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Grade: 10
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Title: Asthma and Its Influence on Swimming
Problem/Question to be addressed: What is the influence of asthma on swimming?
Research:

Asthma and its Influence On Swimming

Dayton, Ohio is the seventh worst asthma city in the United States. This startling fact hits home for all of us that live in the Dayton region. Many people currently suffer from asthma, not only in the Miami Valley, but all over the world. In 2005, it was recorded that 8.8% of all females and 6.4% of all males suffer from asthma ("Percent of Current Asthma Prevalence in the United States, 2005" 1). Studies have been done to test for sports that asthmatics can perform in, with the least amount of disturbances. A sport that has been tested is competitive swimming. Some professionals have stated that swimming is good for asthmatics, while others may tell are convinced that the chlorine is too hard on the lungs and trachea. Personally, I have exercise induced asthma and have recently taken up the sport of competitive swimming. So, I am curious as to what the real results can show for a study based upon high school students and their lung capacities. Even though the chlorine found in swimming pools may be hard on lungs, the humidity and moisture in the air make swimming an ideal way to stay active and compete.

First, let's look at the anatomy of the human lungs. Each person has two lungs. The right side has three lobes and is larger than the left, due to the placement of the organ next to the heart. The left side of the lung has two lobes and is a bit smaller. A person breathes in and the air travels through the voice box, down the trachea, and into the rest of the respiratory system called the bronchial tree. The passage way eventually end at the alveoli. The little alveoli are up against the blood stream. The alveoli puts the oxygen into the blood and takes out the CO_2, sending the carbon dioxide back out of the system.

Next, there is the discussion of the disease called asthma. This disease is an issue with your lungs. The bronchial tube swells up because the muscle wall expands and too much mucus is secreted into the airway. No air can get in or out of the body. Sometimes the effects are so great that the person experiences an asthma attack. This would consist of the person beginning to wheeze and cough in a very severe manner. Certain things can arouse or inflame these symptoms for different people such as exercise, pollen, changing of seasons, and stress. No one really fully knows why some people get asthma and others do not. More and more people become diagnosed with the condition each year. It is definitely genetic and can be also associated with seasonal allergies. Asthma can be treated with antihistamines and fast-acting inhalers. Also, one can take an albuterol inhaler if they know they will soon be coming across the thing(s) that triggering their asthma. These symptoms can be found in people of all ages, even babies. My 2 year old niece was diagnosed with it when she was under a year old. Both of her parents are asthmatics.

The main asthma trigger for this project will be exercise induced asthma. This kind of asthma is where the person works out, pushes himself way too hard, and begins to feel his breathing passage close. The bronchial tube will begin to swell up and the person can no longer get the oxygen to their blood that they need to work out. This particular kind can range anywhere from very mild to extremely dangerous. My personal type of exercise induced asthma is the mild type.

Asthma can be measure and diagnosed by lung capacity tests. “Physicians use a device called a *spirometer* to determine the amount of air patients can breathe out of their lungs” (Moss 1). A 2.5 gallon jug will be the container, and air blown out will be blown out by the participant, pushing out the water and lowering its level.

Then, the sport for this topic is competitive swimming. The literal definition is: "the act of moving through water by using the arms and legs" (Freas 1.) Many people enjoy swimming for fun and to get their physical activity in. It is a great sport for people with disabilities (examples are leg, mental handicaps). Some research has been done and says that it is a good sport to do for people with asthma. The environment of the pool makes an ideal condition to keep symptoms under control. The swimming pool area is humid and moist from the water. This makes it easier for asthmatics to breathe.

Also. most swimming pools have chlorine in them. It is used to kill the bacteria and keep public pools clean. This can sometimes arouse some people's asthma symptoms. It can dry out their throats and build up mucus in their air stream. Chlorine is a harmful chemical when is comes to the skin and hair.

As WedMD explains, "Swimming, which is a strong endurance sport, is generally well tolerated by many people with asthma because it is usually performed in a warm, moist air environment. It is also an excellent activity for maintaining physical fitness" (Chang 1). If I test for lung capacity in swimmers with asthma, swimmers without asthma, non-swimmers with asthma, and non-swimmers without asthma, then the swimmers without asthma with have the best capacity and the swimmers with asthma will have the second highest. I hope to have great success with this project and a good time learning about my condition and sport.

Hypothesis: If I test for lung capacity of competitive swimmers before and after swimming 100 yards, then the average lung capacities would be in descending order: non-asthmatics before, asthmatics before, non-asthmatics after, asthmatics after.

Materials list:

- 4-6 students with asthma, who competitively swim
- 4-6 students without asthma, who competitively swim
- 1 chlorinated swimming pool in a well ventilated area
- 1 1000 mL graduated cylinder
- 1 2.5 Gal water jug with cap
- 50 ft of clear vinyl tubing size ⅝" OD
- 1 black permanent marker
- 1 large clean dish pan
- Masking tape
- Scissors
- Clipboards

Procedure:

Part A: Making the Spirometer Apparatus

1. Fill the 1000 mL grad cylinder up to the 500 mL mark with water.
2. Remove the jug cap and pour out the cylinder contents into the 2.5 Gal jug.
3. Make a line with the marker indicating every 500 mL.
4. Repeat steps 2-4 until the full 2.5 Gal jug is filled with water and marked. Number every 1000 mL line on the side with numbers 1-8. After the 9th liter, write "Fill". The number will later be multiplied by 1000 to find the lung capacity in L. Do not dump out the contents after each mark.
5. Keep the 9 L of water in the jug.
6. Fill the large dish pan with water until its water level is about 5 cm.
7. Put the cap on the opening. Flip the jug upside down and place it in the container. Only once the mouth of the bottlejug is in the water can the cap be removed.
8. Continue to to hang on to the jug in the water and make sure it does not tip over.
9. Cut the 50 ft of clear vinyl tubing into strips, 1 m each with scissors.
10. Label 14 of the 1 m garden hoses as letters A-N with the marker.
11. Insert tube A into the mouth of the bottle, while keeping the other end of hose out of the plastic container.

Part B: Before Swimming (Lung Capacity Testing)

12. Gather the 16 participants in a chlorinated swimming pool area. Assign each swimmer with a letter from A-N.
13. Select one participant at a time.
14. Instruct participant A to "Take a deep breath then blow out ALL the air in your lungs into the tube."
15. When the participant blows into the hose, the air will be pushed up into the bottle. The water will go into the container and the once full bottle will now have a lower level.
16. Record the water level on the bottle by indicating the level number of the participant's lung capacity. Be sure to mark the information under each participant's assigned letter so that the data can be recorded and analyzed properly.
17. Dump out all of the water.
18. Get the next lettered hose
19. Repeat steps 13-18 for participants B-N.

Part C: Swimming and Afterwards (Lung Capacity Testing)

20. Reinsert hose A into the apparatus.
21. Instruct participant A to "Swim a 50 yard sprint with flip turns."
22. After completing the swim, allow each swimmer less than 10 seconds of rest.
23. Test the participant's lung capacity using steps 13-19 again.
24. Repeat steps 21-23 for participants B-N.

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