

## MICROGRAVITY EXERCISE

### Teaching Guidelines

**Subject:** Science

**Topics:** The Nature of Science and Technology, Human Biology

**Grades:** 6 – 12

**Concepts:**

- “Microgravity”

**Knowledge and Skills:**

- Can create a chart for the collection of experimental results
- Can present experimental results clearly in written form.
- Can design an experiment which compares behavior or characteristics of classes of objects or subjects
- Knows that exertion generally speeds up the heart rate

**Subject:** Mathematics

**Topics:** Algebra

**Grades:** 9 – 12

**Concepts:**

- “Variable”
- “Function”

**Knowledge and Skills:**

- Can identify and describe patterns in a collection of related numerical data.
- Can determine the equation of a linear function that closely matches a set of points

**Materials:** Exercise props

**Procedure:**

This project should be done by students in teams of two, three or four.

Distribute the handout and discuss it. Ensure that students understand the assignment. Stress the importance of careful experimental procedure.

For more advanced students, you may wish to require a more quantitative analysis—for example, by plotting the amount increase of heart rate (or the length of time required for the heart rate to return to pre-exercise values) against the amount of time spent exercising, and matching the resulting curve or a linear or polynomial function.

Give students a schedule for working on the assignment and a due date.

School-to-Career Connection: Find out from NASA if there is a local NASA representative who can visit your class.

E-mail printout 13:48

**To: Microgravity Research Team**  
**From: Special Asst. to Director for Long Range Planning**

Now that the space station construction is in progress, it's time to give some more thought to future uses of the facility.

At some point—possibly not until 2010 or even later—we are going to want to start thinking about having families living in a microgravity environment.

Unfortunately, all of our current data relates to adults. So we need to start doing some research on younger people, age 11 - 18.

We'll start with something simple. Can you design an experiment to determine the effect of mild exercise on heart rate in this age group?

Let's be scientific about this. Begin by making a hypothesis concerning how a person's heart rate would change when they begin exercising, while they are exercising over a period of a few minutes, and when they stop exercising.

Then design an experiment to test your hypotheses.

In your experiment, please address one or more of these questions:

- ◆ Is there a difference if the person lies down for few minutes immediately before and immediately after exercising?
- ◆ Is there are difference for athletes as compared to non-athletes?
- ◆ Boys compared to girls?

The design of your experiment will require the approval of your crew chief before you carry it out.

And please be sure that participants engage in mild exercise only (such as stepping onto and off a short platform, or walking briskly).