Breathing and Holding Your Breath

Introduction

Everybody breathes all day, every day. Why?

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1. Why do your muscles and other parts of your body need oxygen?

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2. How does oxygen get to your muscles and other parts of your body? How is the carbon dioxide carried away from the muscles?

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3. How does the body get new oxygen into the lung? How does the body get rid of carbon dioxide that has accumulated in the lung?

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4. What happens when the dome-shaped diaphragm contracts?

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5. When the diaphragm relaxes, will a person inhale or exhale? Explain.

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Holding Your Breath Experiment

1. Normally, you breathe automatically, without even thinking about it. However, you can control your breathing voluntarily when you want to. For example, you can stop breathing and hold your breath for a while.

However, you cannot hold your breath forever. Obviously, it would be very unhealthy to hold your breath for too long! Why?

All parts of your body, including the muscles and the brain, depend on the breathing muscles and the circulation working together to deliver the oxygen needed by all body cells and to remove the carbon dioxide produced by all body cells.

The part of your body that is the most sensitive to lack of oxygen is your brain. If the brain is deprived of oxygen for a few minutes, parts of the brain can be permanently damaged. If oxygen deprivation continues, the person can become "brain dead".

Because it is so important to maintain a continuous supply of oxygen, in a healthy person the part of your brain which controls breathing will not let you hold your breath forever. When you try to hold your breath for a long time, after a while this part of your brain will automatically start the breathing rhythm again, even if you try very hard to hold your breath.

How long do you think you can hold your breath? ____________________
(Specify if your estimate is in seconds or minutes.)

Now, take a deep breath and hold your breath as long as you can, while someone in your group times you. Be sure to hold your nose while you hold your breath. How long did you hold your breath?

_________________

2. How do you think that your brain detects when you should not hold your breath any longer and you must start breathing again?

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______________________________________________________________________

What signals might stimulate your brain to make you start breathing again, even though you are trying to hold your breath?

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______________________________________________________________________
3. Next, you will carry out a simple experiment to test whether changes in the levels of oxygen and carbon dioxide in your blood provide the signal to stop holding your breath. You will breathe into a bag for 1 min. and then hold your breath for as long as you can.

Before you actually carry out this experiment, predict what you think will happen by answering the following questions.

While you are breathing into the bag, what happens to the levels of carbon dioxide in the bag? __________
What happens to the levels of carbon dioxide in your lungs? __________
What happens to the levels of carbon dioxide in your blood? __________
What happens to the levels of carbon dioxide in your brain? __________

While you are breathing into the bag, what happens to the levels of oxygen in the bag? __________. In your lungs, blood, and brain? __________

What change would you predict in how long you can hold your breath after breathing into the bag? Explain why.
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4. In order to make a valid comparison between how long you can hold your breath after normal breathing vs. after breathing into the bag, you need to be sure to hold your breath as long as you can in both conditions. To encourage everyone to hold their breath as long as possible, compare the times that each person in your group was able to hold their breath, and then try again to see if you can hold your breath even longer than your first try.

How long did you hold your breath on this second try? __________

Now, breathe normally for a few minutes. Then, open a 13 gallon plastic bag and swish it through the air to fill it with air. Hold the bag over your mouth and nose and breathe into the bag as normally as you can for 1 minute or as close to a minute as you can.

At the end of your time breathing into the bag, take a deep breath of the air from the bag and hold your breath as long as you can while someone in your group times you. How long did you hold your breath? __________

Was there a difference in the amount of time you could hold your breath after breathing into the bag, compared to after normal breathing? How do you interpret your results?  ____________________________________________________________________________
__________________________________________________________________________
5. Compile the data from all the members of your group in the chart below.

<table>
<thead>
<tr>
<th>Person's name</th>
<th>How Long They Held Their Breath After:</th>
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<tbody>
<tr>
<td></td>
<td>Normal Breathing</td>
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Describe the results. Were the results similar for all members of your group?

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How do you interpret your findings?

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6. Finally, you will test whether you breathe differently after holding your breath for as long as you can. First, observe how you breathe during normal breathing. Next, hold your breath as long as you can. Then, observe how you breathe after holding your breath. Describe the differences in breathing after holding your breath, compared to your normal breathing. Also, do you feel your heart pounding?

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Interpret these observations?

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