Who's got the Beat? Lab

How fast will pulse increase with physical activity and how long does it take to return to normal?

Unlike most workers, the heart never gets time off. Each hour, an average heart pumps about 75 gallons of blood throughout your body. Even more difficult, during exercise the heart must work overtime. The heart is the pump that causes your blood to circulate throughout your body and to all of your cells. The heart makes sure that the oxygen you breathe, the nutrients from the food you eat, and the water you drink, get delivered to your body. Without the heart, each of your organs would not be able to function.

When you exercise, you increase the demands for energy. Therefore your heart must increase the speed at which the blood delivers the vital nutrients. But just how hard is your heart willing to work? In this investigation, you will examine how much your heart rate will increase and the amount of time it takes for your heart to return to its normal rate.

Materials
- Clock with a Secondhand
- Ruler

Setting up
A pulse is the vibrations created each time your heart pumps blood through your arteries. The rate of your pulse indicates the speed of your heart pumping.

Find a large tendon on the underside of your wrist. Using your middle and ring finger from your other hand, locate your pulse just below the base of the thumb and on the outside of the large tendon.

1. Why can’t you use your thumb or index finger to take your pulse?

- Other students took their pulse to find the number of beats per minute. They recorded this score three times in Table 1 and then found the average.
- Students in this sample had an average resting pulse rate ranging from 48 to 88.

Table 1: Rate of pulse when resting

<table>
<thead>
<tr>
<th>Name</th>
<th>Resting</th>
<th>Beats/Minute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trial 1</td>
<td>Trial 2</td>
</tr>
<tr>
<td>Kevin</td>
<td>48</td>
<td>47</td>
</tr>
<tr>
<td>Angelina</td>
<td>60</td>
<td>59</td>
</tr>
<tr>
<td>Dana</td>
<td>78</td>
<td>80</td>
</tr>
<tr>
<td>Yesenia</td>
<td>90</td>
<td>85</td>
</tr>
<tr>
<td>Your name</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Now it’s your turn to find your resting pulse rate before you exercise. As the teacher times you for 30 seconds, count the beats in your pulse then multiply that number by 2 to find the number of beats per minute. Repeat the step two more times, and average your results. Record your results in Table 1.
3. The students then exercised by doing jumping jacks. They had pulse rates ranging from 93 to 130 beats per minute. What do you think your pulse rate will be after you do 100 jumping jacks? Be specific. _______________________________________________________

**Procedure**
4. Do 100 jumping jacks. Do the jumping jacks in a row without stopping. After you stop, immediately take your pulse for 30 seconds (x2).
   a. Without exercising again, continue to take your pulse for the next four minutes. This will determine how quickly your heart returns to its resting rate. Record the results after each minute in Table 2.
   b. Other students’ pulse rates after doing jumping jacks are also listed in Table 2.

**Results**

**Table 2: Rate of pulse after exercising**

<table>
<thead>
<tr>
<th>Name</th>
<th>immediately after exercising</th>
<th>1 min. after exercising</th>
<th>2 min. after exercising</th>
<th>3 min. after exercising</th>
<th>4 min. after exercising</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kevin</td>
<td>93</td>
<td>90</td>
<td>74</td>
<td>67</td>
<td>51</td>
</tr>
<tr>
<td>Angelina</td>
<td>111</td>
<td>99</td>
<td>85</td>
<td>78</td>
<td>72</td>
</tr>
<tr>
<td>Dana</td>
<td>120</td>
<td>109</td>
<td>90</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>Yesenia</td>
<td>130</td>
<td>122</td>
<td>100</td>
<td>93</td>
<td>81</td>
</tr>
<tr>
<td>Your name</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Set up the information from Table 2 onto Graph 1 (on the next page).
4. Write the **time variable on the x-axis.** This is the independent (manipulated) variable. (2 pts.)
5. Write the **dependent (what you are measuring) variable on the y-axis.** (2 pts.)
6. Write the **title** in the format of dependent variable vs. independent variable. Remember to write what these terms actually are in your title. (2 pts.)
7. You will place your data and another student’s data from Table 2 on the same graph. Choose one color to represent your points and another for the other student’s points. Then use the ruler to create a line of best-fit. Do not treat the points as “connect-the-dots.” Put your name in parenthesis by your best-fit line and the student’s name in parenthesis by his or her best-fit line. (4 pts)
8. Extend the line to estimate your heart rate after ten minutes of resting. Using the graph, estimate how long it would take for the student’s heart to return to its resting rate. The resting rate is calculated in Table 1. (2 pts.) __________________________________________________________
9. Why would it be inaccurate to continue the graph line until it hit 0? (2 pts.) __________________________________________________________
10. What else, besides exercise, might speed up your heart rate? Give two examples. (2 pts.) __________________________________________________________
11. Why does your heart rate increase when you exercise? Be specific. (2 pts.) __________________________________________________________
Who’s Got the Beat Lab Page 2

Graph 1

Title ________________________________

y label: ________________________________

x label: ________________________________