

Introduction to Exercise Physiology

Practical 7 – Cardiovascular aerobic endurance

Learning Objectives

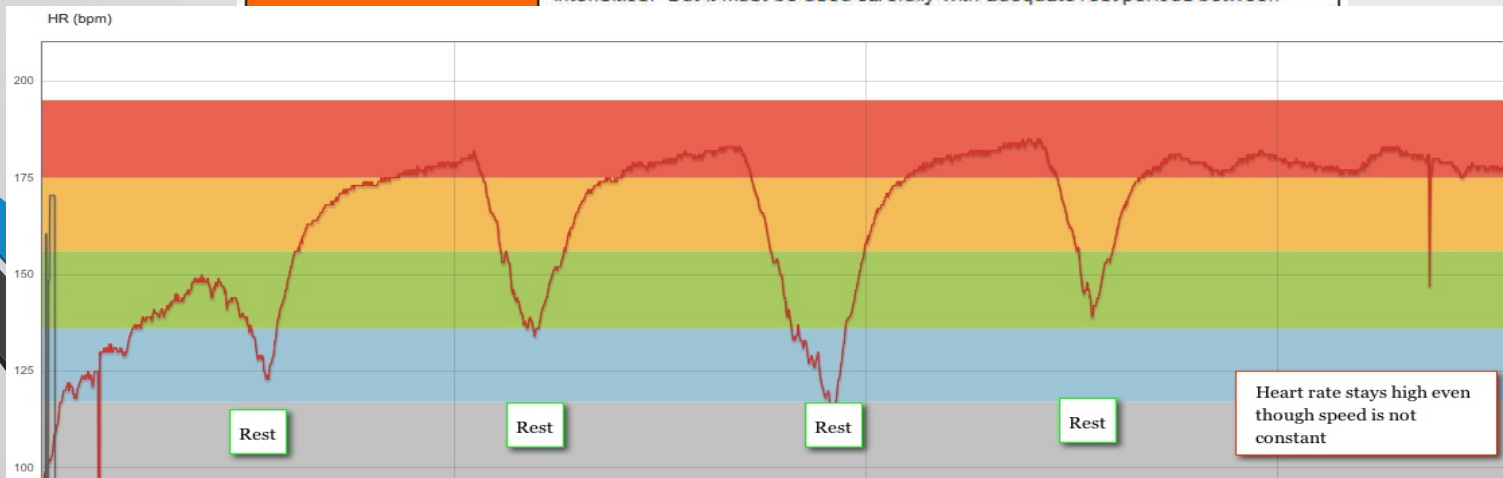
- To define the values around heart rate
- To demonstrate the use of the submaximal Astrand test to determine VO^2 Max
- To be able to record data on excel documents accurately and understand the effects of the measurements you have taken.

Determining Heart Rate

- Resting
 - Sit quietly for 2 minutes
- Maximal
 - $220 - \text{age}$
 - $210 - 65\% \text{age}$
 - Maximal exercise test (step wise)
- Aerobic training
 - Between 65% and 90% max heart rate

Using Heart Rate for Training

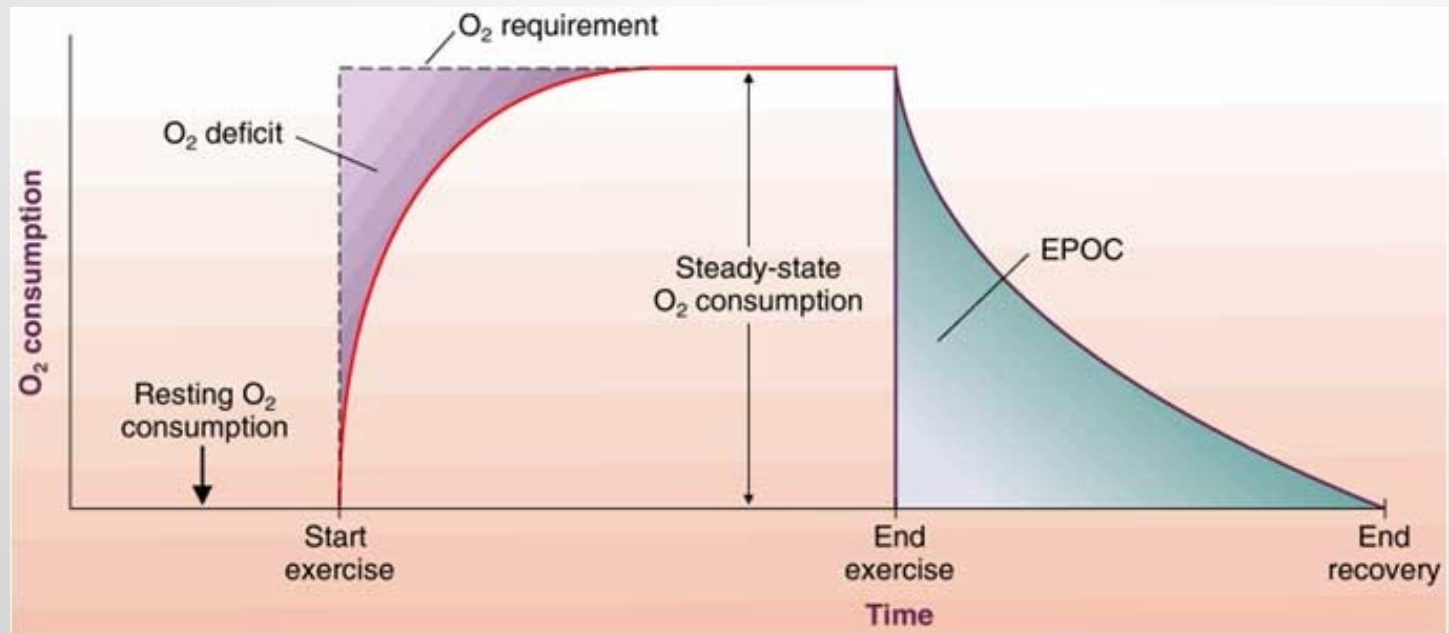
Heart Rate Zone	Description
Zone 1 BLUE Zone (Aerobic)	<u>Active Recovery</u> This is a low-intensity heart rate exercise zone used to establish a strong cardiovascular "base" or foundation. Exercising in the BLUE Zone promotes increased oxygen absorption, fat-burning capacity, and energy-making capacity. Generally, exercising in this zone is used for what is known as "active recovery" following intense exercise in other, more intense heart rate zones.
Zone 2 GREEN Zone (Aerobic)	<u>Endurance</u> This is a moderate-intensity heart rate exercise zone used to improve overall conditioning and endurance. A good portion of your cardio/aerobic exercise time will be spent in this zone, at least initially. Exercising in the GREEN Zone is also good for efficient calorie burning, particularly after you perform your strength training.
Zone 3 YELLOW Zone (Aerobic+Anaerobic)	<u>Lactic Acid Tolerance/Strengthening</u> This is a higher-intensity heart rate exercise zone designed to improve your aerobic conditioning while introducing a slightly-challenging anaerobic component. When exercising in this zone, lactic acid is produced, but not in sufficient quantities to immediately degrade your performance and prematurely exhaust you. Exercising in the YELLOW Zone increases your tolerance and ability to exercise harder when you are required to, particularly when strength training or performing "intervals" during your cardio/aerobic exercise. It also enhances your fat-burning potential only if you are "conditioned" for it.
Zone 4 ORANGE Zone (Anaerobic)	<u>Interval Training/Fitness Enhancement</u> This is a high-intensity exercise zone designed to take your cardio/aerobic fitness to the next level without compromising your strength and muscle mass. Exercising in the ORANGE Zone challenges both your aerobic and anaerobic metabolisms and teaches your body to perform at higher exercise intensities. But it must be used carefully with adequate rest periods between



Oxygen Uptake (VO_2)

- the amount of oxygen required to sustain aerobic energy requirements at any given intensity of exercise.
- VO_2max – the **maximal** amount of oxygen that can be used within the aerobic energy pathways.
- Expressed as lt/min – absolute value
- Expressed as ml/kg/min – relative value

Oxygen Uptake



Astrand



- Safety Information
- Record body weight
- Set seat height
- Set an appropriate initial work load. This should be 55rpm watts for women and 75 rpm for men with the air resistance on 1.
- The participant then cycles at this workload for 2 minutes. Record to the heart rate at 2 minute intervals.
- Increase the intensity for women to 75rpm and then air resistance levels 4/ 7 and 10 at two minute interval until:
- The mean heart rate is between 125 and 170 beats per minute, the test can be terminated.
- At the end allow the subject to keep pedalling at an easy pace with the load removed from the ergometer, for about one minute.

Astrand

- To work out VO_2 Maximum, use the correct scales for males and females to determine aerobic work capacity. You will then need to apply an age factor.
- Once you have completed the age correction factor you will then need to divide the result by 1000 (to give a mL value) and multiply by the bodyweight.

VO₂max Norm values for Men (ml/kg/min)

	18-25 years old	26-35 years old	36-45 years old	46-55 years old	56-65 years old	65+ years old
excellent	>60	>56	>51	>45	>41	>37
good	52-60	49-56	43-51	39-45	36-41	33-37
above average	47-51	43-48	39-42	35-38	32-35	29-32
average	42-46	40-42	35-38	32-35	30-31	26-28
below average	37-41	35-39	31-34	29-31	26-29	22-25
poor	30-36	30-34	26-30	25-28	22-25	20-21
very poor	<30	<30	<26	<25	<22	<20

VO₂max Norm values for Women (ml/kg/min)

	18-25 Years old	26-35 years old	36-45 years old	46-55 years old	56-65 years old	65+ years old
excellent	56	52	45	40	37	32
good	47-56	45-52	38-45	34-40	32-37	28-32
Above average	42-46	39-44	34-37	31-33	28-31	25-27
average	38-41	35-38	31-33	28-30	25-27	22-24
Below average	33-37	31-34	27-30	25-27	22-24	19-22
poor	28-32	26-30	22-26	20-24	18-21	17-18
very poor	<28	<26	<22	<20	<18	<17

Task

Record all your results on the excel document under a separate
TAB

Compare your results with the normative data