

Curriculum Embedded Performance Task
Middle School Science
Content Standard 7.2



Feel The Beat

Student Materials

Connecticut State Department of Education
Bureau of Curriculum and Instruction

Feel The Beat

A Guided Exploration of the Factors That Affect Pulse Rate

You have probably noticed that when you walk or run up the stairs at school to get to a class upstairs, you get “out of breath” and your heart beats faster. Why does this happen? Are there other conditions that cause your heart to beat faster or slower?

Your Task

In this activity you and your partners will design and conduct experiments to explore how hearts beat under different conditions.

Get Ready

Gather the following materials:

Materials

1 stethoscope per lab group

Alcohol wipes

1 stopwatch per lab group

Graph paper, poster paper, markers

Explore

1. Explore the sound of a heart beating using the stethoscope. See if you can detect heartbeats by holding the stethoscope to the neck, back, wrist and ankle. Do the heartbeats sound the same at different places?
2. In your science notebook, describe things you noticed about the beating heart.
3. Think about your observations. Work with your partners to list questions about factors that may affect heart rates. Examine your list, and classify the questions into two groups: (1) those that can be answered through a classroom experiment and (2) those that require other resources like books, the internet or special equipment not available to you.

Experiment #1: Effect of Movement on Pulse Rate

In this investigation, you will explore how different movements (e.g., walking, climbing steps, lifting weights, or hand-clapping) affect pulse rate. Keep a detailed and organized record of your experimental design, data collection and analysis in your science notebook.

Methods For Measuring Pulse Rate

You may have found it difficult to accurately count the heartbeats you heard with the stethoscope because of interference from other noises in the room. An easier way to count heartbeats is to feel the pulse caused each time the heart pumps blood. There are two methods for measuring pulse. You should sit quietly for several minutes before measuring your “resting” pulse rate. You can work with a partner or by yourself to try both ways, and then decide which way works best for you:

Wrist Method: With the palm of your partner’s hand facing up, place the tips of your first two fingers on the fleshy part of your partner’s thumb. Slide your fingers about 2 inches toward the wrist, stop, and press firmly to feel the pulse of blood which each heart beat sends through the artery. To measure heart rate, count the number of pulses in 30 seconds. Multiply that number by 2, and you will have the number of beats per minute (“bpm”).



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Neck Method: Place the tips of your first two fingers on either side of your windpipe, near the lump, called an Adam’s apple, in the middle of your neck. Press gently until you can feel a pulse. To measure heart rate, count the number of pulses in 30 seconds. Multiply that number by 2, and you will have the number of beats per minute (“bpm”).



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CONDUCT YOUR EXPERIMENT:

1. Identify the **question** you will investigate.
2. **Predict**, based on your experiences, which activity will have a greater effect on pulse rate.
3. Design a **procedure** to collect data to answer your research question. Identify the **independent** and **dependent** variables in your experiment.
4. **Write** your procedure in your science notebook. Include enough detail so that you or someone else could repeat your experiment.
5. Get your teacher's approval before you begin your experiment.
6. Create a **data table** to record data related to your experiment.
7. Do your experiment and **record** your findings in your data table. Remember to take a resting pulse count after sitting quietly for 5 minutes.
8. Think about the data you have collected. Do the data for each trial seem generally consistent? If not, do you need to repeat any trials to correct any **errors**?
9. **Analyze** the data. You have collected pulse rate data for several types of movement, several people, or several trials. This is called "**raw data**". Do some calculations that will help you answer your experimental question.
10. Create a **graph** that will help you make sense of your data.
11. **Interpret** the data. What **conclusions** can you make about the effect of different movements on pulse rate? Did anything surprise you?
12. **Compare** your experimental design and results with others in your class.

EXPLAIN YOUR CONCLUSION:

1. **Research** the respiratory and circulatory systems. Find out about the structures of these two body systems, and how they function to move oxygen through the body.
2. **Explain** why the heart beats faster during activity.

Experiment #2 – Effects of Other Variables on Pulse Rate

Review the list of testable questions you and your partners generated as a result of your stethoscope exploration. Choose another pulse rate factor that you are interested in investigating.

CONDUCT YOUR EXPERIMENT:

Keep a detailed and organized record of your experimental design, data collection and analysis in your science notebook.

1. Identify the **question** you will investigate.
2. **Predict** the relationship you expect to find.
3. Design a **procedure** to collect data to answer your research question. Talk with your partners about how you could test your ideas concerning physical or environmental factors that might increase or decrease pulse rate.
4. Identify the **independent** and **dependent** variables in your experiment. Think about the parts of your experiment that should be kept **constant** so you can collect consistent data.
5. **Write** your procedure in your science notebook. Include enough detail so that you or someone else could repeat your experiment.
6. Get your teacher's approval before you begin your experiment.
7. Create a **data table** to record data related to your experiment.
8. Do your experiment and **record** your findings in your data table. Remember to take a resting pulse count after sitting quietly for 5 minutes.
9. Think about the data you have collected. Do the data for each trial seem generally consistent? If not, do you need to repeat any trials to correct any **errors**?
10. **Analyze** the data.
11. Create a **graph** that will help you make sense of your data.
12. **Interpret** the data. What **conclusions** can you make about the effect of different movements on pulse rate? Did anything surprise you?

COMMUNICATE YOUR FINDINGS:

Scientific research can be communicated in formal and informal ways, including written lab reports, journal articles, poster presentations or round-table discussions. Members of a scientific community review the experiments of others, give comments and ask questions. Select a method to share the findings and conclusions from your experiment.