



Exercise Experiment LAB Report

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Introduction Sentence

In this lab report we conducted an experiment comparing resting baseline data to data collected after exercise. In this experiment we used an EKG. An electrocardiogram (ECG or EKG) is a recording of the heart's electrical activity as a graph over a period of time, as detected by electrodes attached to the outer surface of the skin and recorded by a device external to the body. The graph can show the heart's rate and rhythm. This impulse then passes down natural conduction pathways between the atria to the atrioventricular node and from there to both ventricles. The natural conduction pathways facilitate orderly spread of the impulse and coordination contraction of the first the atria and then the ventricles. The electrical journey creates unique deflections in the EKG that tell a story about heart function and health. The respiratory system is responsible for taking in oxygen and replenishing the body's cells and expelling the carbon dioxide from the cells in the body. How does this exchange happen? Well, when you inhale oxygen through your nasal or oral cavity, the air travels through your trachea and into your lungs. After passing through your bronchial tubes, the primary, secondary and the tertiary bronchi, the air finally reaches and enters the alveoli (air sacs). The pulmonary artery carries blood containing carbon dioxide to the air sacs, where the gas moves from the blood to the air. Oxygenated blood goes to the heart through the pulmonary vein, and the heart pumps it throughout the body. We conducted a few experiments testing out lung volumes, respiratory rate, and our pH in our air before and after exercise.

Question: How does exercise affect the cardiovascular and respiratory system? How does the body respond?

Hypothesis: During exercise the cardiovascular and the respiratory system will work faster and harder to keep up with the demand of energy you use during exercise.

Materials: The pictures below are the materials and safety equipment used in this lab.

Other safety materials: Gloves, Paper towels, & Isopropyl Alcohol

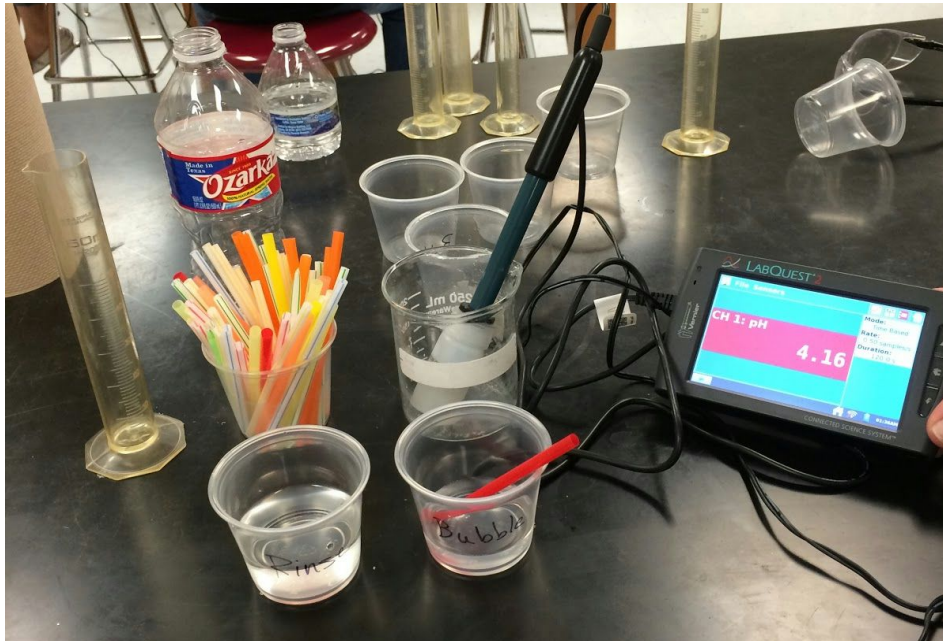


Figure 1: Graduated Cylinder
Straws, Small Cups, Water, LabQuest, pH Sensor

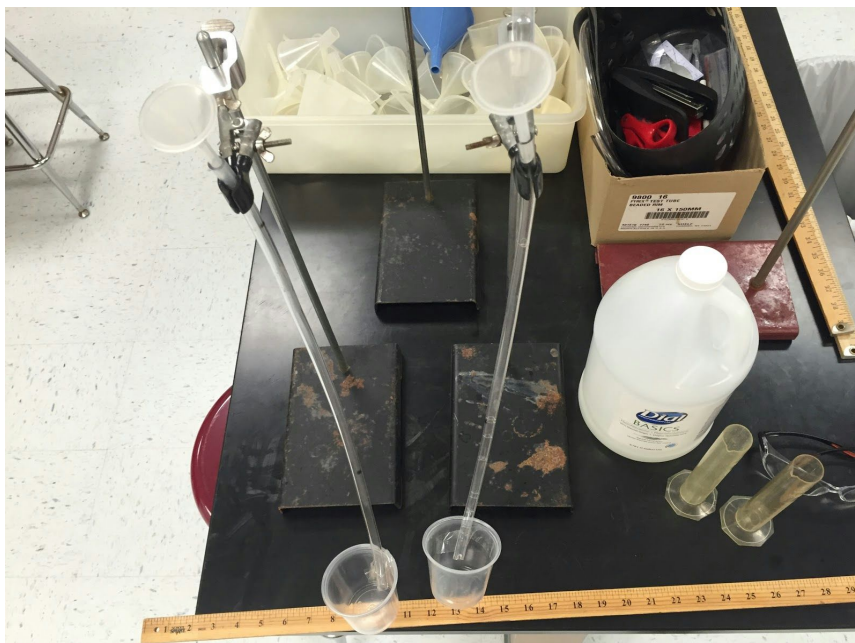


Figure 2: Graduated cylinder, Stand,
22" Tubes, Funnels, Small Cups, Water, Straws, Yardstick, and Safety Glasses.

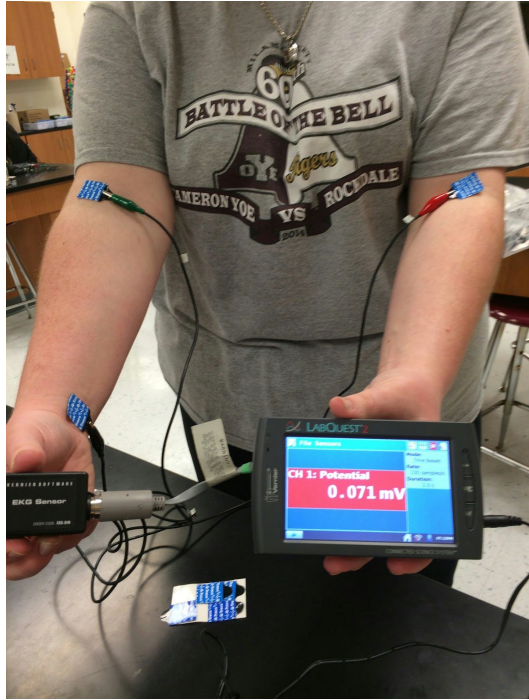


Figure 3: LabQuest, EKG Sensor, and Electrode Tabs.



Figure 4: Spirometer

Safety Information:

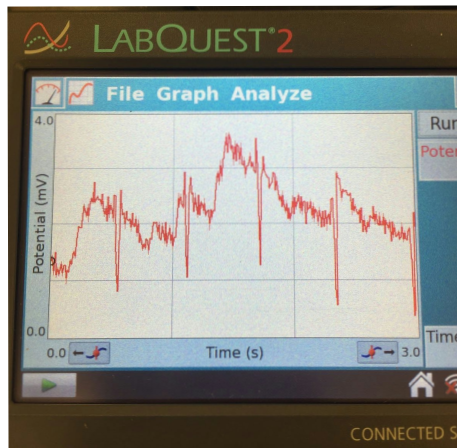
Some lab safety tips include, wear your safety glasses when using the Labquest pH sensor due to acid that the sensor is kept in. When using the Spirometer always clean before and after use with Isopropyl Alcohol and paper towels. Be careful in the lab when conducting exercise, do not let it get out of hand for example don't chase one another in the lab, and do not jump of the lab tables. Wear the proper safety gear for the lab you are performing. Wear appropriate clothing. Be careful handling the equipment and use it properly. When you are finished conducting the lab make sure you put everything up properly and push in the stools.

Procedures:

To set up the EKG make sure it is on and the sensor is connected. After you check that attach the three EKG electrode tabs with tape on to your arms. The electrode tabs are attached to the electric wires that are attached to the Labquest. During the lab you need to be at rest, laying your arms at a 90 degree angle on the table while sitting down. You must be sure to remain still as possible and breathe normally, and try not to alter the data. The Labquest will then show the data from the test done, collect and record your readings. When preparing the spirometer you must spray the mouth piece with Isopropyl Alcohol, and wipe it off with a paper towel. When blowing into the spirometer have good grip and try to avoid air from escaping. Make sure you are ONLY exhaling, Do Not inhale. After blowing into the spirometer and you have recorded your data be sure to push out all the air before testing again. For the Tidal Volume, take a normal inhalation and exhale into the bag. Repeat 3 times and record your data after each, then find the average. To test expiratory reserve volume take a normal inhalation and then breath into the spirometer till you can not exhale no longer. For the last test on the spirometer take the vial volume by inhaling 3 times then breathe into the spirometer until you can not exhale no more. When conducting the pH lab, measure 20 mL of water and pour into a small cup, then insert the pH sensor and take a the level of pH as a control. Then you blow through a straw into the small cup of water for 40 seconds, allow time to go by for the pH levels to stabilize and then record pH level. All of these labs will be conducted and recorded again to collect data for after exercising.

Data:

Baseline Cardiovascular Data (Resting)



	Beginning Time (s)	Ending Time (s)	Average Time (s)
P-R	1.43s	1.66s	.23s
QRS	1.57s	1.732s	0.162s
QT	1.58s	2.00s	0.426s
R-R	1.60s	1.623s	0.023s
Heart Rate (bpm)	78 bpm		

Figure 5: Is a table and image of the data collected from my EKG reading. This table represents the raw data collected at rest. It was collected using the Labquest EKG sensor. The image is a picture of the EKG reading.

After Exercise Cardiovascular Data (20 Jumping Jacks)

	Beginning Time (s)	Ending Time (s)	Average Time (s)
P-R	1.79s	2.885s	1.095s
QRS	2.30s	2.389s	0.089s
Q-T	2.92s	3.74s	0.821s
R-R	2.30s	2.526s	0.226s
Heart Rate (bpm)	99 bpm		

Figure 6: Is a table sporting the data collected with the Labquest EKG sensor after 20 jumping jacks.

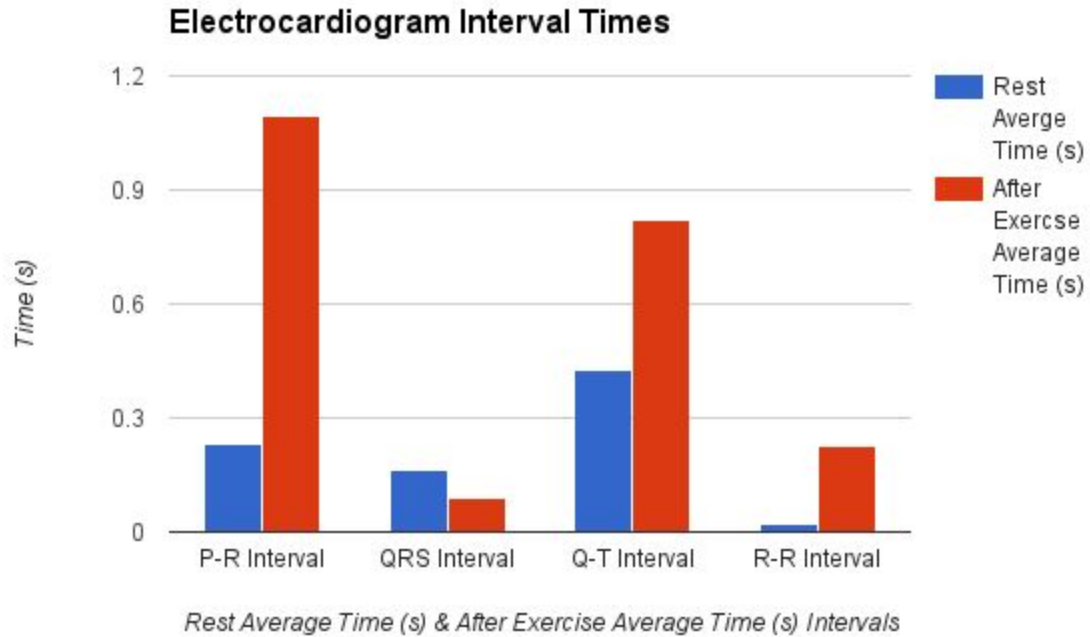
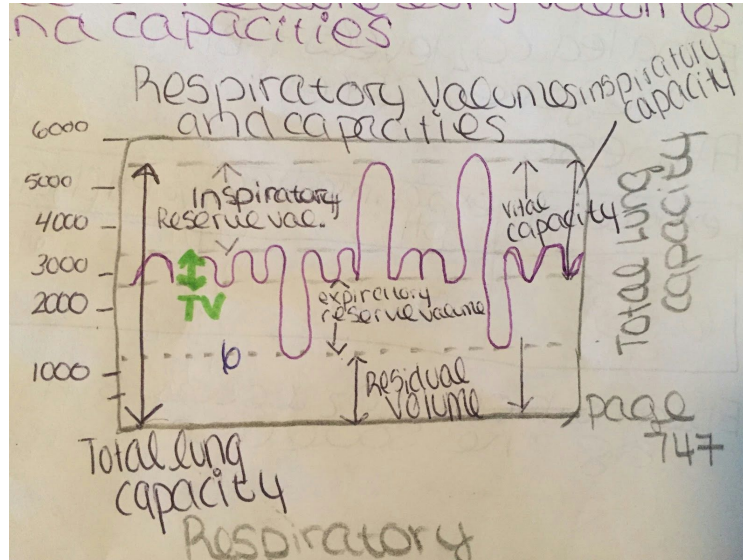


Figure 7: Is a bar chart represents the comparison between the raw baseline EKG data and the exercise ECG data.

Analysis of Cardiovascular Data:

The bar chart represented the comparison of the electrocardiogram intervals. The blue bars were my personal data collected while I was at rest. The red bars is the personal data I collected after I did 20 Jumping jacks. The standard resting EKG interval times P-R is between 0.12 to 0.20s, QRS interval is less than 0.12s, and the Q-T interval is between 0.30 to 0.40s. My results compared to the standard resting EKG interval times is abnormal. I was a little stressed out that day but my result were not that far off from the standard results.



Baseline Respiratory Data (Resting)

	Trial 1	Trial 2	Trial 3	Average
TV	600 mL	500 mL	500 mL	533 mL
ERV	3700 mL	3000 mL	2900 mL	3200 mL
TC	4600 mL	4700 mL	4800 mL	4700 mL
Breaths per Minute (bpm)	12 bpm			

Exhaled Carbon Dioxide & pH change	
Control pH	6.78
Experimental pH	5.01
% pH Change	26.01%

Figure 8: This table shows the raw data collected at rest. It was collected by using a spirometer and a Labquest pH sensor. The purple chart is the baseline respiratory data, which has the 3 trials and the average. The blue chart has the exhaled carbon dioxide and the pH change at rest. The pH of the blood is determined by the concentration of hydrogen ions in the blood.

After Exercise Respiratory Data:
(20 Jumping Jacks)

	Trial 1	Trial 2	Trial 3	Average
TV	600 mL	700 mL	600 mL	733 mL
ERV	3700 mL	3800 mL	3600 mL	3700 mL
TC	5200 mL	5100 mL	4800 mL	5033 mL
Breaths per Minute (bpm)	28 bpm			

Exhaled Carbon Dioxide & pH Change	
Control pH	6.78
Experimental pH	4.82
% pH change	28.90 %

Figure 9: These tables display the raw data I collected after 20 jumping jacks. I collected these numbers using a spirometer and a pH sensor. In comparison from figure 8, we can see that the numbers in both charts have increased after exercise.

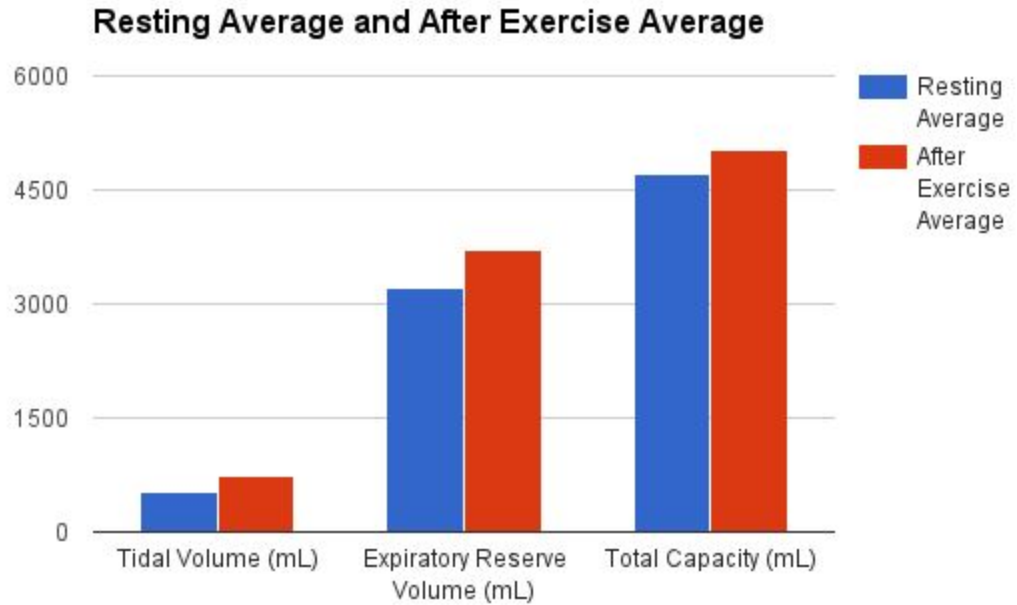


Figure 10: This graph shows the difference between the data of the baseline respiratory volume to the exercise respiratory. The data is the average volume from 3 different trials conducted each time, the volume was calculated in milliliters (mL). Even just after 20 jumping jacks you can see how the supply for air demand increased.

pH % Change

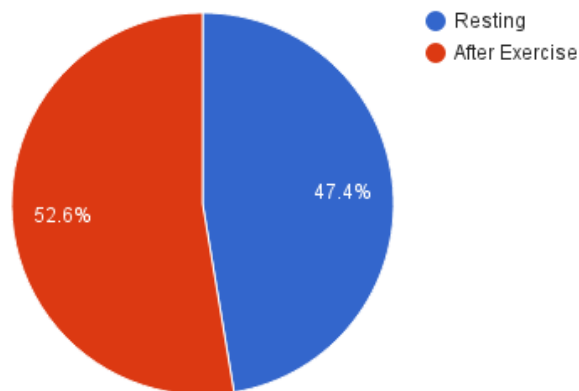


Figure 11: Pie chart shows the percentage change in the pH levels. At rest it is at 47.4%, and just after 20 jumping jacks the pH levels rose up to 52.6%.

Analysis of Respiratory Data

Lung Volumes and lung capacities vary from gender, age, height, etc. Lung volumes also vary with exercise. On average Tidal Volume (TV) is 500 mL, Expiratory Reserve Volume (ERV) is 1,200 mL, and the Residual Volume is 1,200 mL. My average volume at rest test for TV was 533 mL, ERV 3,200 mL, and VC was 4,700 mL. If we compared my personal data to the average data, we can conclude that my TC was little above normal. My ERV was above normal, and my VC was way above normal. Which is okay cause i have built up my lungs and diaphragm due to participating in band for 5 years. After I recorded my results after exercising I noticed all my lung volumes increased. My TV 733 mL, ERV 3,700 mL, and my VC reading a 5,033 mL. My Breaths per minute also increased rising from a 12 at rest to a 28 after 20 jumping jacks.