Brisa Herrera

Laboratory 11- Cardiovascular Measurements

October 22, 2023

Purpose – Cardiovascular parameters, other than EKG, may be measured which reflect the general condition of an individual. Among these parameters are blood pressure, heart sounds, and pulse rate. Comparison of the values obtained between resting and exercise states may provide a good measure of the physical fitness of a person. In this laboratory, you will measure the effects of postural change and exercise on these cardiovascular parameters using several different types of equipment. A method of determining the physical fitness of an individual will be demonstrated.

Procedures – For lab 11-A, determination of blood pressure we understood 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, understood 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, be able to identify the first and second heart sounds on a graphical record, understand the various parts of the arterial pulse wave, be able to determine the pulse rate from a graphical record, understand the functions of the heart sounds microphone-pulse transducer. We started off by wrapping the blood 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. Place the stethoscope securely over the brachial artery. Close the pressure valve and begin pumping up the rubber ball. 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. Slowly open the pressure valve and listen for the pulse sounds to reappear as the pressure drops. These are known as Korotkoff sounds. The first sound heard signals the systolic BP. Record this value from the scale. 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. We then measured the Bp immediately upon standing. Lastly, we measure the BP three minutes after standing. Discuss the orthostatic response in terms of the receptors used and the effects of postural change. Include any limitations to obtaining reliable results. For lab 11-B, demonstration of a measure of physical fitness, a general measure of physical fitness is the ability to resume a normal resting pulse rate shortly after a brief period of exercise. One is less fit if increased periods of time are required to regain the resting pulse rate. Fitness may be considered a function of the degree to which the cardiovascular system has been developed. Fitness may be measured in several standardized tests; however, we will be measuring the changes in heart rate as it relates to activity and participant's age. We will monitor the change in pulse rate that occurs when a resting student exercises and then attempts to return to a resting pulse rate. We will compare these changes in heart rates between students who exercise regularly and students who do not and determine the target heart rate range for exercise for these students.

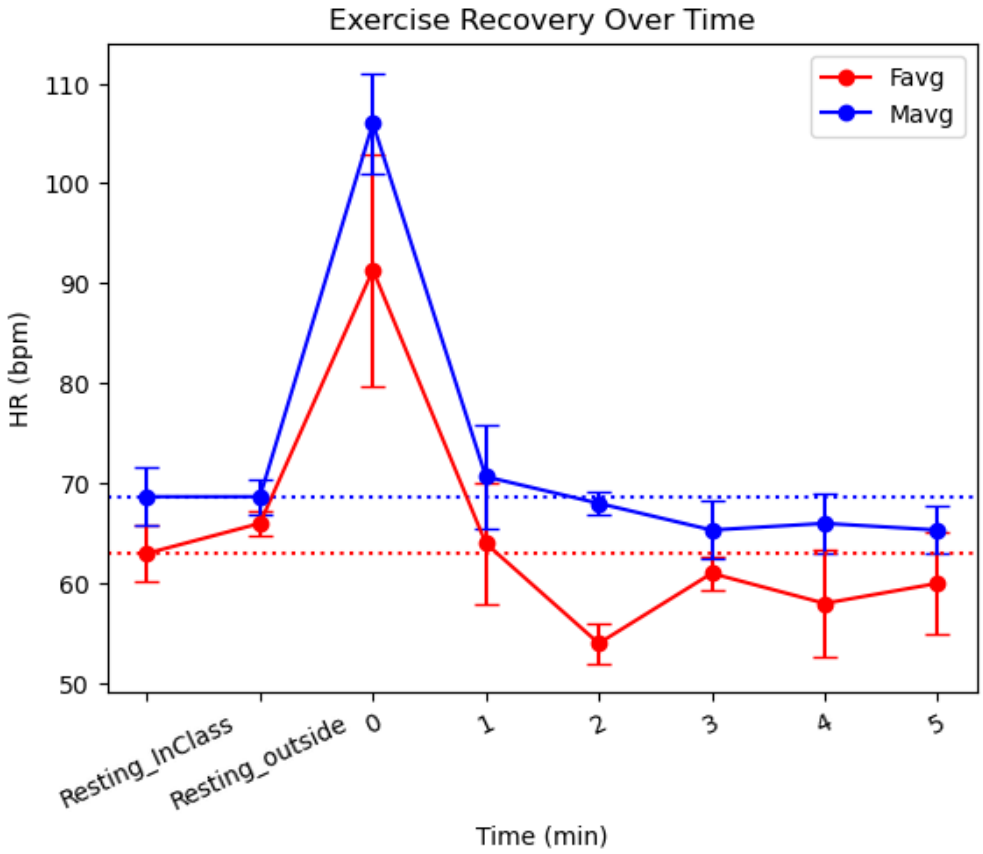
We started off by selecting three students who exercise regularly and three students who do not. Each student will take his/her resting pulse rate for one minute and record this value. Each student will jump on and off a bench a couple of times. Immediately upon returning to the laboratory, each student will record his/her pulse after exercise. 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 15seconds and multiply by 4.). For lab 11-C, demonstration of the divining responses, marine mammals are known to experience bradycardia upon becoming immersed in water. This behavior is known as the diving response. Humans may also experience such a response, though, not as pronounced as that of marine mammals. We will attempt to establish a diving response in the following exercise with the help of the computer. We started off by filling a large tub with ice cold water and selecting one student volunteer and hook him/her up to the computer. Recordings of a Lead II ECG and pulse pressure from a thumb will be obtained with the student at rest for a baseline measurement. Recordings will then be taken with the student holding his/her breath for at least 20seconds, hopefully for 30 seconds. The experiment will be repeated with the student holding his/her breath and placing his/her head into a bucket of ice-cold water and then record the result to make graphs.

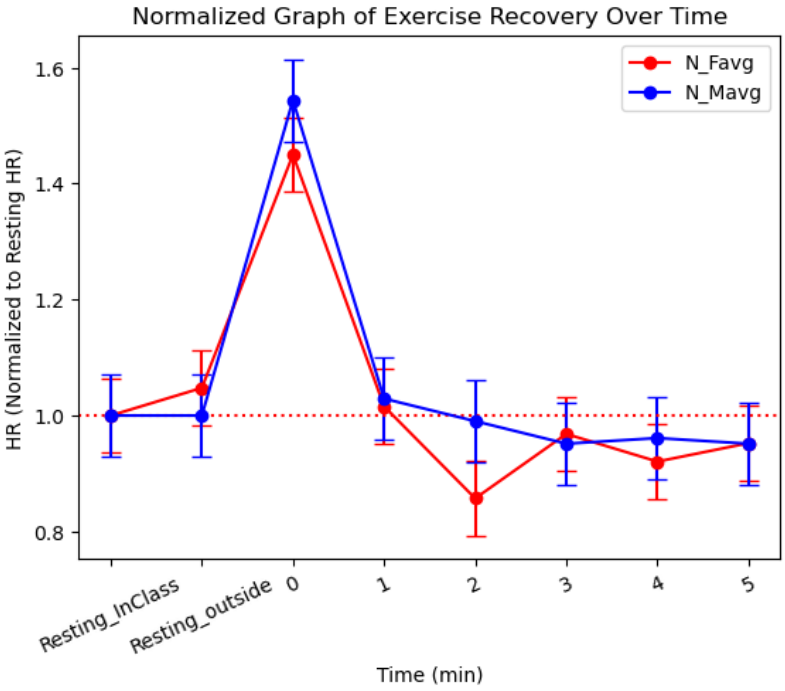
Results –

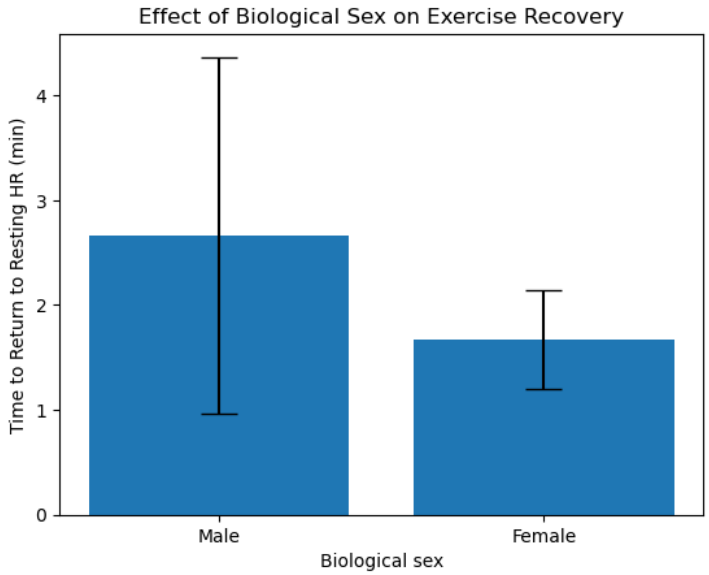
11-A

Bp measured sitting down/calm	98/64
Bp measured immediately upon standing	90/62
Bp measured three minutes after standing	96/70

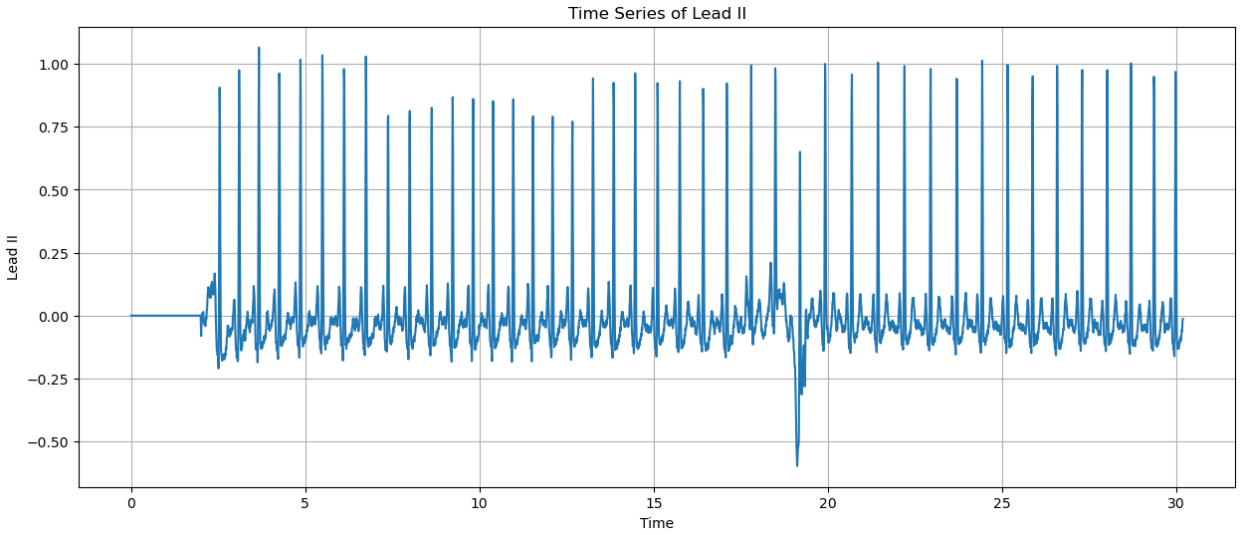
11-B

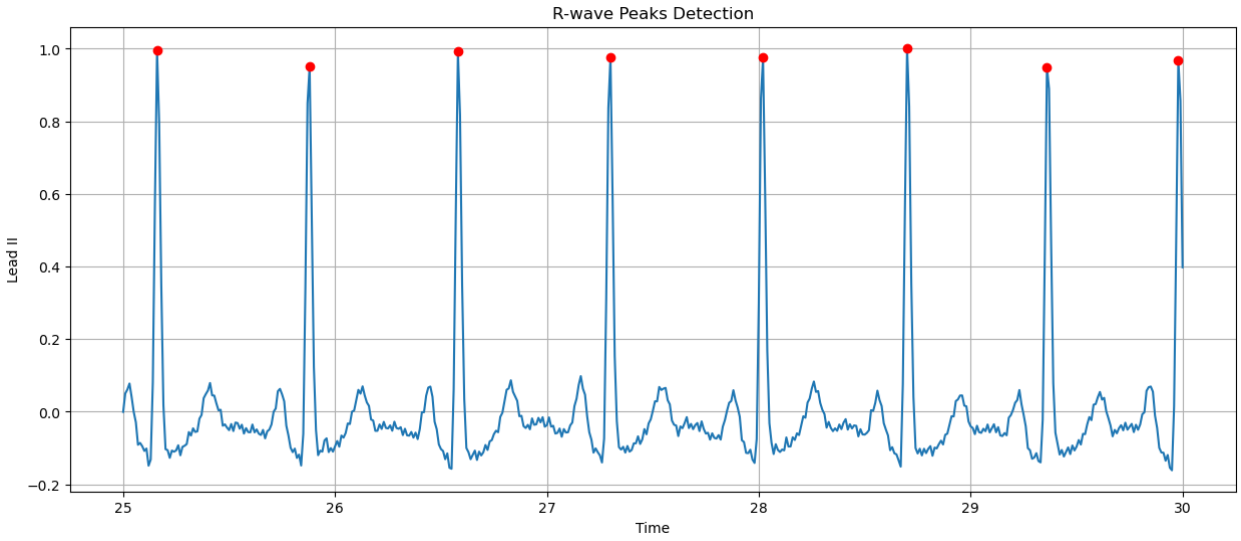

Exercise Recovery Over Time
Favg
Mavg
HR (bpm)
110
100
90
80
70
60
50
Resting_InClass
Resting_outside
0
1
2
3
4
5
Time (min)

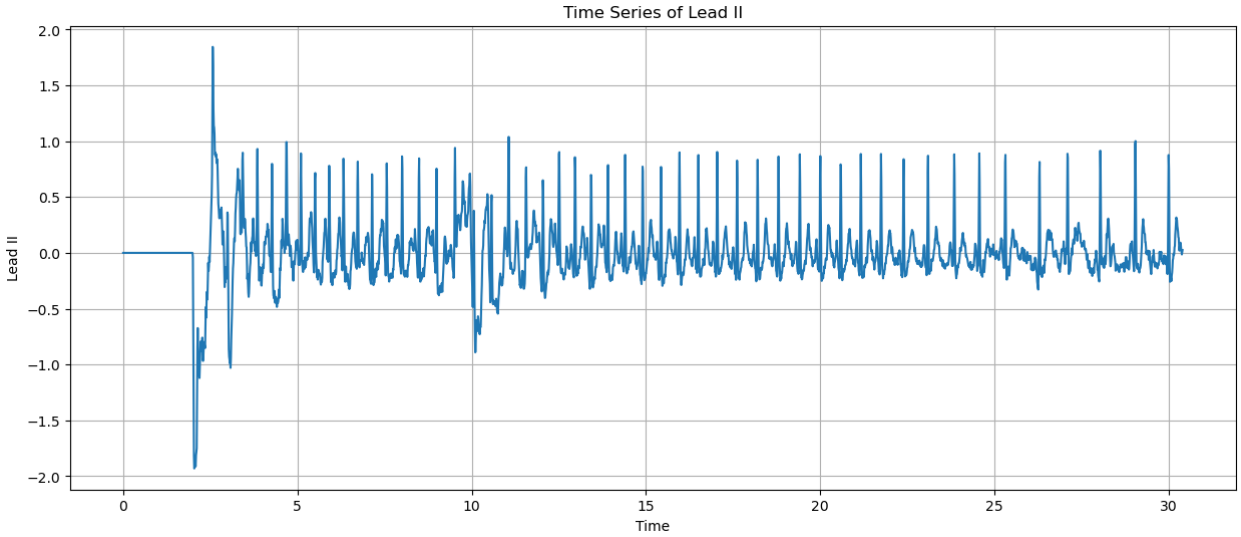

Normalized Graph of Exercise Recovery Over Time
N_Favg
N_Mavg
HR (Normalized to Resting HR)
1.6
1.4
1.2
1.0
0.8
Resting_InClass
Resting_outside
0
1
2
3
4
5
Time (min)

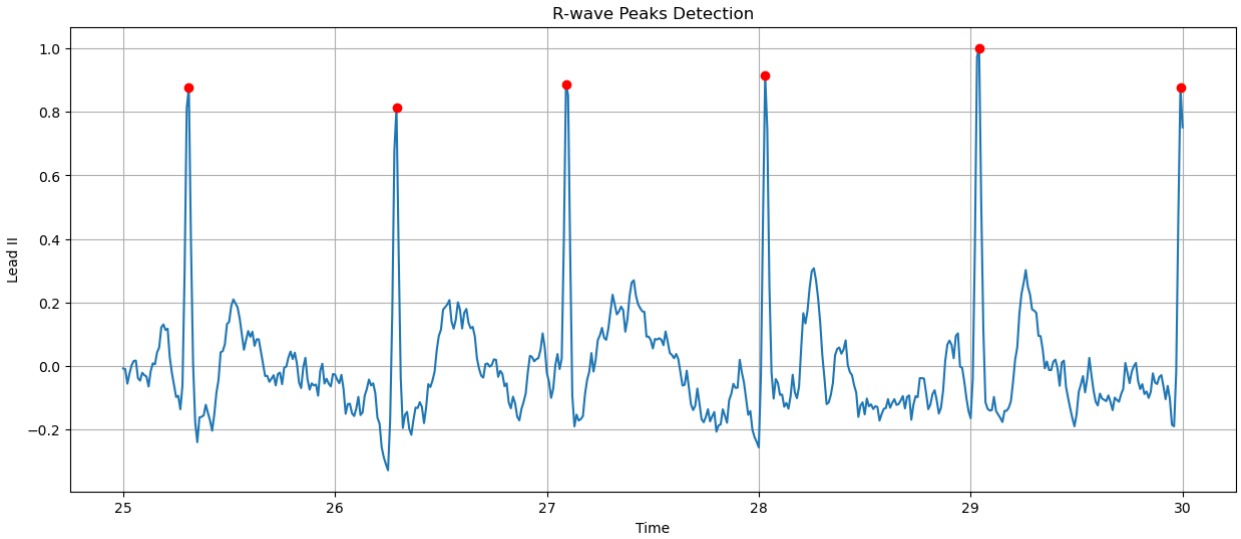

Effect of Biological Sex on Exercise Recovery
Time to Return to Resting HR (min)
0
1
2
3
4
Male
Female
Biological sex

11-C

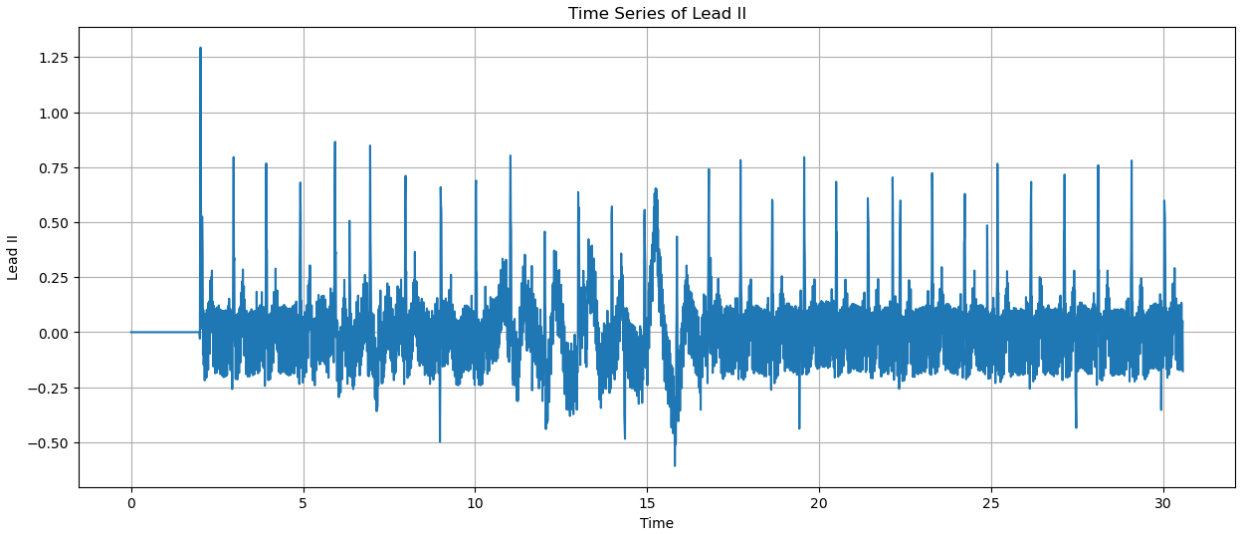

Time Series of Lead II
Lead II
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
0
5
10
15
20
25
30
Time

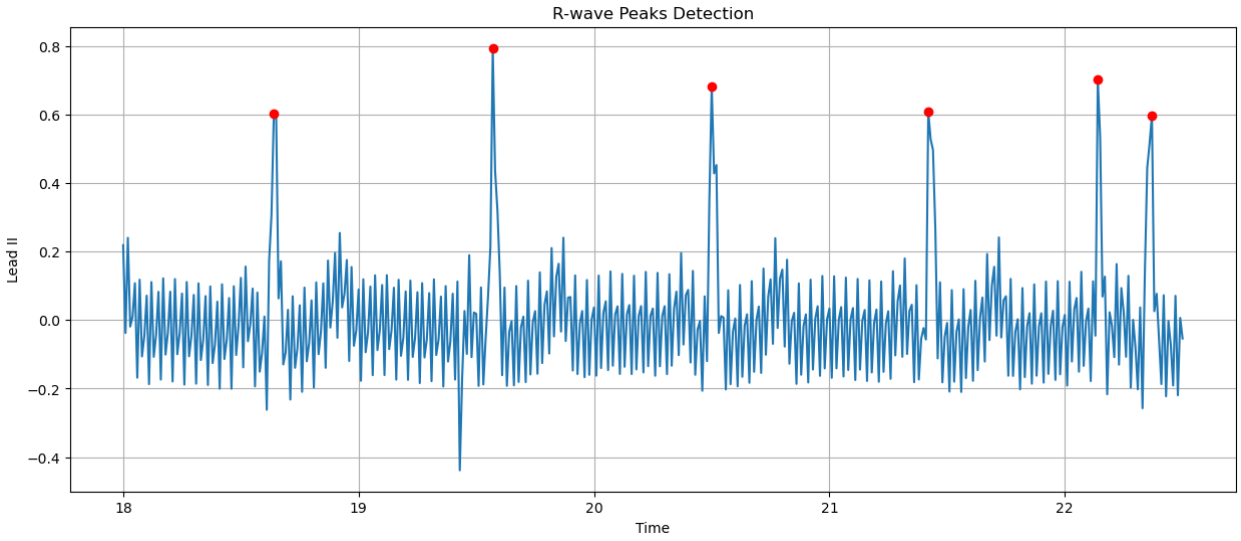

R-wave Peaks Detection
Lead II
Time
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
25
26
27
28
29
30

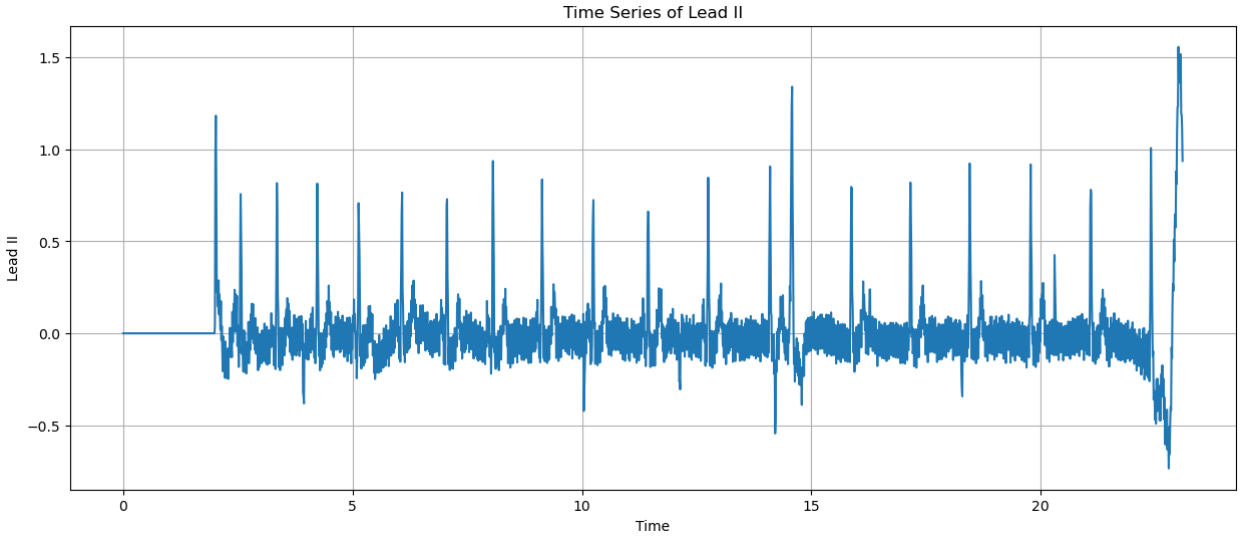

Time Series of Lead II
Lead II
Time
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
0
5
10
15
20
25
30

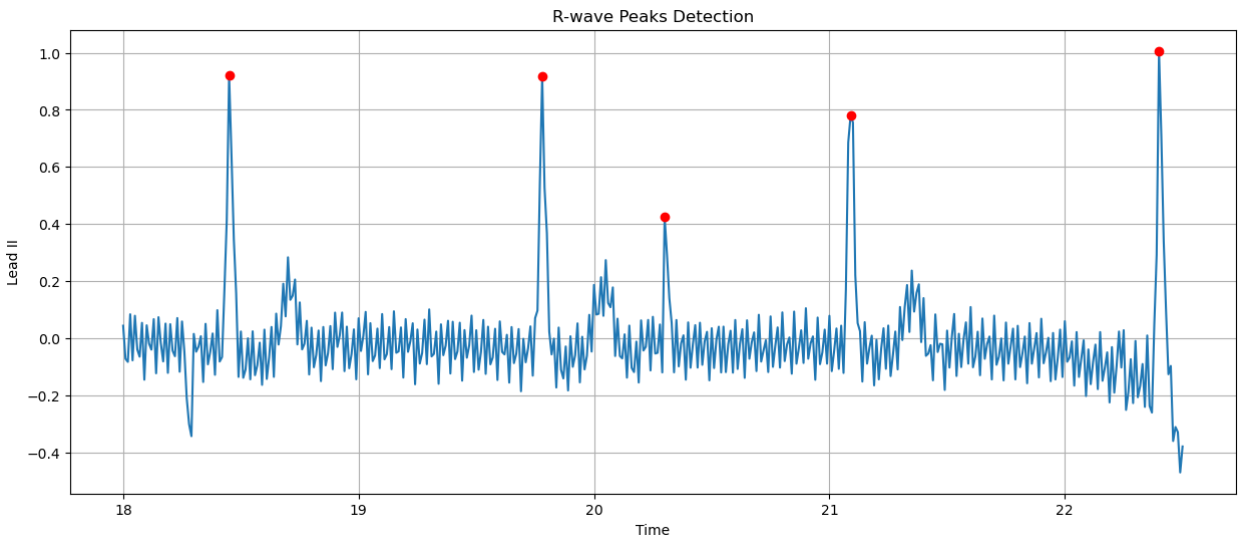

R-wave Peaks Detection
Lead II
Time
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
25
26
27
28
29
30

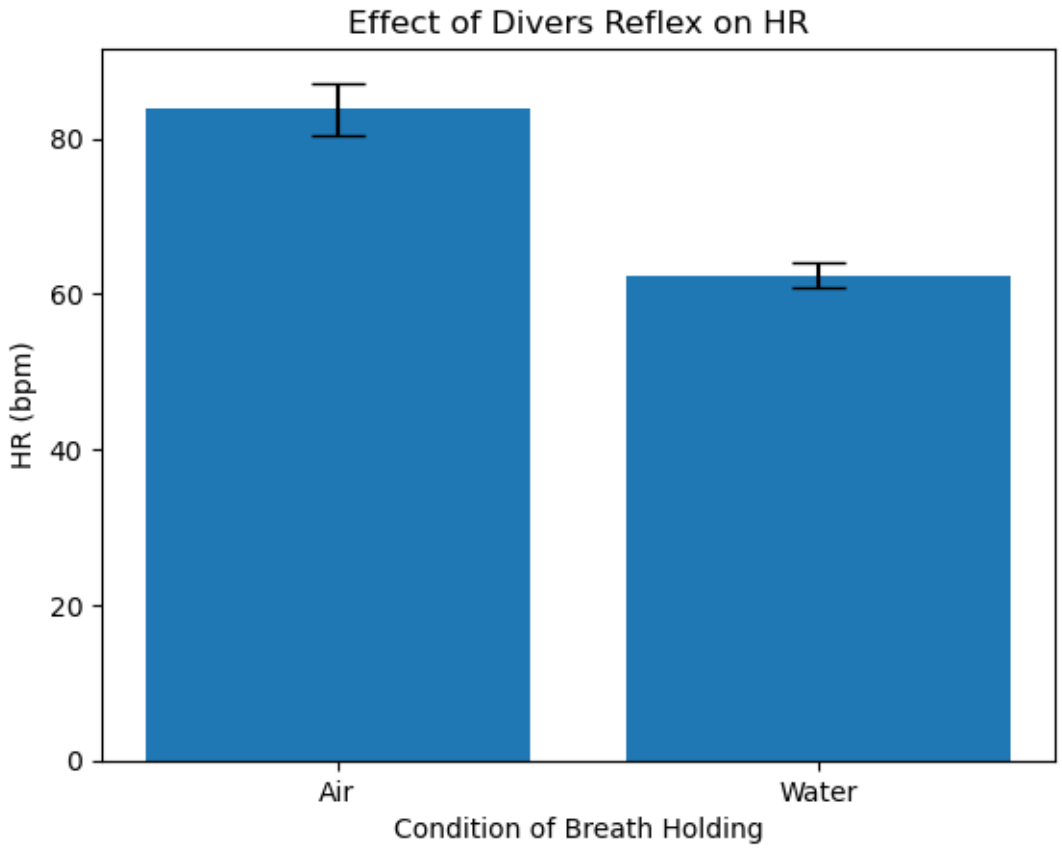
Data 2


Time Series of Lead II
Lead II
Time
1.25
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
0
5
10
15
20
25
30


R-wave Peaks Detection
Lead II
Time
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
18
19
20
21
22


Time Series of Lead II
Lead II
Time
1.5
1.0
0.5
0.0
−0.5
0
5
10
15
20


R-wave Peaks Detection
Lead II
Time
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
18
19
20
21
22



Discussion – In laboratory 11, we did a couple of experiments that were fun to do. Our first experiment was to take each other's blood pressure sitting down, standing up, and standing for three minutes. Taking blood pressure for me is easy since I do it Monday through Friday at my job. My blood pressure sitting down and relaxing was at a 98/64 which is low, but I usually run low and my blood pressure immediately standing up was a 90/62 which is normally because I suddenly stood up. From what I understand is that when you're laying down relaxing as well as sitting and suddenly standing up your Bp drops and that's why you can suddenly feel dizzy. Lastly my blood pressure standing after three minutes was 96/70 which was better because it regulated after standing for a while. For our second experiment a few students started off by taking their heart rates and then Dr. Oak had a couple students go outside and jump on and off and bench to get their heart rate racing for a little bit. After jumping on and off the bench they re-

checked their heart rate and compared it to the resting one which was way faster. The students took their heart rate every minute to see how long it took to go back to regular. Dr. Oak compared male and females heart rate to see who's was faster and who's went down quicker. For our last experiment Dr. Oak filled two large tubs of ice-cold water and had two students submerge their faces in the water to see how high or how low their heart rate would go. After that Dr. Oak helped us to make graphs for two experiments which was a big help since we have a big test coming up to study on. This experiment was interesting to me because it still has to do with the heart and the pulse is very important well at least to me because I usually have irregular heart beat it cans suddenly go up to 170 and just go down to 68 after a few minutes.

Conclusion – All in all, for laboratory 11, cardiovascular measurements, cardiovascular parameters, other than EKG, may be measured which reflect the general condition of an individual. Among these parameters are blood pressure, heart sounds, and pulse rate. Comparison of the values obtained between resting and exercise states may provide a good measure of the physical fitness of a person. In this laboratory, you will measure the effects of postural change and exercise on these cardiovascular parameters using several different types of equipment. A method of determining the physical fitness of an individual will be demonstrated. I really enjoy doing these experiments related to the heart and hoping we can continue to do them.