Regulation of Human Heart Rate

State Standard Investigation and Experimentation 1a: Students will select and use appropriate tools and technology to perform tests, collect data, analyze relationships, and display data.

Today, after you learn how to measure heart rate accurately, your group will design an experiment to test how a stimulus or activity affects heart rate. During the next laboratory period, you will carry out your experiment, analyze your data, and draw a conclusion.

Measuring Heart Rate Accurately
Each time the heart beats, blood is pumped into the arteries. As the blood surges into the arteries during a heart beat, each artery stretches and bulges. This brief bulge of the artery is called a pulse. You will be measuring heart rate by counting the number of pulses in the artery in the wrist in a 30 second interval.

To feel the pulse, find the artery in your partner’s wrist. Place the tips of the first two fingers of one hand on the palm side of your partner’s wrist, over toward the thumb side of his or her wrist. You may need to press quite firmly in order to feel the pulse of blood which each heart beat sends through the artery. Don’t use your thumb to feel the pulse in the wrist, because you thumb has a pulse of its own.

To measure heart rate, count the number of pulses in 30 seconds. Multiply that number by 2, and you will have the number of heart beats per minute.

Designing Your Experiment
List some activities or stimuli that you think may increase a person’s heart rate.

Are there any activities or stimuli that you think may decrease a person’s heart rate?

Discuss how you could test your ideas concerning activities or stimuli which may increase or decrease heart rate. Choose a hypothesis that your group would like to test. Write your hypothesis here.

Plan your experimental procedure.
Try to keep everything constant, except for the one stimulus or activity you want to test. This will allow you to measure the effect of the stimulus or activity you are testing, and minimize the effects due to any other factors that may influence heart rate. In designing your experiment, remember that heart rate can be affected by minor physical activity such as changing seats, so you need to keep this type of factor constant in order the assess the effects of your experimental stimulus or activity.

Plan to have each person in the group be a subject in the experiment, in order to see whether different people have the same heart rate response to your stimulus or activity.

In the space below, describe the procedure for your experiment. Be specific about what you plan to do to your subjects (the stimulus) or what you want your subjects to do (the activity). Specify when and how often you will measure heart rate; you will need to measure resting heart rate two or three times before your stimulus or activity, and you will need to measure heart rate during and/or after your stimulus or activity.

List of Specific Numbered Steps in Your Procedure

Your teacher will check your plan for your experiment, and make any suggestions that could improve the experimental procedure. Discuss these suggestions and, if you decide to make any changes in your experimental procedure, incorporate these changes in your description of your procedure.

Doing Your Heart Rate Experiment
Review your experimental plan from last time, and carry out the experiment for each subject in your group. Record your data – make sure to include: name of each subject tested, resting heart rate, heart rate during and/or after the stimulus or activity, anything you notice which might affect the results.
Analyzing Your Results
Discuss the best way to analyze your data in order to determine if your hypothesis is supported or refuted (not supported). You may want to use one of the following methods of analysis:

1. For each subject, calculate the difference between the resting heart rate and the heart rate during or after the stimulus or activity. Make a table which shows these changes in heart rate values.
2. Calculate the average change in heart rate for all subjects in the experiment, and record this average in the table.
3. For each subject, graph the resting heart rate and the heart rate during and/or after the stimulus or activity. Be sure to label both axes of any graph that you make.
4. Calculate the average resting heart rate and the heart rate during and/or after the stimulus or activity. Graph these averages.

What conclusions can you draw from your experiment?

Do your results support your hypothesis?