

Pumping Up the Stress

Segment 1

Purpose

- To discover how the heart pumps blood throughout the body
- To prove that the more active a person is, the more the heart works to supply blood to the body
- To locate your pulse points and calculate your heart rate

Background

The heart is a muscle in your body. It is located slightly to the left of the middle of your chest and is about the size of your fist. The heart's job is to send blood throughout your body. Blood gives your body the oxygen and nutrients it needs and carries away waste products. The heart is like a double pump. The right side of the heart receives the oxygen depleted blood from the body and pumps it to the lungs. The left side of the heart receives the oxygen rich blood from the lungs and pumps it to the body. It takes your heart less than 60 seconds to pump blood to every cell in your body. As your heart pumps, valves inside your heart open and close. This opening and closing makes a distinct sound known as your "heartbeat." You can hear the heartbeat by using a stethoscope, a medical tool used to hear sounds within the body. Your heart will beat slower when your body is at rest and faster when it is active. This increase in heartbeat occurs because the more active you are, the more oxygen rich blood your body needs. Your heart must pump faster to accommodate the increase in need. Your heart rate is the number of times the heart beats per minute.

Aerobic activities are designed to make your heart beat faster and increase the amount of oxygen in the blood. According to the Center for Disease Control (CDC), aerobic activities improve the function of the heart, may help lower blood pressure, help control weight, and increase a person's overall feeling of well-being.

Procedure

- To demonstrate the pumping action of the heart, pull the handle up on the bicycle tire pump and push it down. Repeat several times and feel the air that is pumped through the hose.
- Think about how this pump is similar to a heart. Instead of pumping air, the heart pushes blood throughout the body. In your science journal, describe how you think the heart works.
- To listen to the sound your heart makes as it works, make a simple stethoscope.
 - Attach a funnel to one end of the rubber tubing with masking tape.
 - Repeat and attach the second funnel to the other end of the rubber tubing. See diagram 1.
- Sit still for about 3 minutes in a quiet location.
- Tightly hold one funnel up to your ear.
- Hold the other funnel up to your heart or a partner's heart (remember the heart is located slightly to the left of the middle of your chest).
- While continuing to sit, listen carefully until you hear the sound of the heart beating. See diagram 2.
- Using the timer, count the number of heartbeats in 10 seconds. Record the number in your science journal.
- To find the number of beats per minute, multiply the number of beats in 10 seconds by 6. Record the answer in the Heart Stress Test chart for Trial 1. Note: Another way for older students to find a pulse is to locate the pulse in the inner wrist, neck, or temple and to place two fingers over the pulse. As they feel the pulse beat, they can count the number of beats for 15 seconds and multiply by four.
- Repeat steps 5–9 for two more trials. See diagram 3.
- Find the average of the three numbers and record it in the chart. This number is your average sitting heart rate.

Materials

- bicycle tire pump
- 1 m of rubber tubing
- 2 funnels
- masking tape
- timer (stopwatch or clock with second hand)
- Heart Stress Test chart (p. 23)
- pen or pencil
- colored pencils
- science journal

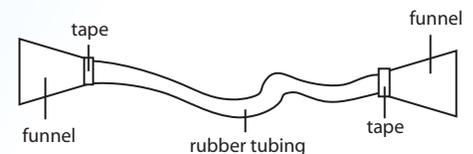


Diagram 1



Diagram 2

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12. Predict what will happen to your heart rate after you begin physical activity and as activity is increased. Record your predictions in the space provided at the bottom of the chart.
13. To find your standing heart rate, stand up and wait about a minute. Repeat steps 5–11 while standing.
14. Use steps 5-11 as a guide to determine your heart rate while performing the following activities.
 - a. In an open area away from objects and people, swing your arms back and forth for 20 seconds.
 - b. Wait 2 minutes to allow your heart rate to return to normal and then walk briskly around the room for 30 seconds.
 - c. Wait 2 minutes and then hop 25 hops around the room.
 - d. Wait 2 minutes and then run in place for 30 seconds.
15. Make a graph to show how your heart rate changed during each of the activities. Be sure to include your sitting heart rate on the graph.
16. Compare your data to that of other students in your class. How do you compare?
17. Using each student's data, calculate the class's average heart rate for each activity and graph the results. Discuss results, looking for patterns.
18. Create a new graph to compare the heart rates of boys versus girls.
 - a. Choose two different colored pencils.
 - b. Calculate the average heart rate for the girls for each activity and graph the results in one color.
 - c. Calculate the average heart rate for the boys for each activity and graph the results on the same graph but using a different color.
19. Compare the graphs of the average heart rate for the various activities between the girls and the boys in your class and discuss any similarities or differences between the two sets of data.

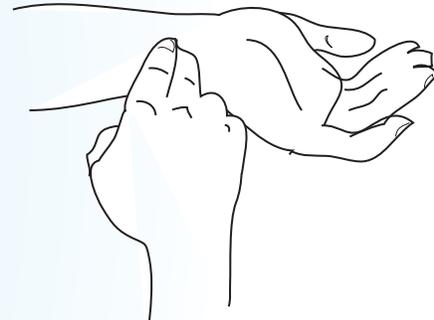


Diagram 3

Discussion

1. When was your heart rate the slowest? When was it the fastest?
2. Did your heart rate increase with physical activity? Why or why not?
3. How do you think an extended period of physical activity would affect your heart rate?
4. Was there a difference between the heart rate of the girls versus the heart rate of the boys? Why or why not?
5. Why is aerobic activity important?

Extension

1. Extend the various activities for a longer period of time. Record the new heart rates and the length of the activity.
2. Research to learn more about the heart and its parts. Make a diagram of the inside of the heart.
3. Build a 3-D model of the heart. Use the Internet and the library as resources to help make your model.
4. Have a teacher or parent contact a grocery store meat department or meat packing plant to obtain a cow or pig heart for dissection.

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Heart Stress Test Chart

Activity	Trial 1 Beats per Minute	Trial 2 Beats per Minute	Trial 3 Beats per Minute	Average * Beats per Minute
Sitting				
Standing				
Swinging Arms				
Fast Walk				
Hopping				
Running				

* Note: To calculate the average number of beats per minute, add the three numbers for each activity and divide that number by three.

What will happen when activity is increased?

Prediction: _____
