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Anatomy

Homeostasis Lab Report

Introduction: Intrinsic Conduction System and Cardiac Cycle

The intrinsic conduction system (nodal system) is built into the heart tissue and sets the heart's basic rhythm. Since the system is composed of a special tissue that is a cross between muscle and nervous tissue, it causes heart muscle depolarization in only one direction – from the atria to the ventricles. This enforces a contraction rate of approx. 75 beats per minute. This system begins with the SA node (aka pacemaker) in the right atrium that starts each heartbeat and sets the pace for the whole heart as it has the highest rate of depolarization. Next, the impulse spreads through the both atria to the AV node (right atrium), which is located in the junction of the atria and ventricles, and then the atria contracts. At the AV node, the impulse is delayed briefly and then it is passed through the AV bundle, the bundle branches (left and right), and the Purkinje fibers; resulting in a contraction of the ventricles that begins at the apex and moves up toward to atria. The atria and ventricles repolarize when they are relaxing. ECG records the traces of the flow of current through the heart. During the P wave, the atrium is depolarizing. At the QRS wave, the ventricles are depolarizing, while the atria is repolarizing. Finally, at the T wave, the ventricles are depolarizing.

The cardiac cycle is a term that refers to the events of one complete heartbeat, during which both atria and ventricles are contracting and then relaxing. The length of the cycle is normally 0.8 seconds. The first cardiac period is mid-to-late diastole. At this point, the pressure in the heart is low, and blood is flowing passively into and through the atria into and through the atria into the ventricles from the pulmonary and systemic circulations. The semi-lunar valves are closed while the AV valves are open. Then the atria contact and force the blood remaining in their chambers into the ventricles. The next period is the ventricular systole. After the ventricular contraction begins, the pressure in the ventricles increases rapidly, closing the AV valves. Then the semi-lunar valves will open when the pressure in the ventricles is higher than the pressure in the large arteries leaving the heart. During this time, the atria are relaxed and their chambers are being filled with blood. Then, the semi-lunar valves close. The last period is the early diastole. The ventricles relax and the semi-lunar valves are closed to prevent backflow. In addition, the pressure in the ventricles drops, but once the pressure is lower than the atria, the AV valves are forced open and the ventricles again begin to refill rapidly with blood.

I. Objective

What is the effect of the length of exercise on an individual's heart rate?

II. Hypothesis

If the length of exercise is intense during a short period of time, then the heart would beat increasingly fast than the heart rate of an individual who exercised for a longer period of time as the heart levels out how hard it can pump after a period time. Furthermore, it would take the heart longer to rest when vigorous exercise is performed for a shorter period of time than a longer period of time.

III. Experiment

A. Materials

1. Stopwatch (Or some sort of device that can act as a stopwatch)

B. Procedure

1. To begin, record your resting heart rate (bpm)
2. Then set your stopwatch and run in place vigorously for 30 seconds.
3. After, have your partner record your heart rate every 30 seconds (30, 60, 90, 120), such that after each 30 seconds, you begin counting all over.
4. Have your partner record down and multiply the number by 2 to obtain the beats per minute.
5. Take a break until your heart rate returns to resting.
6. Repeat steps 2-5 for two more times. You should obtain three trials of 30 seconds running in place.
7. Run in place for 60 seconds (1 minute) and repeat steps 3-5.
8. Repeat step 7 two more times.
9. Run in place for 120 seconds (2 minutes) and repeat steps 3-5.
10. Repeat step 9 two more times.
11. Finally, run in place for 180 seconds and repeat steps 3-5.
12. Repeat step 11 two more times.
13. In total, you should have twelve trials: three for 30 seconds, 3 for 60 seconds, 3 for 90 seconds, and three for 120 seconds.
14. Afterward, take the averages of each column under each set of trails, such that you take the average of the first 30 seconds of the trail for running in place for 30 seconds.

IV. Data

A. Resting Heart Rate

My Resting Heart Rate	101 bpm

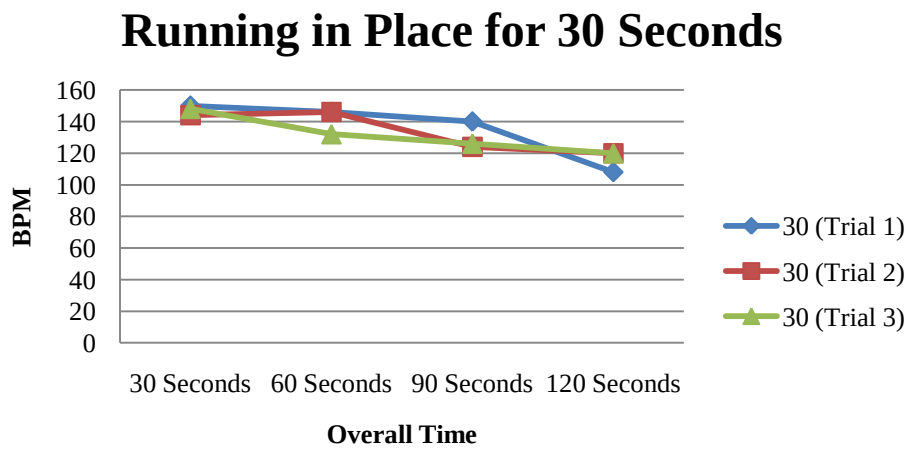
B. Data Tables

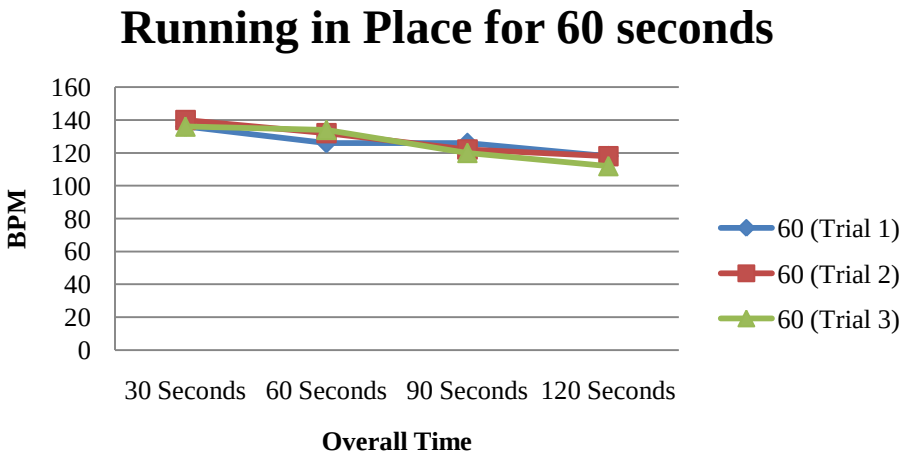
Running in Place

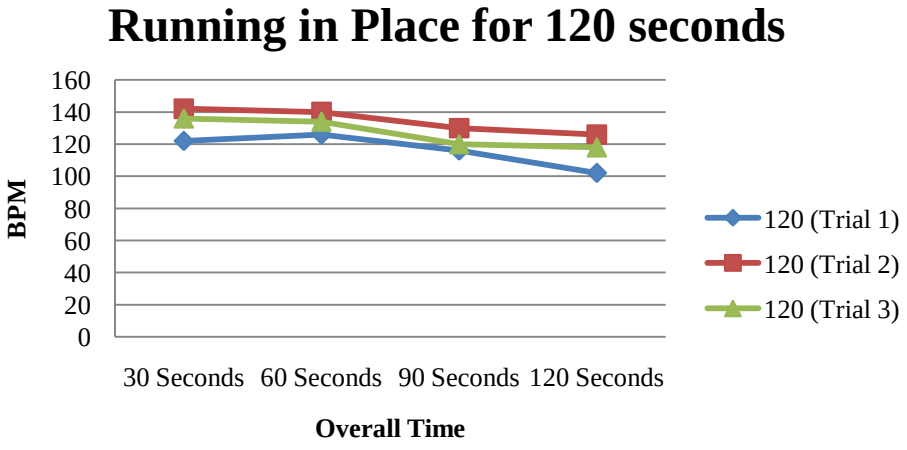
Trial/Heart Rate at each 30 seconds	30 Seconds	60 Seconds	90 Seconds	120 Seconds
30 (Trial 1)	150 bpm	146 bpm	140 bpm	108 bpm
30 (Trial 2)	144 bpm	146 bpm	124 bpm	120 bpm
30 (Trial 3)	148 bpm	132 bpm	126 bpm	120 bpm
Average:	**147.33 bpm**	**141.33 bpm**	**130 bpm**	**116 bpm**
Trial/Heart Rate at each 30 seconds	30 Seconds	60 Seconds	90 Seconds	120 Seconds
60 (Trial 1)	136 bpm	126 bpm	126 bpm	118 bpm
60 (Trial 2)	140 bpm	132 bpm	122 bpm	118 bpm
60 (Trial 3)	136 bpm	134 bpm	120 bpm	112 bpm
Average:	**137.33 bpm**	**130.66 bpm**	**122.67 bpm**	**116 bpm**
Trial/Heart Rate at each 30 seconds	30 Seconds	60 Seconds	90 Seconds	120 Seconds
120 (Trial 1)	122 bpm	126 bpm	116 bpm	102 bpm
120 (Trial 2)	142 bpm	140 bpm	130 bpm	126 bpm
120 (Trial 3)	136 bpm	134 bpm	120 bpm	118 bpm
Average:	**133.33 bpm**	**133.33 bpm**	**122 bpm**	**115.33 bpm**
Trial/Heart Rate at	30 Seconds	60 Seconds	90 Seconds	120 Seconds

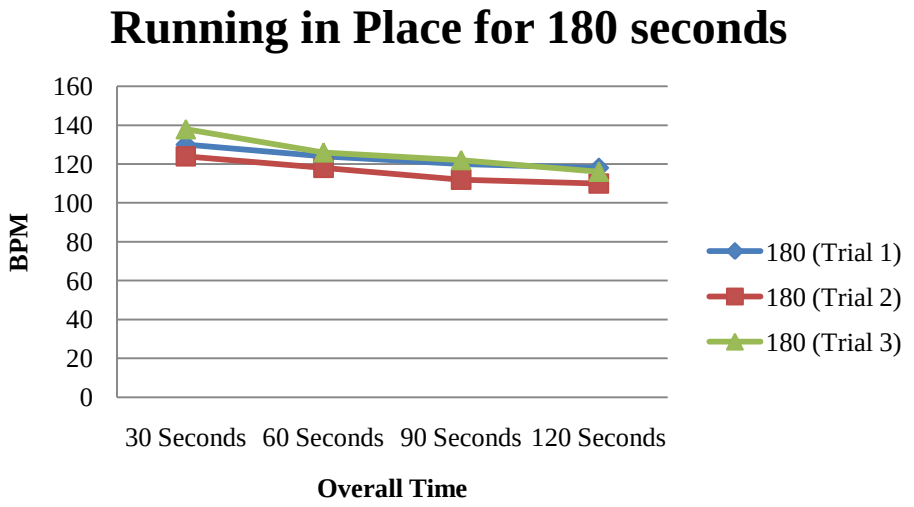
each 30 seconds				
180 (Trial 1)	130 bpm	124 bpm	120 bpm	118 bpm
180 (Trial 2)	124 bpm	118 bpm	112 bpm	110 bpm
180 (Trial 3)	138 bpm	126 bpm	122 bpm	116 bpm
Average:	**130.67 bpm**	**122.67 bpm**	**121.33 bpm**	**114.33 bpm**

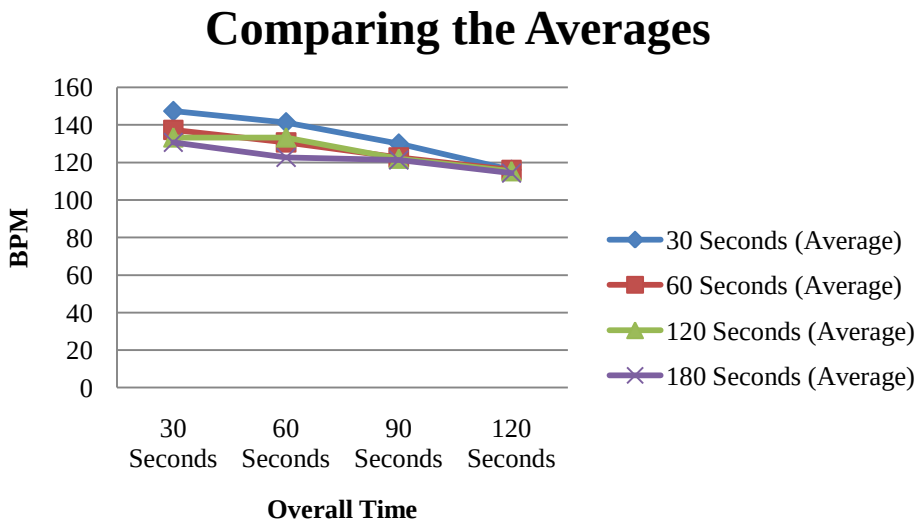
C. Line Graph











V. Conclusion

My hypothesis was correct, as observing during long exercising; my heart rate was lower than at doing exercise for 30 seconds as my data shows. By looking at the average comparison graph, my heart rate average was higher when I was doing the 30 seconds of running in place than running in place for 180 seconds. Yet, the numbers were really close together. During a longer time of exercise, the heart levels itself out, as it gets used to pumping harder than usual so regulation comes into play. The heart pumps more than pumping faster. Furthermore, the time for my heart rate to return to resting took longer during the 30 second period of running than 180 period of running.

VI. Discussion

Many factors came into play when it came down to this experiment's efficiency, such as mental capability, un-efficient counting, and rate of exercise. Running in

place for 30 seconds is easier than doing it for 3 minutes (180 seconds) because our bodies get tired out if we intensely keep going for 3 minutes and we also don't really want to run for *that* long. Furthermore, I observed that I tend to mess up when counting because everything is rushing so fast that I can't keep up. In addition, the rate of exercise plays a significant factor. I observed that not all students exercised vigorously because some didn't have their heart rate go as mine did.

A. Hypothetical Experiment For Overweight Individuals

Objective: What is the effect of the length of exercise on an individual's heart rate that is overweight compared to healthy and fit individuals?

Hypothesis: If it takes an overweight individual to run the mile longer than a fit individual, then their heart rate would increase intensely as their hearts are working harder to pump.

Manipulative Variable: Time (Duration of time it takes for the individual's heart rate to return to resting)

Control Variable: Individual

Data: It would be observed in the data that the individual's heart rate would be very fast during the 30 seconds of exercise. Then it would continue to decrease significantly, as the individual may get tired out very easily. Therefore, there would be a noticeable difference when comparing the averages of the running intervals of 30 seconds, 60 seconds, 120 seconds, and 180 seconds.