**Activity 5**

**Heart to Heart**

**DISCOVER HOW HARD YOUR HEART WORKS WITH DIFFERENT TYPES OF EXERCISE.**

The heart is the hardest working muscle in the human body, pumping out oxygenated, nutrient-rich blood with every beat. But no matter how hard this muscle works each second, it still needs exercise to stay strong. Hearts that get regular exercise can pump more blood with less strain. In this activity, girls will compare ways to measure heart rate (and build their own stethoscopes!) to learn how exercise affects heart rate.

**Part 1**

**Find Your Heart Rate**

**Here’s how:**

1. **Introduce heart rate.** You may want to show an image of the circulatory system. Ask girls what is the purpose of the heart? (to pump oxygenated blood out to the body) What is a heart rate? (the rate at which the heart beats, contracting and squeezing out blood)

2. **Brainstorm.** Ask girls to list all the methods people use to measure heart rates. ² (pulse, stethoscope, heart rate monitor)

3. **Experiment with the pulse method.** Ask girls how they could find their resting heart rate by measuring their pulse. Find a pulse by placing an index and middle finger on the inside of the wrist, beneath the palm of the hand, and pressing down firmly. Count the number of beats for 10 seconds and multiply this by 6 to get the number of beats per minute (bpm). Sit quietly for a few minutes before taking your measurement. For better accuracy, do three trials, record the results, and find your average resting heart rate.

1-7 See SciGirls Seven strategies on page 3.
4. **Build a stethoscope.** Ask the girls to break into small groups and think about how to design a stethoscope using the materials provided. Remind them to make a plan before diving in. One approach is to cut off the bottom third of a water or soda bottle, then insert the vinyl tubing into the mouth of the bottle and secure it with duct tape. (See below.) Girls can then place the funnel on the chest and move it around to find the spot where the heart beats the loudest. Girls should take turns listening and recording each other’s resting heart rate. Do three trials, record the results, and find your average resting heart rate. Make sure that girls are respectful of one another and ask permission before taking the measurements.

**POINTER:** If girls are struggling, applaud their efforts. Ask what factors could help them hear better? (reduce background noise, find the proper placement, place a hand over their other ear to eliminate excess noise) To help find the proper placement, have the “patient” run in place for a few seconds before testing. Tell girls to listen for the “lub-dub” sound—the heart valves closing to prevent blood from flowing backward.

5. **Compare.** How do the resting heart rates from these two methods compare? If you have a heart rate monitor available, try using it. How accurate are the pulse and stethoscope methods compared to the monitor?

**Part 2**

**Explore How Exercise Affects Heart Rate**

6. **Question.** Divide the girls into small groups and deliver the **SciGirls Challenge:** Explore how heart rate changes with activity. At least one girl in each group will need to exercise, so you may want to group girls who are comfortable exercising with girls who aren’t.

To learn how activity influences a horse’s heart rate, watch the **SciGirls Get Healthy DVD.** (Select Horsing Around: Test).

Anyone with heart or respiratory conditions should not exercise. Kids who cannot exercise should be in charge of collecting data.

Visit pbskidsgo.org/scigirls for videos and projects.
7. **Plan.** Ask your girls how they think heart rate changes with activity. Which activities would raise your heart rate the most? Design your own experiment to test. Here are some things to consider:

- types of exercise (running, walking, jumping jacks, jumping rope)
- length of time spent doing each activity
- method for measuring heart rate (pulse, stethoscope, heart rate monitor)
- recovery time between each activity
- how many people will participate

8. **Encourage predictions.** Predict which type of exercise will increase heart rate the most or rank activities from highest to lowest expected heart rate.

9. **Find your maximum heart rate.** Calculate your approximate maximum heart rate (the upper limit your heart can handle while exercising) by using the following equation:

\[
\text{maximum heart rate} = 220 - \text{age}
\]

10. **Find out how hard you worked.** To calculate how hard the heart working during each kind of exercise, find the intensity level with this equation:

\[
\text{intensity level} = \frac{\text{heart rate after exercise}}{\text{maximum heart rate}} \times 100\%
\]

**POINTER:** Your target heart rate zone ranges from 50% to 85% of your maximum heart rate. Knowing your zone helps you get the most benefit from exercise with fewer injuries. If you exercise at less than 50% of your target heart rate, you may not be working hard enough. Moderate activities reach 50% to 70% of your target heart rate. If your body is conditioned, you can engage in vigorous activities at 70% to 85% of your target heart rate. The American Heart Association recommends engaging in moderate activities 30 min. every day.

11. **Communicate results.** Have each group create a presentation of their data. How did results compare to predictions? Which type of exercise raised your heart rate the most? Why? Where does this level fall in your heart rate zone?

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**Standards Correlation**

The activities in this book align to national education standards including: Standards for Technological Literacy, National Science Education Standards and the National Council of Teachers of Mathematics Standards. To download the complete and most current alignments, please visit [pbs.org/teachers/scigirls](http://pbs.org/teachers/scigirls).

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