Resting & Exercise Measures of Cardiovascular Function

Introduction

Heart rate (HR) is an easy way to measure an individual's cardiac function and estimate fitness level. The more efficient the cardiovascular system the lower the heart rate and the greater the stroke volume (amount of blood ejected by the heart with each beat). HR increases proportionally with the workload (up to maximum levels where HR plateaus – "steady state"). In terms of exercise prescription it is critical to understand that a linear relationship exists between HR and exercise intensity.

Statement of the Objectives

1. To become familiar with blood pressure and heart rate responses to aerobic exercise.
2. To practice palpation measures of heart rate.
3. To understand the influence of various physiological and environmental factors.
4. Measurement of HR during rest and exercise.

Methods

- Obtain subjects height and weight; provide these data to the laboratory assistant.
- Fit the subject with a Polar heart rate monitor and ask the subject to be seated for approximately 2 minutes. Measure resting heart rate from the monitor and radial artery.
  Record these data.

Arterial locations for taking the pulse by palpation:

A. **Carotid artery** --in the neck, just to the side of the larynx (voice box).
B. **Brachial artery** -- in the upper arm, medial to the inferior third of the bicep.
C. **Radial artery** -- lateral side of the wrist.

To measure radial heart rate:

- ❖ Use your index and middle fingers
- ❖ Do not use your thumb since it contains an arterial pulse itself
- ❖ Start the stopwatch on a pulse beat and begin the count with zero
- ❖ Count the pulse at one location during a: 30-second interval; 15-second interval; a 10-second interval; or a 6-second interval

- Have subject lie supine for approximately 2 minutes. Determine the measures of HR in this position.

- Position subject on exercise machine and take HR for 2min.

- Instruct the subject to begin exercise. Start the clock when the desired rate and resistance are achieved. (Instructor will clarify workloads for LOW and HIGH)

- Measure HR-Polar (last 3 seconds of each minute) and HR-Palpation TBD by TEAM during each minute of exercise.

- At the end of the 12-minute exercise period, stop exercise. Subject should remain on exercise machine for a 6-minute recovery period. Measure recovery HR for each minute of the post-exercise period. Proceed to next condition (high power output) when HR is ± 10-15 beats/min from resting HR.

Laboratory #1 – Recording Form

Measurement of HR during rest and exercise.

Subject Name _____ Age _____

Sex _____ Height _____ in Weight _____ kg

Resting HR
(Subject **Seated**)
HR (Polar) _____ $b \cdot min^{-1}$ HR (Radial artery) _____ $b \cdot min^{-1}$

(Subject **Supine**)
HR (Polar) _____ $b \cdot min^{-1}$ HR (Radial artery) _____ $b \cdot min^{-1}$

LOW workload

	Time (min)	HR ($b \cdot min^{-1}$) Palpation	HR ($b \cdot min^{-1}$) Polar
Mode **details**	1		
	2		
Start Exercise	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12		
Recovery	1		
	2		
	3		
	4		
	5		
	6		

HIGH workload

	Time (min)	HR ($b \cdot min^{-1}$) Palpation	HR ($b \cdot min^{-1}$) Polar
Mode **details**	1		
	2		
Start Exercise	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12		
Recovery	1		
	2		
	3		
	4		
	5		
	6		

Results

Create a graph and plot HR vs. Time for both of the exercise conditions.

Discussion Questions

Compare seated & supine heart rates. What factors may account for the differences with these postural changes?

Were the 2 methods of measuring HR the same? Explain. List some possible reasons why the Polar monitor and palpation would differ.

Did the physiological responses reach a steady state during cycle exercise? Was this true at both power outputs? If not, which power output did not reach a steady state? What are some reasons why this may have occurred? Hint: define 'steady state!'

Which energy fuel substrate is being utilized during rest and during each test condition? Why?

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