How do the Circulatory System and the Respiratory System Work Together to Maintain Homeostasis?

Introduction

Background

Homeostasis is the maintaining of a balanced condition in the body despite changing external conditions or demands on the body. The circulatory system works with the respiratory system in order to deliver nutrients to the body’s cells. The respiratory system is made of the mouth and nose, trachea, and lungs. The respiratory system brings oxygen into the lungs where it is delivered to the blood vessels. The lungs are where the circulatory system takes over. The circulatory system includes the heart, blood, and blood vessels. The blood vessels in the lungs, called capillaries, take oxygen from the lungs and deliver it to the organs, muscles, brain and other tissues of the body. When oxygen arrives where it is needed, it will leave the blood by diffusion. Along the way, blood picks up a waste called carbon dioxide which enters the blood by the process of diffusion. When the blood makes it back to the lungs, carbon dioxide leaves the blood and enters the lungs where it is then breathed out.

In addition to carrying oxygen and carbon dioxide, the blood carries other nutrients and wastes from the food that we eat. These nutrients are carried from the stomach (where they are from the food we eat) to cells where they are needed. Like carbon dioxide is taken to the lungs, other wastes are picked up from the cells and delivered to the kidneys where they will be added to urine to be excreted by urination.

The body has many systems that work together to keep it in homeostasis – balance. When two systems work together, we call it complementary. Just like a student might get a complimentary drink to go with their popcorn at the movies, two complimentary systems in the body also go “with” each other. The circulatory and respiratory systems are just two of these complimentary systems. We will learn about other complimentary systems as we continue to learn about homeostasis in the human body.

Purpose

The purpose of this activity is for students to be able to see their bodies conducting homeostasis in action.

Procedures:

1) Take your pulse for 15 seconds. Multiply the number of heartbeats you had in those 15 seconds by 4. This is the amount of beats per minute (bpm). Write it here _____________.
2) Now, have your partner count your breaths for 15 seconds. Multiply the number of breaths (respirations) you had in those 15 seconds by 4. This is the amount of breaths per minute. Write it here _________________.
3) Exercise for 30 seconds (Jumping Jacks, push-ups, run-in-place).
4) Immediately after the exercise, count your pulse in the same way that you did previously. Write the number of beats per minute here: _____________.
5) At the same time, have your partner count the number of breaths per minute in the same manner as before. Write the number of breaths per minute here: _________________.
6) Rest for 3 minutes, allowing your body to return to your basal conditions.
7) Repeat steps 3-5, except this time exercise for 60 seconds of exercise.
8) Rest for 4 minutes.
9) Repeat steps 3-5, except this time exercise for 90 seconds of exercise.

Data Table:

<table>
<thead>
<tr>
<th>Time of exercise</th>
<th>Heart beats per minute</th>
<th>Breaths per minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>resting</td>
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<tr>
<td>30 sec.</td>
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<tr>
<td>60 sec.</td>
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<tr>
<td>90 sec.</td>
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Graph: On the back of this paper, create a graph. Use a line graph to represent your data. Use a dotted line for Heart Beats per minute. Use a solid line for Breaths per minute.

X – Axis= Independent Variable (Time)
Y - Axis= Dependent Variable (BPM)
1) What is the relationship between amount of exercise and heart rate? Breathing rate? (positive/negative correlation?)

2) Why does your breathing rate increase when you exercise more? (think of the cells’ perspective).

3) What did you learn about how the circulatory system and the respiratory system are complimentary?

4) What jobs do the circulatory system and the respiratory system do for the human body? How are these two jobs related?

5) How do you know that homeostasis was achieved?

6) Draw a picture of a person in whom homeostasis was NOT achieved 😞