

1. Exercise intensity is an important parameter in exercise physiology. It can be estimated in several ways.

- a) Discuss the pros and cons of estimating exercise intensity using an objective method (heart rate monitors) versus a subjective method (Rating of Perceived Exertion) (4 points).

Objective

Pro: derived from linear HR-VO₂ relationship and workrate; reliable, accurate, relatively cheap

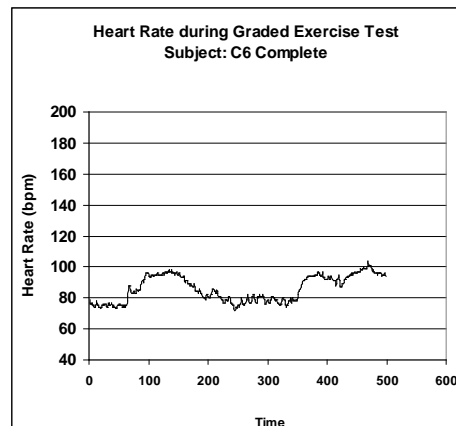
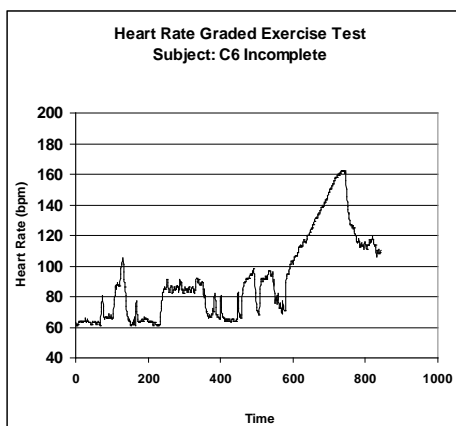
Con: prone to internal and external influences (drift, temp, etc); problematic in some patients

Subjective:

Pro: reflect integral state of various body functions; very cheap/free; no need for large HRR

Con: reliability not as good, especially in sedentary people

- b) Below are 2 examples of heart rate recordings of 2 individuals with a C6 spinal cord injury during a graded exercise test. The protocol was first a warm up, followed by 2 submaximal blocks at constant power output (PO), followed by continuously increasing PO until exhaustion. Discuss possible explanations for the differences between the 2 recordings. (3 points)

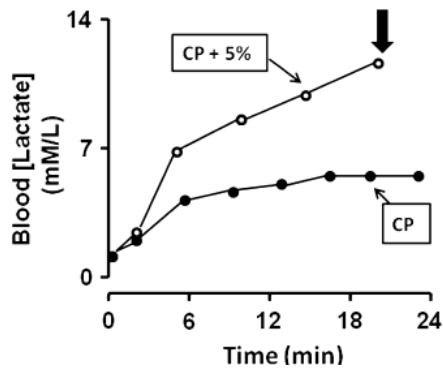


- Right: autonomic dysfunction, sympathetic nervous system not working well
- Right: very limited muscle mass; fast fatigue;

- c) Discuss whether heart rate recordings can be used in individuals with spinal cord injury to estimate/prescribe exercise intensity. (3 points)

- Can be used, but have to individually assess whether HR-VO₂-PO relationship is normal, whether HRR is large enough

2. According to Jones et al. (2010), the Critical Power (CP) concept constitutes a practical framework in which to explore mechanisms of fatigue and help resolve crucial questions regarding the plasticity of exercise performance and muscular systems physiology.



a) Describe the CP model using the graph above. Also discuss what the arrow could point at. (3 points)

- CP maximum power a person can exercise at for very long time. Stabilization of Lactate, VO_2 , HR etc is possible, not above CP.
- Arrow indicates exhaustion, or reaching VO_{2max} ; all AWC has been used

b) The CP model as described in Morton (2006) is based on several assumptions. One of the assumptions is “Aerobic power is available at its limiting rate CP the moment exercise begins and remains so right up until the end of exercise..”. Discuss why this assumption is not fully correct (2 point)

- Aerobic energy system needs time to gear up. Gradual increase from start to max in about 3 minutes.

c) Using the figure below, describe how Wilkie (as described by Morton) tried to correct for this assumption (3 points)

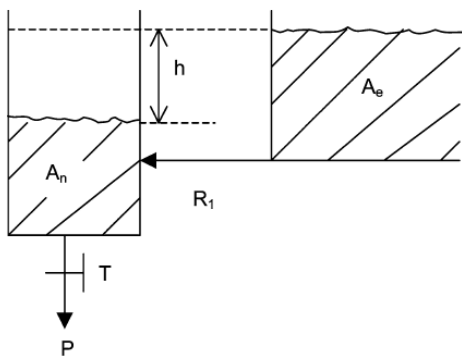


Fig. 3 Wilkie's correction to the CP hydraulic model

A_n and A_e at same level. R_1 lower. Height difference h will increase after start due to dropping in A_n . A_e will start to contribute through R_1 . As h increases, so will contribution of A_e .

d) Describe the 2 methods to determine the Critical Torque (as described in Burnley 2009) (2 points).

- 5 tests at constant but different submax torque until fatigue. Plot Torque-Time relationships, determine asymptote: CT
- All-Out 5-min test, max contractions with short rest. Average torque at end of test represents CT.