

## **Lab 11 Cardiovascular Measurements**

**Purpose:** The purpose of this lab is to investigate and measure the effects of changes with sitting vs standing and exercise on various cardiovascular parameters, including blood pressure and pulse rate. Additionally, the report explores the relationship between physical fitness and the ability to recover a normal resting pulse rate after a period of exercise. Measure and compare blood pressure values during different positions (sitting vs standing) changes and exercise to understand how the cardiovascular system responds to these conditions. Analyze the changes in pulse rate before, during, and after exercise to determine how quickly individuals can return to their resting pulse rate.

### **Procedure:**

#### **11-A: Determination of blood pressure**

1. Wrap the pressure cuff of the sphygmomanometer snugly around the upper left arm of your lab partner. Your lab partner should assume a relaxed, sitting or supine position.
2. Place the stethoscope securely over the brachial artery. Close the pressure valve and begin pumping up the rubber ball.
3. You will begin to hear the arterial pulse as you pass the diastolic pressure. Continue pumping until the pulse is not heard, approximately 10 mmHg above your partner's normal systolic pressure. The brachial artery is now totally occluded.
4. Slowly open the pressure valve and listen for the pulse sounds to reappear as the pressure drops. These are known as Korotkoff sounds.
5. The first sound heard signals the systolic BP. Record this value from the scale.
6. The sound will become louder as the pressure drops until it finally starts to become muffled. Record the pressure at which the sound vanishes. This signals the diastolic BP. Record your blood pressure as systole/diastole
7. Alternate with your lab partner and repeat these procedures.
8. Next, measure the BP of each of you immediately upon standing. (NOTE: be sure to have your cuff inflated prior to standing, so that you can begin to release pressure immediately upon standing.)
9. Lastly, measure the BP three minutes after standing. Record these values for your use and on the chalkboard.

### **11-B: Demonstration of a measure of physical fitness**

1. Select three students who exercise regularly and three students who do not. Each student will take his/her resting pulse rate for one minute and record this value.
2. Each student will then run the track twice at a fast but comfortable pace.
3. Immediately upon returning to the laboratory, each student will record his/her pulse after exercise.
4. Each student will take his/her pulse at one minute intervals until the resting pulse is reestablished. (NOTE: The best method to employ is to take the pulse rate for 15 seconds and multiply by 4.)
5. These results will be recorded on the chalkboard for discussion. Is there a difference between the exercisers and the non-exercisers? Which student(s) do you consider to be in better physical condition? Why?
6. Determine the target heart rate range for each student (if the ages are available) and for yourself. The target heart rate range determines the heart rate that should be maintained for 20-30 minutes, at least 3 times per week for cardiovascular fitness. To determine your target heart rate range do the following calculations for the Karvonen formula (only use numbers rounded off to whole numbers):
  - a.  $220 - \text{your age} = \text{maximum heart rate (max HR)}$
  - b.  $\text{Max HR} - \text{resting HR} = \text{HR reserve}$   
(to find your resting heart rate, take your pulse before getting out of bed each morning for three days and then take the average)
  - c.  $\text{target heart rate range} =$   
 $(\text{HR reserve} \times 60\%) + \text{resting HR} = \text{low target heart rate}$   
 $(\text{HR reserve} \times 80\%) + \text{resting HR} = \text{high target heart rate}$   
Example: 20 year old with a resting heart rate of 65 beats per minute  
 $220 - 20 = 200 (\text{maxHR})$   
 $200 - 65 = 135 (\text{HR reserve})$   
 $(135 \times 60\%) + 65 = 81 + 65 = 146$   
 $(135 \times 80\%) + 65 = 108 + 65 = 173$   
This student's target heart rate range would be 146 – 173 beats per minute.
7. Include your calculations for your target heart rate in the results section of your report.
8. Evaluate the class results in terms of target heart rate and level of fitness for each individual.

## Results:

### 11-A: Determination of blood pressure

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BP Sitting	124/64	123/60
BP Standing	110/60	130/80
BP After 3 mins of Standing	100/60	123/53

### 11-B: Demonstration of a measure of physical fitness

#### Experiment 11 B

1. Observe / understand background

2. Does biological sex affect HR recovery?  
Male vs. Female

3. Hypothesis: NO difference between male vs Female

4. Design Experiment ... w/ proper controls

5. Get Results

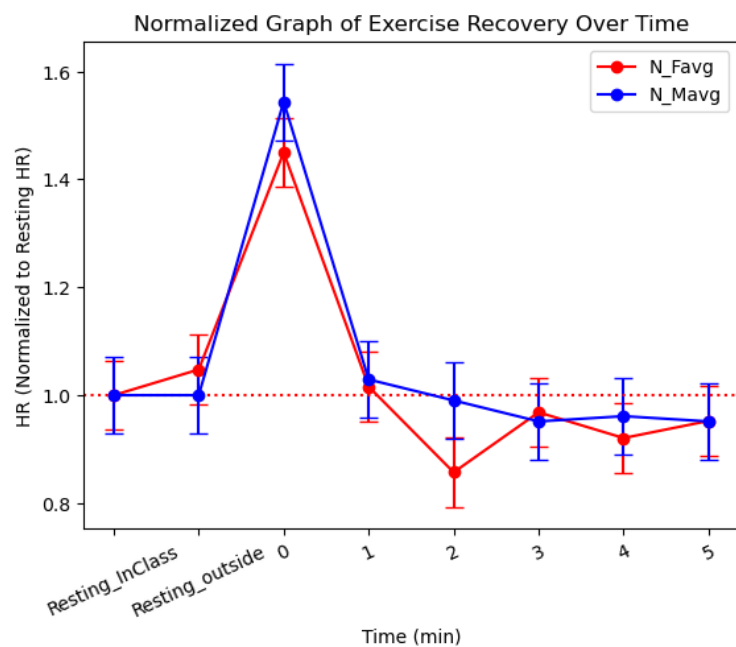
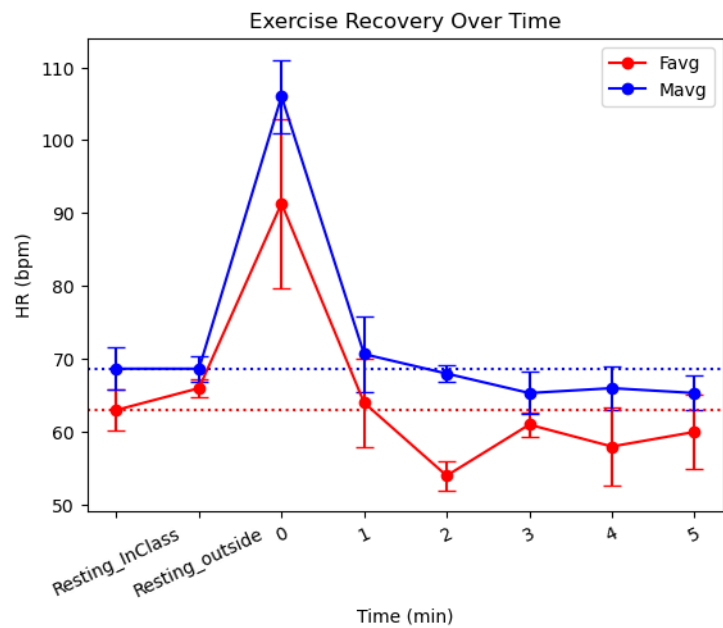
Female Average

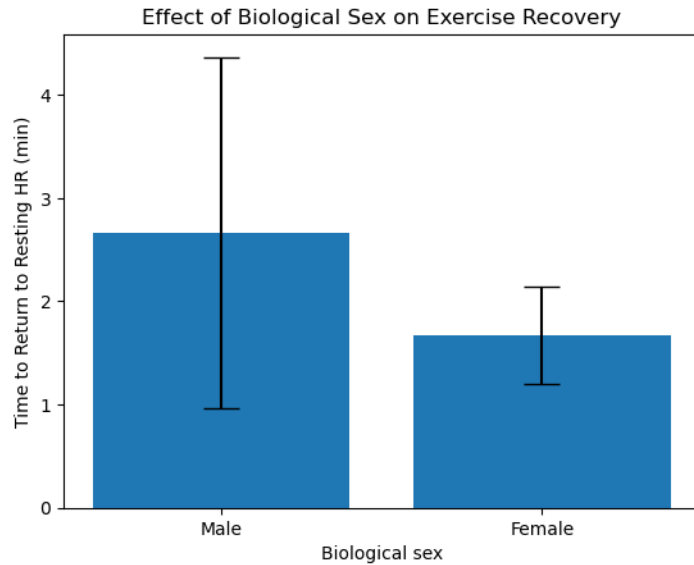
6. Analyze Data

Male Average

7. Conclusion

	Resting in class	Resting Outside	After Exercise	1	2	3	4	5
F1	58	62	72	68	56	58	48	50
F2	68	64	112	52	56	64	62	66
F3	63	68	90	72	50	61	60	64
M1	64	66	116	70	68	66	68	64
M2	74	72	102	80	70	70	70	70
M3	68	68	100	62	66	60	60	62





**Discussion:** The measurements assessed in this laboratory experiment are essential indicators of an individual's overall health and fitness. Blood pressure is a critical indicator of cardiovascular health. It is expressed as a ratio of systolic pressure over diastolic pressure. Systolic pressure corresponds to the pressure when the heart's ventricles contract, while diastolic pressure is the pressure when the ventricles relax. The pulse pressure is the difference between these two values, providing insights into arterial elasticity and cardiac output.

**Conclusion:**

- Understand the events that occur during the taking of a normal blood pressure.
- Know the normal blood pressure values for ventricular systole and diastole.
- Understand the effects of postural changes on blood pressure.
- Understand the function of a well-developed cardiovascular system in relation to physical fitness.
- Be able to calculate your target heart rate range for cardiovascular fitness.
- Be able to describe the major events that occur during a mammalian diving response.