



Student Activity Sheet

What Do You Know About the Effects of Exercise?

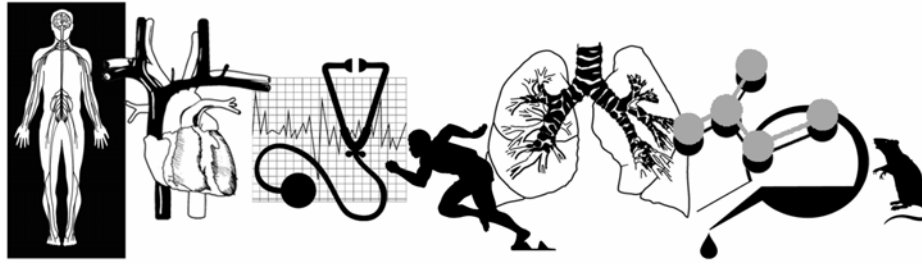
Materials

- Pen/pencil
- Poster board or roll paper (1 sheet per group)
- Post-It™ notes

Procedure

- Using the poster board and Post-It™ notes, work with your group to develop a “KWL” chart (complete the first two columns only).
- Describe what you **know** about how exercise affects the cardiovascular and respiratory systems (heart, blood, blood vessels, lungs), and what you **want** to know. See the example below.
- You’ll come back to the third column (the “L”) at the end of PhUn Week!

How Exercise Affects My Heart, Blood, Blood Vessels, and Lungs		
What I <u>K</u> now	What I <u>W</u> ant to Know	What I <u>L</u> earned



What is Physiology?

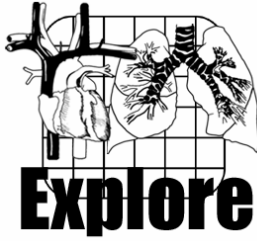
Physiology is the study of life.

Physiologists answer key questions ranging from the workings inside single cells to the interactions between human populations and our environment here on earth, the moon, and beyond. To answer these questions, physiologists work in laboratories, libraries, in the field, and in space. For example, a physiologist may study how a particular enzyme contributes to the functions of a specific cell or subcellular organelle. Other physiologists may use the simple nerve networks found in marine snails to answer questions about the fundamental mechanisms of learning and memory. Many physiologists investigate the cardiovascular system of animals to answer questions about heart attacks and other human diseases. And physiologists may study how the body adapts to temperature and environmental extremes encountered on earth, or the microgravity encountered in space flights to learn how life processes cope with these environmental stresses.

Physiology is important because it is the basis upon which we expand our knowledge of what "life" is, how to treat disease, and how to cope with stresses imposed upon our bodies by new environments.

Some physiological questions:

- Why does blood clot in a wound but not while flowing through blood vessels?
- Can we prevent loss of bone mineral during space flights or during long illnesses in bed?
- How does the nervous system convert stimuli into memories?
- Why is the immune system unable to defend the body from certain viruses?
- What factors limit human athletic performance?
- What makes one cell become cancerous while another does not?



Suggestions for Teachers

How Do Your Heart and Lungs Work Together Compared to Those of Your Classmates?

Purpose

To explore “resting” responses of the heart and lungs. Exercise (skeletal muscle contraction) is such a common physiological state that true physiologic “rest” is rarely achieved during the day.

Objectives

Students will be able to:

- Take a pulse
- Measure the rate of breathing

Materials

- Copy of Student Activity Sheets for each student

Procedure

- 1) Students should work in groups of three or four.
- 2) Have students practice taking their pulse before the lesson (see diagram).
- 3) Have students practice counting their classmate’s rate of breathing (number of breaths in one minute).
- 4) You will find that it is easier for students to take pulse and breathing readings if all groups start and stop at the same time. The room must be quiet while readings are being taken.

Safety

Students should NOT take the pulse at the carotid artery in the neck because too much pressure may cause lack of oxygen to the brain, resulting in unconsciousness. Also, mechanical pressure on the carotid artery can be sensed by the baroreceptors there as high blood pressure, which will cause the autonomic nervous system to adjust the heart rate to lower the blood pressure.

Reference:

Adapted from Runyan, P. K. (1997). “Factors affecting blood pressure and heart rate.” *Works in Progress* 1997, Bethesda, MD: The American Physiological Society.

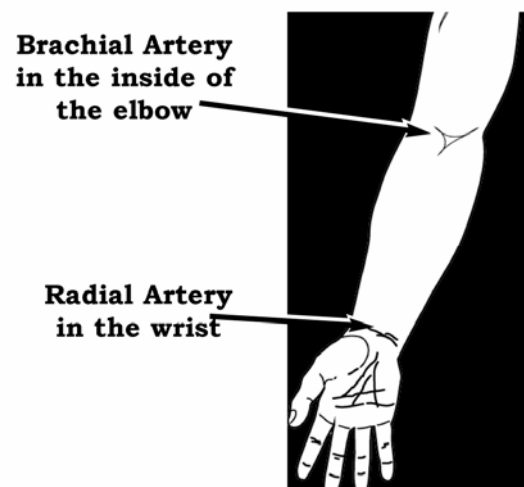
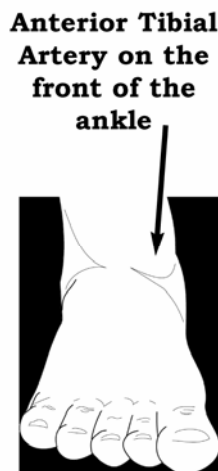
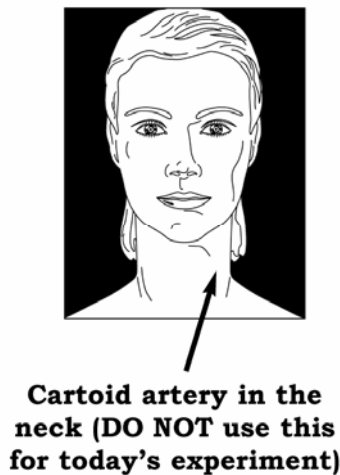


Student Activity Sheet

How to Measure Your Pulse or Heart Rate

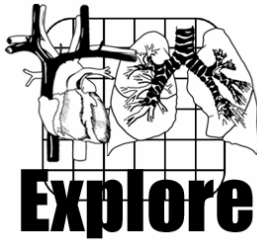
Method

- 1) Feel at your ankle, elbow, or wrists (see diagram below) with the fingertips of your index and middle fingers for your pulse point until you detect pulsations.
- 2) Keep yourself as still as possible while you are taking your heart rate.
Do not hold your breath.
- 3) Count the number of heartbeats you feel during the time periods on your data chart (15, 30 and 60 seconds). Record the results.
- 4) Try repeating steps 1-3 to measure your heart rate at different pulse points.



Resting Pulse			
Pulse Point	Time Period		
	15 seconds	30 seconds	60 seconds
Pulse - Brachial Artery			
Pulse - Radial Artery			
Pulse - Anterior Tibial Artery			

Student Name: _____



Student Activity Sheet

How Do Your Heart and Lungs Work Together Compared to Those of Your Classmates?

Background Information

Different people have different heart rates (**pulse**) and different rates of breathing while they are in a relatively quiet state (**resting**). These differences are known as **biological variability**. Sometimes scientific measurements are improperly made or are not made in the best way to have results that are about the same from one measurement to another. This is called **experimental variability**. In this experiment, you will measure your pulse and rate of breathing and compare your measurements to those of your classmates. Finally, you will think about why there might be differences in heart rate and rate of breathing among middle school students.

Procedure

- 1) Do these activities in groups of three to four. Each student should participate as an experimental “subject.”
- 2) Each subject should stand quietly at rest for a minute or two before you measure his/her pulse. Find your partner's radial pulse (on the thumb side of the inner wrist). Count and record the pulse for 6, 10, 15, 30, and 60 seconds. Then use the multiplication factor found in the table to calculate the number of beats/minute. If you have difficulty finding the pulse in the wrist, try the other arm and or the ankles. **DO NOT take the pulse from arteries in the neck area.**

Radial Artery
in the wrist



Student Name: _____

Resting Pulse			
Count pulse for:	Record the count:	Multiply by:	Heart beats per minute
60 seconds		x 1 =	
30 seconds		x 2 =	
15 seconds		x 4 =	
10 seconds		x 6 =	
6 seconds		x 10 =	

- 3) During the 60-second pulse recording (or another 60-second period), have one student count the number of breaths that the subject takes during the whole minute. Each breath involves BOTH inhaling and exhaling the air (chest moving up AND down). The subject should try to breathe normally and quietly. Record your data here:

Resting rate of breathing (breaths/min) _____

- 4) Add your data to the charts that your teacher has provided and to the chart on the next page.

Student Name: _____

Histogram - Resting Heart Rates												
Number of Students	12											
	11											
	10											
	9											
	8											
	7											
	6											
	5											
	4											
	3											
	2											
	1											
	40-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80	81-85	86-90	91-95	96-100

Number of beats/minute

Student Name: _____

Histogram - Resting Breathing Rates								
12								
11								
10								
9								
8								
7								
6								
5								
4								
3								
2								
1								
	5-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45

Number of Students

Number of breaths/minute

Student Name: _____

Heart Rate and Breathing Rate Analysis

- 1) Is the resting pulse (in beats/minute) the same for each measurement? Why could you get different answers for different measurement times?

- 2) Not everyone has the same resting heart rate. Add your data to a bar graph (histogram) of resting heart rate for everyone in the class. What might explain the **variability** (differences) in heart rate between individuals?

- 3) Can you change your pulse by thinking about it? Describe how you could test this.

- 4) Not everyone has the same resting breathing rate. Add your data to a bar graph of resting breathing rate for everyone in the class. What might explain the **variability** (differences) in breathing rate between individuals?

- 5) Can you change your breathing rate by thinking about it? Describe how you could test this.