



Suggestions for Teachers

Module #2

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 #2a and #2b 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 on page 23).
- 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.

Suggestions for Assessment

Groups can turn in the answers to their analysis questions.

References and Resources

McArdle, W.D., Katch, F.I., & Katch, V.L. (1991). *Exercise physiology* (3rd edition). New York: Lea & Fedger.

Vander, A.J., Sherman, J.H., & Luciano, D.S. (1994). *Human physiology: The mechanisms of body function* (6th edition). New York: McGraw-Hill, Inc.

Student Name: _____



Student Activity Sheet

Module #2a

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 in the time periods on your data chart on the next page. Record the results.
- 4) Try repeating steps 1-3, measuring your heart rate at different pulse points.



Carotid artery in the neck (DO NOT use this for today's experiment)

Anterior Tibial Artery on the front of the ankle



Brachial Artery in the inside of the elbow

Radial Artery in the wrist



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

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 Name: _____



Student Activity Sheet

Module #2b

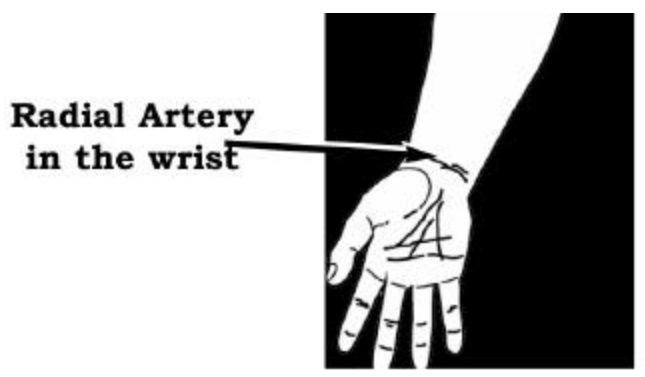
How Do Your Heart and Lungs Work Together Compared to Those of Your Classmates?

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.**



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

