Juan Marino

Professor Okerblom

Human Physiology

27 October 2023

Lab #11-CARDIOVASCULAR MEASUREMENTS

Purpose

The purpose of this lab is to learn how to properly execute a blood pressure test using a pressure cuff from a sphygmomanometer and a stethoscope. Another experiment will also be comparing the effect of biological sex on regular exercise and how long the heart rate will take to return to normal parameters. We will then be comparing between males and females before and after physical activity and determine if there is an effect on recovery time. Finally, we will also be testing the diverse response to see its effect in regards to heart rate and if it slows down as soon it comes in contact with colder temperatures in water.

Procedures

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.
10. Discuss the orthostatic response in terms of the receptors used and the effects of postural change. Include any limitations to obtaining reliable results.

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 re-established. (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 – your age = maximum heart rate (max HR)
b. Max HR – resting HR = HR reserve (to find your resting heart rate, take your pulse before getting out of bed each morning for three days and then taking the average)
c. target heart rate range =
(HR reserve x 60%) + resting HR = low target heart rate
(HR reserve x 80%) + resting HR = high target heart rate
Example: 20-year-old with a resting heart rate of 65 beats per minute
220–20 = 200 (max HR)
200–65 = 135 (HR reserve)
(135 x 60%) + 65 = 81 + 65 =146
(135 x 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

11-C: Demonstration of the diving response(Extra Credit)

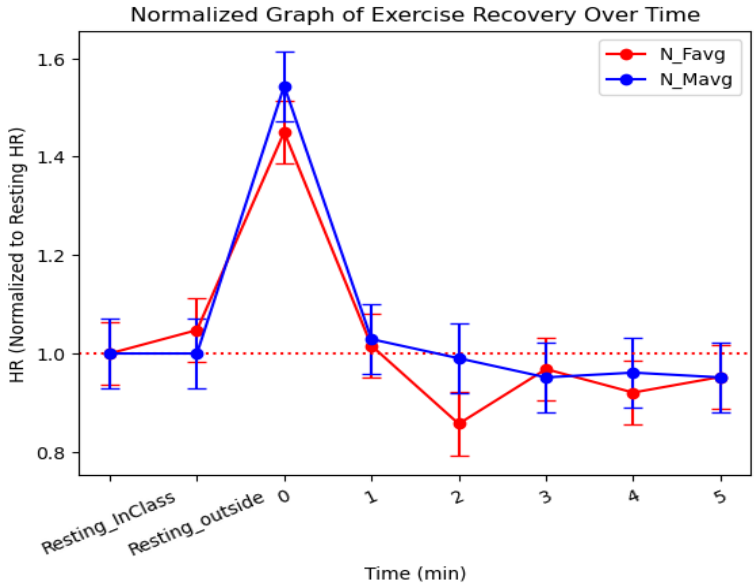
1. Fill a large tub with ice-cold water.
2. Select one student volunteer and hook him/her up to the computer.
3. Recordings of a Lead II ECG and pulse pressure from a thumb will be obtained with the student at rest for a baseline measurement.
4. Recordings will then be taken with the student holding his/her breath for at least 20 seconds, hopefully for 30 seconds.
5. The experiment will be repeated with the student holding his/her breath and placing his/her head into a bucket of ice-cold water.
6. Include copies of the results in your lab report.
7. Evaluate the three sets of data in terms of bradycardia and vasoconstriction. What are the adaptive advantages of these reflexes?

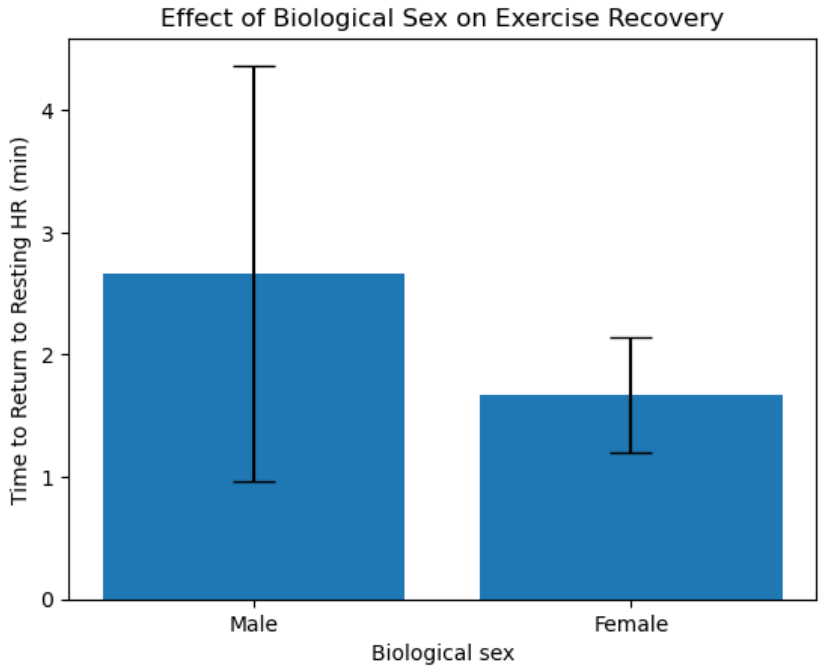
Results

11-A: Determination of blood pressure:

TRIAL 1	120/80
TRIAL 2	120/80
TRIAL 3	120/70

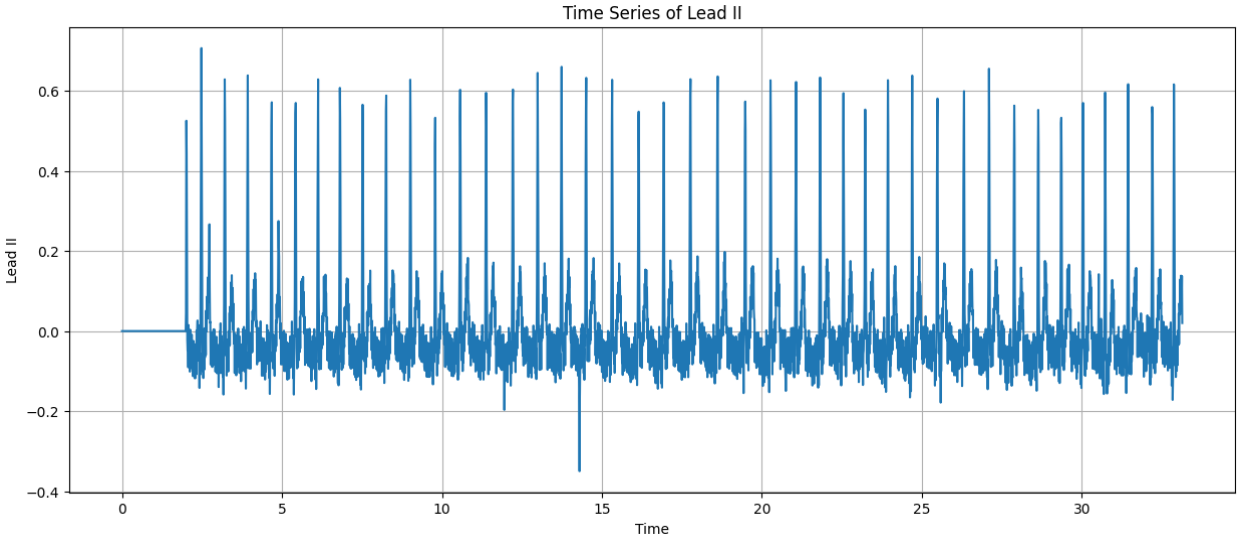
11-B: Demonstration of a measure of physical fitness

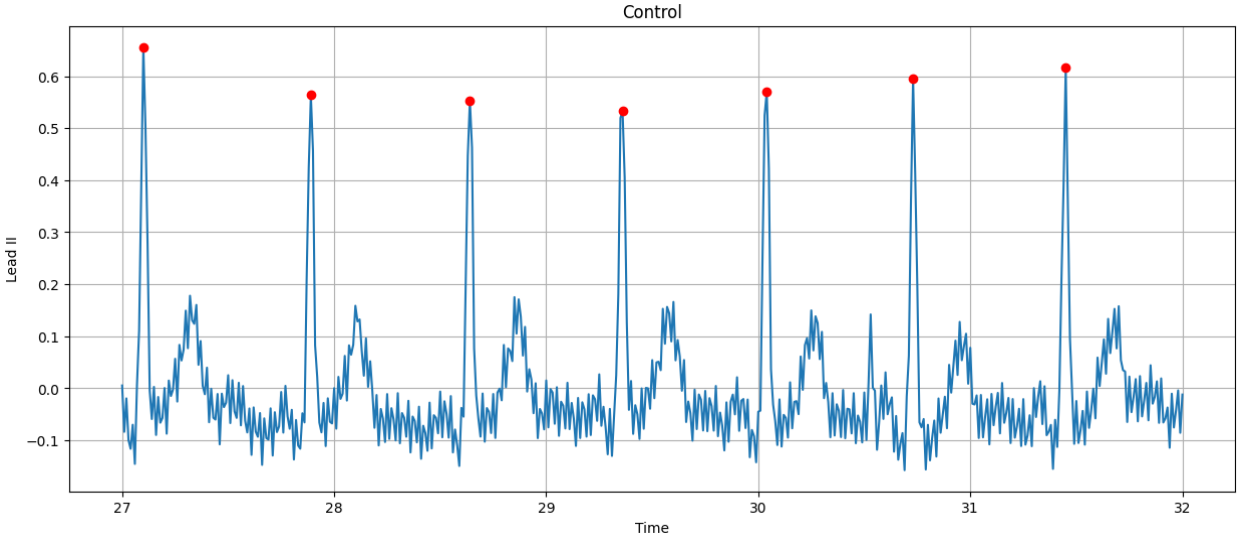




11-C: Demonstration of the diving response(Extra Credit)

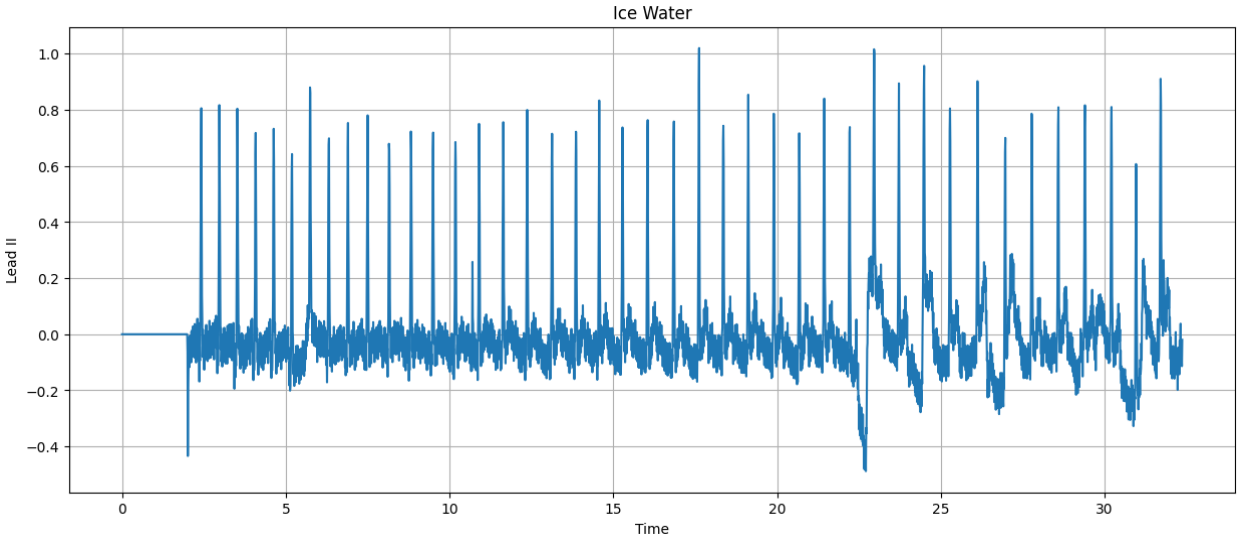
Normal Heart Rate(Control)

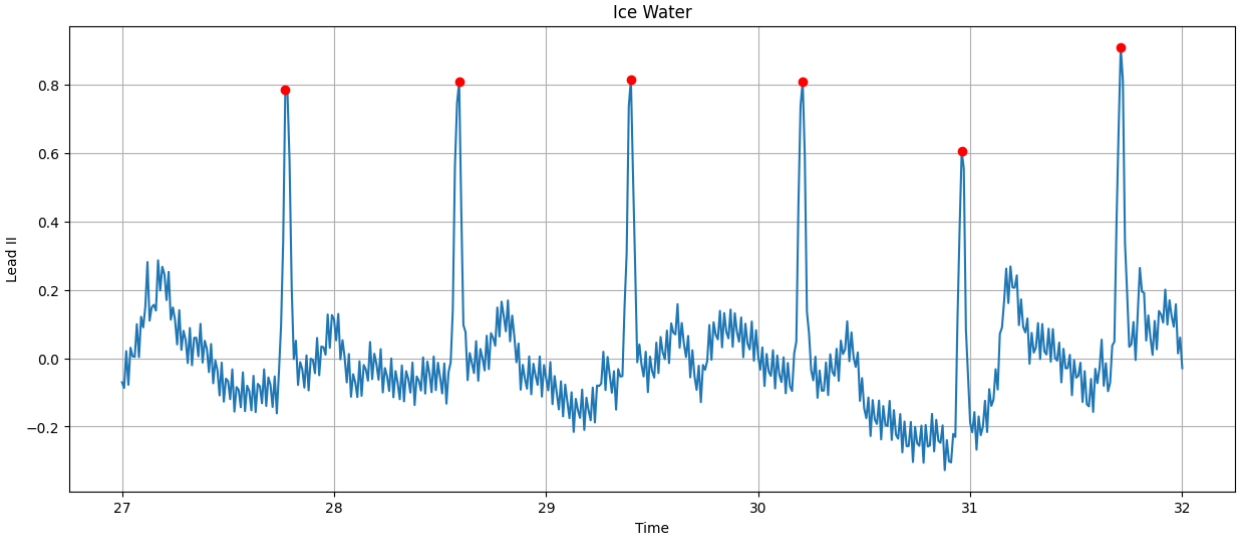




Average RR interval in the window: 0.77 seconds Heart rate in the window: 77.52 BPM

Divers response 30 Seconds in Ice Water





Average RR interval in the window: 0.82 seconds Heart rate in the window: 72.82 BPM

Discussion

11-A: Determination of blood pressure:

For this experiment, everything came out normal for a male my age(21). The average blood pressure for someone my age is 119/70, I got an average blood pressure of 120/76 which seems to be within normal parameters. Other than having normal blood pressure, I thought it was really cool to learn how to take blood pressure using a pressure cuff and a stethoscope, I had only ever seen it done with a machine before then. Overall, the results look normal.

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

The results show that women have a faster recovery time to exercise than men do, according to the data it takes men about two and a half minutes to recover from a workout and have their heart rate return to resting. Women have a recovery time of about one and a half minutes, this means

that on average, women have a faster recovery time from intense workouts compared to men. Therefore, according to the data, the effect that biological sex has on recovery time from expertise is that women will return to a resting heart rate faster than men. I believe that the reason behind it is that on average men are heavier than women and also naturally contain more muscle fiber, meaning that women don't need nearly as much rest as men do. Another reason for women having a faster recovery time is the anti-catabolic effect of estrogen, meaning that due to estrogen, muscles break down a lot slower than they do in men and therefore allow for a faster recovery time in women overall.

11-C: Demonstration of the diving response(Extra Credit)

The results clearly show a response to the colder water in the container. In the controlled data that was taken prior to dipping my face into cold water in a normal environment, I had an average resting heart rate of about 77.52 beats per minute. After dipping my face into the ice-cold water for 30 seconds(felt like an eternity because that water wasn't just cold, it was COLD COLD) my average heart rate had dropped to 72.82 beats per minute. This shows a 4.7 beats per minute difference between the control and the ice water, this clearly shows that there in fact is a diverse response to cold water. While the difference may not be super great, it's still very intriguing regardless, I say this because I was struggling to keep my face in the water so I thought my heart rate would actually climb and not drop like it did.

Conclusion

11-A: Determination of blood pressure:

The results were within normal ranges for a male my age, we learned how to properly perform and execute a blood pressure test using a pressure cuff from a sphygmomanometer and a stethoscope.

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

The results showed that there indeed is an effect on biological sex and recovery time from workouts, the data displayed that on average, women tend to recover a minute faster than men do. Two possible reasons for this being the case could be due to men being heavier than women because men naturally contain more muscle fiber compared to women. A second reason women could have a faster recovery time when compared to men is because of the anti-catabolic effect of estrogen that causes muscle to tear at a slower rate when compared to men. These two factors combined could be a possible explanation as to why women recover faster than men.

11-C: Demonstration of the diving response(Extra Credit)

The results showed that we as humans do indeed have what is known as a “divers response”. The divers response states that as soon as our body hits water that is at a lower temperature than natural, our heart rate also tends to drop along with it. This was clearly shown in the difference between the average heart rate under normal conditions as compared to the average heart rate after placing my face in ice-cold water. While the difference in heart rate wasn't great, it still displayed a drop in average heart rate after being exposed to the colder temperatures in the ice water and therefore shows that humans do indeed have a divers response when entering water that is lower than our body temperature.