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DIFFERENCE IN ATHLETES & NON ATHLETES RESPIRATION VALUES

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ABSTRACT

The purpose of this study is to compare the lung capacities of six different individuals, within three different categories: smoker, athlete, and non-athlete. This report in particular focuses on the specific lung volumes and capacities of an athlete and a non-athlete. Physical activity has a very definite effect on how deeply a person can breathe. It was therefore hypothesized that due to their increased amount of aerobic or anaerobic activity, an athlete would exhibit greater lung volumes and has a significantly greater lung capacity than a non-athlete. To determine respiratory values, both individuals were tested using a spirometer. The results from this experiment then proved that non-athletes have lower respiratory values than athletes.

KEYWORDS:- Athletes, Respiration, Values, Non Athletes, Difference, Lung

INTRODUCTION

This study was performed show the difference in lung capacities among different people, in this case when exercise or aerobic activity is involved. Generally, total lung capacities in adults depend on several factors including height, weight, gender, age, or physical fitness. This case is specifically comparing an athlete and a non-athlete.

Aerobic activity can be defined generally as exercise that uses a lot of oxygen, while targeting a specific muscle group for an isolated period of time. It is usually low in intensity, and long in duration. Aerobic activities include things like walking, jogging, biking, or swimming. Anaerobic activity on the contrary does not require much oxygen, and usually leaves a person feeling drained or fatigued. Most athletes fall under this general category. Anaerobic activities include most almost all sports and weight lifting. Regardless of which type of activity a person participates in, in almost all cases athletes have a higher lung capacity than non-athletes simply

because they use their lungs more. Increased oxygen intake and lung usage allow the lungs to grow in strength and therefore can expand more readily and take in more air. Exercise is not just limited to increasing lung capacity however. Activity also increases blood flow to the heart, increased metabolic breakdown, and endurance of muscles (Bird, Smith, James). All of these factors combine with increased lung capacity for an overall healthy body. A non-athlete however has atrophied muscles, decreased metabolic enzymes and a diminished lung capacity.

From all of this information, it can be hypothesized that due to their increased amount of aerobic or anaerobic activity, an athlete would exhibit greater lung volumes and have a significantly greater lung capacity than a non-athlete. The point of this particular experiment was to prove this by using a spirometer to measure respiratory values and to prove whether or not physical activity has a significant affect on a person's lung capacity.

MATERIALS & METHODS

In this experiment, the main instrument that was used was a non-recording spirometer. In order to work, a subject simply exhales into the device and the indicator moves to indicate the value. This experiment began by choosing two individuals, an athlete and a non-athlete, to perform the procedure. In this case, both subjects were male. The values that were measured were the tidal volume (TV), the inspiratory reserve volume (IRV), expiratory reserve volume (ERV), and vital capacity (VC). To measure the TV, the subject was asked to inhale a normal breath and then exhale normally as well into the spirometer. The instrument was also used to find ERV and IRV. ERV was measured by having the individual inhale a normal breath, then exhale forcibly into the spirometer. IRV is somewhat similar. Instead of inhaling a normal breath however, the subject is asked to inhale the maximum amount of air possible, then exhale into the spirometer. This should be a relatively high number depending on the subject. All three of these values, TV, IRV, and ERV, were then used to find the VC. VC is simply a sum of these three numbers, and it describes the total amount of air that a person can take into their lungs. Another important value in this experiment was the minute respiratory volume (MRV). Although it does not contribute to the overall VC, it is still a significant measurement. It describes the total amount of air that a person can take into their lungs in a period of one minute. In order to find this value, the subject was asked to breathe normally for one minute, while their partner counted their total respirations during that time. Then this number was multiplied by the tidal volume (TV) to find the measured respiratory volume (MRV).

RESULTS

For this experiment, an athlete and a non-athlete were asked to perform five individual tests in order to find certain respiratory values. It was performed in a Kent State University lab using a spirometer. The results show that the athlete had higher values in every category. The individual results for TV were: 233 mL for the athlete, and 116 mL for the non-athlete; for MRV, 2563 mL for the athlete and 1972 mL for the non-athlete; for ERV, 1500 mL for the athlete and 1400 mL for the non-athlete; for IRV, 2900 for the athlete and 1917 for the non-athlete; and finally in the category of VC, the athlete's was 4622 mL and the non-athlete's was 3433 mL. Not only were the athlete's values significantly higher than the non-athlete, but in some cases they were almost double, proving their higher overall lung capacity.

DISCUSSION

It is generally is assumed that an athlete would breathe better than a non-athlete. This experiment's hypothesis made this claim, and the data from this experiment proved it to be correct. The athlete's results surpassed, and were almost double in some areas, that of the non-athlete, therefore demonstrating that amount physical activity is a direct determiner of a person's overall lung capacity.

Although physical activity plays a huge factor, there are also some genetic and environmental factors that contribute to the subjects' lung capacity and thus could have affected the results of this experiment. First of all, both subjects were male and had relatively the same weight, therefore gender and weight could not be used to argue the results. However, the athlete is 6'3 in height, while the non-athlete is only 5'8 in height. According to "Volume of Human Lungs", taller individuals automatically have a greater lung capacity than shorter individuals (Elert). This means that even before this test was performed, the athlete was more likely to breathe deeper than the non-athlete. In addition to the height advantage, environment also may have influenced the experiment results. Subject one, the athlete, grew up in a mountainous area of Pennsylvania. On the contrary, subject two, the non-athlete, was born and raised in an area in Alabama that is close to sea-level. According to Respiratory Physiology & Neurobiology, a person who lives in an area at sea-level will develop a slightly smaller lung capacity than someone who grew up in an area with higher altitudes, such as the mountains (Morris). The reason behind this is that the partial pressure of oxygen is lower in an area of higher altitude, which means that oxygen doesn't diffuse into the bloodstream as readily. Unlike normal lungs, this causes the body's diffusing capacity to increase in order to process more air. In both of these realities, height and environment, the athlete has an advantage over the non-athlete as far as lung capacity. These two factors do not necessarily falsify these results, but they could partially explain why the athlete had much higher respiratory levels. If the two subjects were of the same height and from the same area, the results might have been much closer.

On a different note, even though the athlete had much higher respiratory factors than the non-athlete, this does not mean that the non-athlete had necessarily normal levels either. The normal tidal volume (TV), or normal inhalation and exhalation, for the average adult male is 500 mL. Both the athlete and the non-athlete were recorded as having much lower levels than this, the athlete's being 233 mL and the non-athlete's. The normal IRV for an adult male is 3 L (Morris). Again, even though the athlete had a significantly higher value than the non-athlete, both of these values were below the normal number. Even in the category of vital capacity, for which the normal level is 4.6 L, the non-athlete recorded 3.4 L, which is well below average. The athlete barely scored in the normal range with a value of 4.62 L. The only category in which both subjects had values above that of normal levels was the ERV. This presents a very important question: even though the athlete had values higher than the non-athlete in every area, why were almost all of the values for both subjects below that of the average male? Due to the results of the experiment, it is clear that even with the added factors of height, environment, and physical activity, that the non-athlete has an abnormally small lung capacity, while the athlete simply has an average one.

NOTES & DISCLAIMERS

This test, for the most part, was very straight forward. There were no errors with the experiment nor the research. The only possible improvements that could have been made for this test would be to perhaps use individuals who were much more similar in height and weight in order to keep these from being a factor in skewing the results.

CONCLUSION

As a whole, this experiment proved how physical activity can play a role in overall lung capacity, as shown through the comparison of an athlete to a non-athlete. Testing for simple lung volumes in actuality plays a very big role in the progress of medical research. Therefore experiments similar to this are very important as far as clinical research because they can help doctors and scientists gain new insight about the respiratory system and can help them gain a better understanding of respiratory diseases and problems.

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