level (HR & intensity) at which we go from a sustainable to non sustainable intensity.

#### 1) Stress Tests

Without current knowledge of max HR, a stress test must be performed. This test can be performed using any movement pattern that can be safely warmed up and challenged for at least 3 min straight. Good examples are:

- a) Near max speed running on an incline treadmill or hill. For this test you need a good hill. The hill needs to be moderately steep and take you about three



minutes (i.e. oxford hill in White Rock) to summit. Begin the test approximately five minutes or 1.5KM from the hill. Gradually accelerate towards the hill achieving 80-85% MHR at the base of the hill. Attempt to maintain your speed by increasing your effort. Your heart rate will rise and you will fatigue. Monitor the HR and make a mental note of your highest heart rate achieved. You can do a similar test on a treadmill.

- b) If no hill (i.e. prairies), it is possible to carry out a test on a flat piece of road or at your local running track. A crescendo 800m run. Finish the first 400 meters at a speed causing your breath to go shallow. For lap 2, the last 400 metres go for it. During this second lap, you must progressively build speed so that you are working at and battling to maintain 100% effort. If you are very fit or have left something in the tank, walk for 3 min and repeat this test. This test is very reliable.
- c) Make your own course including step-ups, simple fast foot drills, suicide cone run. If you prefer variety and are comfortable performing SAQ style activities, then my personal favourite is:
- Perform a dynamic warm-up then 1 submaximal run through of course below.
  - 30s of 6-9 inch of up up down down step-up,
  - 2 lengths of a speed ladder performing a straddle run as fast as humanly possible
  - 5 cones, 3-5m apart suicide run. Run and touch cone 2, run back to 1, 3 to 1, 4 to 1, 5 to 1.
  - Repeat entire circuit 1 more time. Total time will be approximately 3 min.

Notes:

- Before performing any high intensity activity or test, it is important to have medical clearance from a physician. If you have a family or recent history of heart disease this type of activity is not recommended.
- Before performing the test, warm-up progressing the intensity until your breath begins to go shallow.

### Methods for Determining Anaerobic Threshold (AT)

#### a) Calculate your Max Heart Rate (MHR)

- Apply the equation below.
- Use the age predicted MHR chart. This method isn't as accurate but is much safer with moderately active or with at risk populations.

Max Heart Rate (MHR) – Minus Resting heart rate (RHR) = Net Heart Rate (NHR). Apply the percentages for your zones (60-70, 70-80-, etc.) + RHR to



create(delete) determine the appropriate effort and training zones (see chart below). For Example:

- 1) Max HR (200) – Resting HR (50) = 150
- 2) 150 x .85 (very active AT) = 127.5
- 3) 127.5 + Resting HR (50) = 177.5 as my 85% training intensity

## ARC Age Predicted HR Recovery

AGE		60	55	50	45	40	35	30	25	20
<b>Max HR</b>		<b>160</b>	<b>165</b>	<b>170</b>	<b>175</b>	<b>180</b>	<b>185</b>	<b>190</b>	<b>195</b>	<b>200</b>
Zone 5	100% ↑90%	160 144	165 149	170 153	175 158	180 162	185 167	190 171	195 176	200 180
Zone 4	90% ↑80%	144 128	149 132	153 136	158 140	162 144	167 148	171 152	176 156	180 160
Zone 3	80% ↑70%	128 112	132 116	136 119	140 123	144 126	148 130	152 133	156 137	160 140
Zone 2	70% ↑65%	112 104	116 107	119 111	123 114	126 117	130 120	133 124	137 127	140 130
Zone 1	65% ↑55%	104 88	107 91	111 94	114 96	117 99	120 102	124 105	127 107	130 110

- When training in Zone 5, if you observe HR max's greater than your predicted, then adjust your training zones according to your new maximums

*Inactive* = I highly recommend you 8-12 weeks in a walk run program before performing high intensity cardio or SAQ training.

*Moderately active* (2x-3x cardio or HR challenging activities / wk) = assign 78-82% as your threshold)

*Very Active* = (4-5x cardio or HR challenging activities / wk) = assign 83-87% as your threshold)

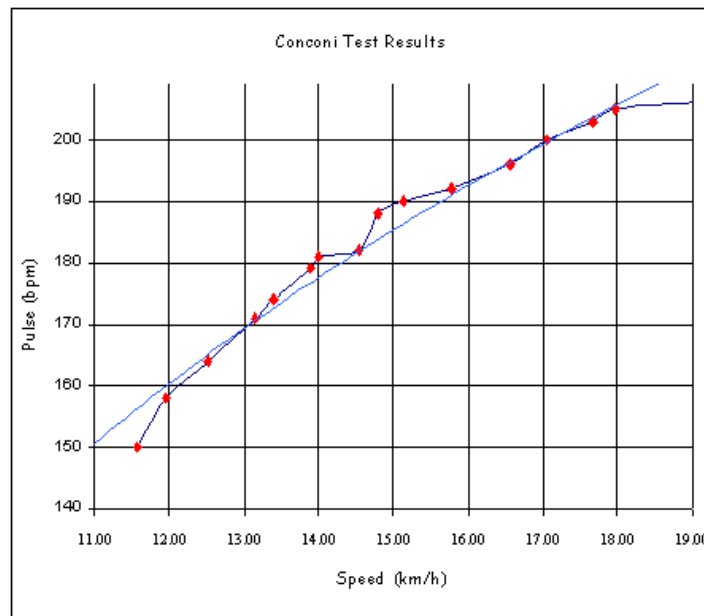
NB\* these percentages can be adjusted based on trial and error and may vary depending on the type of activity you are participating in.

- b) *Conducting the Test on a Treadmill or Bike test to determine heart rate deflection point*



- The participant progressively warms up for 8-10 minutes to point of approximated AT.
  - Starting at a light jog, increase treadmill **incline level by 1, speed by .5mph**
  - On cycle increase by **1-2 levels 90s** (be consistent)
  - Once breath goes shallow or approximated AT is reached, reduce to fast walking pace for 1 min and begin test **2-3 steps below** the approximate AT.
- The participant commences the test, starting their HRM / watch and the assistant starts the stopwatch or uses the timer on the exercise device.
- Be certain to use consistent increments that allow for at least **6-8 data points** before fatigue / speed drop off occurs.
- The trainer records the HR every 90s, noting the Ventilatory Threshold (VT)\*
- The trainer increases the treadmill speed (.5mph) & level (1' incline) every 90s.
- The trainer stops the stopwatch when the athlete is unable to continue and records the final HR - the athlete stops their HRM watch recording

On graph paper, or in excel, plot your HR's against your speed. You will find the graph gradually rises to start with and then briefly flattens before rising again. This flattening and deflection point in the graph indicates the participant's anaerobic threshold (AT). In the example conconi graph below this flattening appears to be around 182pm.



NB\* in a small portion of the population, no deflection point will be discernable. In this case, ventilatory threshold (VT) – the point where depth of breath changes deep, long breath to shallow, short breaths will be used.



### Using Heart Rate to Train

1. Zone 1 (50-60%): Easy to moderate intensity
2. Zone 2 (61-75%): Somewhat hard, breath still controlled
3. Zone 3:(76-AT%)Hard, but conversational
4. Zone 4:(AT – 90%) Very hard & non conversational
5. Zone 5: (90-100%) Max effort

Fitness	Performance / Athlete
<ul style="list-style-type: none"> <li>For Zone 4-5 activities, Use 20% as your start point for recovery between repetitions for Zone 4 or 5 exercises.</li> <li>Use 10-15% for exercises involving Zone 2-3 activities</li> <li>Example calculation (180 x .2 = 36). Subtract 36 from 180 = 144.</li> <li>You can use this method to determine your start point or work to rest intervals regardless of the interval length, rest length etc.</li> </ul>	<ul style="list-style-type: none"> <li>For Zone 4-5, Use 25% as your start point for recovery between repetitions.</li> <li>Use 15-20% for exercises involving Zone 2-3 activities</li> <li>Example calculation (190 x .25 = 36). Subtract 47.5 from 190 = 142.5.</li> <li>You can use this method to determine your start point or work to rest intervals regardless of the interval length, rest length etc.</li> </ul>

Type of Training	Peak HR Zone (at end of interval)	HR (recovery:work ratio )
Core Activation Warm-up	Zone 1	Constant 50-60%
DROM Warm-up	Zone 2	Constant 75-85%
Dynamic Warm-up	Zone 3	Constant 75- <AT%
Lower Strength	Zone 1-Lower 4	50-60% : 80-85%
Upper Strength	Zone 1-Upper 3	50-60% : 76-85%
Functional Strength	Zone 2-Upper 4	61-75% : 85-90%
Linear Cardio Intervals	Zone 4-Lower 5	61-75% : 85-95%
360' SAQ Short Intervals	Zone 2-Upper 4	61-75% : 85-90%
360' SAQ Long Intervals	Zone 3-5	76-80% : 90-100%
<ul style="list-style-type: none"> <li>for advanced fitness or athletes attempting to build fatigue resistance recover to higher end of recovery (i.e. less rest).</li> <li>Less fit or athletes not attempting to develop fatigue resistance, recover to low end of recovery (i.e. more rest).</li> </ul>		

SAQ Drill Type	ARC HR Zone	HR (Recovery:Work Ratio )	Indiv Zone HR
Core Activation	Zone 1	Constant 50%-60%	
General Warm-up	Zone 2-3	Constant 61-AT%	
Dynamic ROM	Zone 2-3	Constant 61-AT%	
Med Ball Drills	Zone 3-4	65-75% : 75-90%	
Ladders	Zone 2-4	65-75% : 85-90%	
Hurdles	Zone 2-5	65-75% : 85-95%	
Cone & Pattern Drills	Zone 2-5	70-75% : 90-100%	