Muscle Fatigue Lab

Muscle Fatigue

Muscle fatigue is the decline in muscle tension as a result of previous contractile activity. A fatigued muscle is slower to contract and takes longer to relax. The onset of fatigue depends on the type of skeletal muscle, the duration of the activity, and the fitness of the individual. If a fatigued muscle is allowed to rest, it will recover. The rate of recovery depends on duration and intensity of previous exercise. Athletic training is designed to delay the onset of muscle fatigue and increase the speed with which muscles recover.

Materials

Tennis Ball, netbook, Hand Dynamometer

Hypothesis

Before you begin, write a hypothesis as to which group member will show the greatest and least muscle fatigue.

__________________________

__________________________

Procedure Part A

1. One person should obtain a tennis ball. Your job is to squeeze the ball with your **non-writing hand** as many times as possible in one minute. A legal squeeze places a dent in the ball with the heel of your hand. Don’t stop squeezing. Don’t give up.
2. Your partner should count how many squeezes you get every 10 seconds over a one-minute time period. The third person in your group should record these numbers in the chart below.
3. Once the first person is done. Switch roles and record data for each group member below.
4. Graphing. Open up your netbook, turn it on, open your chrome browser, go to eagleriverhighschool.com, select student apps, open google docs, and login.
5. Create a new spreadsheet, and type in the data below. Including the titles and times.
6. Highlight everything (including the titles,) and select insert chart. Select the option to use column A as labels. Click on customize and give the graph and its axis the proper names. Be sure each group members name is on the graph someplace.
7. Share your graph with your teacher.
<table>
<thead>
<tr>
<th>Number of Squeezes</th>
<th>Person 1</th>
<th>Person 2</th>
<th>Person 3</th>
<th>Person 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
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<td>20</td>
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</tbody>
</table>

**Procedure Part B**

1. Now we will use a slightly more sophisticated tool to measure muscle fatigue. Obtain netbook, a Go!link, and a Hand Dynamometer.
2. Plug in your Go!link to a usb port, and then the Hand Dynamometer to the Go!link.
3. Turn the netbook, open up the education file, and select logger lite. In logger lite, go to experiment menu, select all sensors, then Go!link. From the drop down menu on the right, select Hand Dynamometer.
4. When you are ready to start, hit the green collect button and start squeezing. Squeeze as many times as you can, as fast as you can, and as hard as you can. Keep it up for two minutes, click stop in loggerlite when you are done.
5. When you are done, hit the scale button. This will resize the scale of your graph so that it is the maximum viewable size.
6. Go to the file menu and select print graph, type in the students name in the name window, click ok.
7. In the print window, give the graph a name, and select PDF for output form, and then finally print.
8. Repeat for each team member.
9. Once you are done as a group you can upload the your graphs into google docs. Click on internet, open your Chrome browser, go to eagleriverhighschool.com, select student apps, open google docs, and login.
10. Click on the upload button, select files, and then select all of your groups graphs. (If it does not come up right away look in the student folder.)
11. Take some time to look at each group members graph and answer the questions below.

**Questions and Analysis**

1. What is the independent variable of both parts A and B? __________________
2. What is the dependent variable for part A? ___________________ For part B ___________________.

3. What is the relationship between the independent and dependent variable? (If you were not sure how to answer question #3. Answer #4 and #5 first.)

4. Consider both parts A and B, what happens to the speed at which a person can flex the muscles in their hand over time?

5. Consider both parts A and B, what happens to the force with which a person can flex the muscles of their hand over time?

6. Which of your partners showed the most significant fatigue in part A? ___________________ In part B? ___________________

7. What do you think would have happened if each test had continued for another minute?

8. Obtain a copy of the article, “Lactic Acid Is Not Muscles' Foe, It's Fuel.” For years people have believed a scientific mistake about muscle fatigue. What have been for the last five generations believed causes your muscles to fatigue and “burn?”

9. Explain the work of Dr. Myerhoff and the experiment this “myth about Lactic Acid” was based on.

10. The scientific process is based on constantly revising hypothesis based on new data. What do scientists now realize about the role of Lactic Acid in the mitochondria of muscle cells?