Ventilatory Function

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Lab 7

3/18/2013

Exs. Phys Lab/ Vanderveen/ 10:20

**Abstract:**

During the lab, we wanted to see the relationship between the different types of hyperventilation and how long you can hold your breath immediately following hyperventilation. We first started by hyperventilating in ambient air and then seeing how long we could hold our breath. We then followed by seeing how long we can hold our breath. We repeated these steps however with hyperventilating into a paper bag. Next we did a spirometry experiment and also an open circuit spirometry experiment to find our FEV1 and FVC.

**Purpose and Background:**

The purpose of this lab is to familiarize students with the assessment, and terminology associated with the human ventilatory system. Many of the tests have been developed for diagnostic purpose. In exercise physiology these tests are used to classify or describe participants in experiments

This lab relates to the following topics studied in class:

* Ventilatory functions
* Parts of the lung
* Gas exchsange
* Fick’s Law
* Boyle’s Law
* Hyperventilation
* Spirometry
* FVC

Important definitions and other information are:

**Hyperventilation-**to breathe unusually deeply or rapidly because of anxiety or organic disease and in excess of the body's requirements, causing too much loss of carbon dioxide

**Spirometry-** an instrument for measuring the capacity of the lungs

**FVC-** total volume of air voluntarily moved in one breath, from full inspiration to maximum expiration.

**FEV1-** represents the total volume of air voluntarily moved in one breath during a 1 second period of time.

**Hypothesis**

The theory illustrated by this laboratory experiment is ventilatory functions

So I can make the following hypothesis for this lab:

If I breath ambient air and try to hold my breath as long as possible, then if I hyperventilate I wont be able to hold my breath as long as I can.

**Materials used in this laboratory experiment.**

* Paper Bag
* Mouthpieces
* Spirometer

**Safety items for this laboratory experiment**

* Be sure to change the mouth pieces on the spirometer
* If you feel light-headed do not continue with the experiment

**Procedure**

Hyperventilation Experiment (paper bag):

1. Breathe normal and then hold your breath as long as you can in ambient air (room temperature air).

2. Record how long you held your breath on the data sheet.

3. Hyperventilate in ambient air for 5-10 seconds and then hold your breath as long as you can.

4. Record how long you held your breath on the data sheet.

5. Hyperventilate into the paper bag for 5-10 seconds, keep bag at your mouth, then hold your breath for as long as you can.

6. Record how long you held your breath on the data sheet.

Spirometry Experiment:

1. Turn machine on

2. Subject breaths normally for 1 min. (Tidal Volume)

3. Subject inhales (big deep breath in) and then exhales (blowing everything out).

4. Subject returns to normal breathing for 30s –min. (TV)

5. Record the FVC (forced vital capacity)

6. Label the readings on the chart. IRV, TV, ERV, IC, FVC

Open-Circuit Spirometry Experiment:

1. Follow directions of portable spirometer.

2. Record the FEV1 (forced expiratory volume)

**Data Table**

**Paper Bag Experiment**

|  |  |
| --- | --- |
| **Condition** | **Time Held Breath For** |
| Hold Breath Normally | 27 seconds |
| Hyperventilate and hold breath | 25 seconds |
| Hyperventilate into the bag and then hold breath | 26 seconds |

**Spirometry (Open Circuit)**

|  |  |
| --- | --- |
| FEV1 | 1.13 L |
| FVC | 3.96 L |

**Spirometry (Closed Circuit)**

|  |  |
| --- | --- |
| FVC | 1.95 L |

**Graphs**



**Questions**

1. It is a direct relationship between lung volume and body size. The larger the body size, the larger the lungs which means you will have a larger lung volume.

**2)** There are two factors that primarily influence how a gas is exchanged. One is the surface area of the lungs. The other factor is the thickness of the surface area.

**3)** Breathing normally the ambient air then holding my breath allowed me to have the longest time possible. It should’ve been the second one but I hyperventilated incorrectly.

**4)** After breathing into the paper bag was the least effective because I was breathing in CO2 back in from the bag that I previously exhaled.

**5)** Sprint because you will be able to hold your breath for a longer period of time after hyperventilating.

**6)** A build up of CO2 could cause you to inhale underwater to soon causing you to take in water before you reach the top of the water for air.

**Discussion**

In this lab, there were multiple simple tests we had to perform. Breathing into air, then hyperventilate and hold our breaths as long as we can. We had to do that into paper bags as well as with the portable Spirometer in both an open and closed circuit and record our results.

When breathing into ambient air and then holding my breath, I was able to last 27 seconds. When hyperventilating into ambient air and holding my breath I held my breath for 25 seconds.

When hyperventilating into the paper bag and then holding my breath I was able to hold my breath for 26 seconds. While using the spirometer, the FEV1 was 1.13 liters and the FVC was 3.96 liters. With the closed circuit spirometer the FVC was 1.95 liters.

Our results were varied and they should have shown that hyperventilating into ambient air should have allowed us to hold our breath the longest. The reason being because when you hyperventilate back into the paper bag you are breathing in the carbon dioxide that you just breathed out.

There were multiple errors that may have occurred during the lab. If you weren’t hyperventilating properly it may have skewed your numbers so that the results weren’t correct. You also could have possibly held your breath longer but did not feel like doing it anymore causing you to stop holding your breath.

**Appendix**

**Appendix 1: Draft procedure used in lab**

**Appendix 2: Draft Data table written during lab**

# Appendix 3: Draft Results Table