

# Investigating Pulse Rate

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*The heart pumps through blood vessels to all parts of the body. With each contraction of the heart, blood is forced into the arteries. This surge of pressure is felt in the arteries as the PULSE. The rhythmic pulse can be felt at any place where an artery is close to the surface of the body and can be pressed against some firm tissue. The pulse rate is exactly equal to the heartbeat rate.*

*Medical personnel use the pulse rate as one indication of how the heart is functioning. Heart rate is influenced by many things, such as age, sex, physiological state, psychological state, and temperature. In this activity, you will investigate how several of these factors influence the pulse rate.*

In this activity you will...

1. Feel a pulse and determine pulse rates.
2. Determine the effect on pulse rate of standing at attention, holding your breath, deep breathing and exercise.

## Procedure

1. Work with a partner. Throughout this experiment, you and your partner will take turns being the subject and the experimenter. First you must learn how to take a pulse. Study the image below to see how to locate the pulse in your partner's wrist.



2. After you have sat quietly for 1 minute, have your partner count your pulse rate for **15 seconds**.
  - a) **Record this in Table 1.**
  - b) **Determine your pulse rate for 1 minute by multiplying your answer in "a" by 4. Record this number (your pulse rate per minute) in Table 1.**
3. Repeat Step 2, two more times. Then switch roles with your partner

**Record your average resting pulse rate (Trial 1 + Trial 2 + Trial 3) and record it in the table.**



**Table 1: Determining Resting Pulse Rate**

TRIAL	PULSE RATE/15 SEC	PULSE RATE/MIN
1		
2		
3		
	Average =	

[4 PTs]

4. The subject should stand at attention for **2 minutes**. Then, while the subject is still standing at attention, the pulse should be taken by the experimenter for **15 seconds**. Switch roles.

**Determine your pulse rate by multiplying this number by 4. Record your AT ATTENTION pulse rate in Table 2.**

4. While seated, the subject should take a deep breath, exhale part of it, and hold the breath as long as possible. While the breath is being held, the subject's pulse should be taken by the experimenter for **15 seconds**. Then switch roles.

**Determine your pulse rate by multiplying this number by 4. Record your BREATH-HOLDING pulse rate in Table 2.**

5. While seated, the subject should take deep breaths regularly for **30 seconds**. After the first 15 seconds, the pulse of the subject should be taken by the experimenter for the remaining **15 seconds** of deep breathing. Then switch roles.

**Determine your pulse rate by multiplying this number by 4. Record your DEEP-BREATHING pulse rate in Table 2.**

6. The time needed for your pulse to return to the sitting pulse rate is called RECOVERY TIME. The subject should do sit ups, push ups, run in place or do jumping jacks for **1 minute**. Immediately after exercise, the subject should sit and the pulse should be taken for **15 seconds**. Take the pulse again after **45 seconds**. Then it should be taken again after **1 min 45 seconds**, so that a 15 second pulse rate is taken EVERY TWO MINUTES FOR 5 MINUTES. Switch roles.

**Determine your pulse rate by multiplying this number by 4. Record your AFTER-EXERCISE pulse rate in Table 2.**

7. Assuming that your stroke volume is **70mL/beat**, calculate your cardiac output for each of the activities using the following formula:

**CARDIAC OUTPUT = STROKE VOLUME (mL/beat) x HEARTBEAT (beats/min)**



Table 2:

<b>ACTIVITY</b>	<b>PULSE RATE / 15 SECONDS</b>	<b>PULSE RATE / MINUTE</b>	<b>CARDIAC OUTPUT (ML/MIN)</b>
<b>AT-ATTENTION</b>			
<b>BREATH-HOLDING</b>			
<b>DEEP-BREATHING</b>			
<b>AFTER EXERCISE (0 MIN)</b>			
<b>AFTER EXERCISE (1 MIN)</b>			
<b>AFTER EXERCISE (3 MIN)</b>			
<b>AFTER EXERCISE (5 MIN)</b>			

[7 PTs]

## Analysis

1. Copy the resting rates/min from your class.
  - a) Calculate the average resting rate of the class from this information. **[2 PTs]**
  - b) Explain how your resting pulse rate compares with the average rate from the class. **[2 PTs]**
2. Explain how holding your breath affects your pulse rate. **[2 PTs]**
3. Which activity increased your pulse rate the most. EXPLAIN WHY. **[2 PTs]**
4. Why do athletes often have a lower pulse rate than non-athletes? **[2 PTs]**
5. What might happen if there were no valves in the veins? **[2 PTs]**