Today you will be exploring whether there is a relationship between your breathing and your pulse. You will need to work in groups of four for this lab. You will all get turns doing four different jobs:

1. Timekeeper
2. Breath counter
3. Pulse taker
4. Subject (the person being measured)

### Materials:
- Jump rope
- Stopwatch
- Pencil and paper for taking notes

### Preparation:
Decide who will take which job first.

#### STEP 1: Collect baseline data
Tell the subject to sit quietly for a few moments.

**Measure resting heart rate:**
Using the method shown in the photograph, the pulse taker locates where he or she can feel the subject's pulse. When the timekeeper signals, the pulse taker counts the number of heartbeats in exactly 30 seconds.

**Measure resting breathing rate:**
During the same 30 seconds, the breath counter observes the subject and counts the number of breaths he or she takes. Record your data in the table on the next page.

Repeat this procedure so you can find an average for accuracy. Remember to convert your data to a unit rate (per minute) by multiplying by 2.

When you have finished collecting baseline data for the first subject, continue Step 1 by rotating jobs until everyone in your group has had their resting heart rate and resting breathing rate measured.

#### STEP 2: Measuring the effects of exercise
Now you are going to measure the effects of exercise at two intensity levels.

The procedure is exactly the same as Step 1, but this time the subjects will be exercising prior to data collection.

**Low-intensity test:**
Have the subject jump rope (or a similar exercise) at a slow pace for one minute. Immediately after he or she completes this task, measure his or her pulse and breathing for 30 seconds. (Don't forget to convert to a unit rate.) Record the data on the next page.

**High-intensity test:**
Have the subject jump rope (or similar) at a fast pace for two minutes. Immediately after he or she completes this task, measure his or her pulse and breathing for 30 seconds. (Don't forget to convert to a unit rate.) Record data on the next page.

When you have finished the low- and high-intensity exercise tests for the first subject, continue Step 2 by rotating jobs so that everyone in your group is measured.
The Power of Per

Breathing rate and heart rate: Do they correlate?

Enter your data from all tests into this table.

<table>
<thead>
<tr>
<th>Heart Rate</th>
<th>Breathing Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-second sample</td>
<td>per minute rate</td>
</tr>
<tr>
<td>Baseline Test 1</td>
<td></td>
</tr>
<tr>
<td>Baseline Test 2</td>
<td></td>
</tr>
<tr>
<td>Average of Baseline Tests</td>
<td></td>
</tr>
<tr>
<td>Low-Intensity Exercise Test</td>
<td></td>
</tr>
<tr>
<td>High-Intensity Exercise Test</td>
<td></td>
</tr>
</tbody>
</table>

STEP 3: Graphing your data

After you complete your table, plot your data points on the graph. Use one color to represent heart rate and a different color to represent breathing rate. If this is not a familiar task to you, ask your teacher to show you a sample graph.
The Power of Per

Breathing rate and heart rate: Do they correlate?

STEP 4: Consider your data...What might it mean?

1. What effect does exercise have on your breathing rate? On your pulse rate?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

2. Is there a correlation between your breathing and pulse rates? If so, why do you think this relationship exists?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

3. Why did you repeat your measurements when collecting baseline data? Would you have better data if you repeated the other tests too? Why or why not?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

4. You have collected quantitative data about what happened when you exercised. Can you add some qualitative data about what happened during the tests? For example, did your face feel hot?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

5. On a scale from 1 to 4, rate your group’s precision when collecting data:

☐ disorganized and imprecise (1)  ☐ okay, but not great (2)  ☐ good with minor exceptions (3)  ☐ flawless (4)

Can your group make a claim about something you think is true based on the evidence in your lab work? If so, MAKE IT!