

Name: _____

Period: _____

Muscle Fatigue Lab

Problem

How much time does it take for muscles to become fatigued? Why do they fatigue or “burn” when doing work?

Materials

- Pencil
- Tennis ball
- Stopwatch
- Partner (to record your squeezes)
- Muscle Fatigue Lab worksheet
- Graph paper
- Ruler (for drawing graph)



Hypothesis

What do you think will happen when you demand your muscles to work at maximal effort over the course of time? What might a line graph of your muscle’s work look like over time? Why do you think this is? Do you think there will be a significant difference in the amount of work your muscles can do between your dominant hand and your non-dominant hand? Why or why not? How many total squeezes do you think you’ll average during three minutes of squeezing for both hands? **2pts**

Data Collection

1. Use the data table to record results (your partner will actually be entering your data, so after writing your name above make sure you switch lab worksheets).
2. Hold a tennis ball in your **dominant hand** with the same elbow resting on a desk. When your partner tells you to begin (and starts the stopwatch), start squeezing the tennis ball as *hard* and as *fast* as you can while continually counting the number of squeezes *out loud* (“1, 2, 3...13, 14...66, 67...123, 124...” etc.).
3. Every 10 seconds, your partner will record the number of times you have squeezed the tennis ball since the start. Continue the activity for 3 minutes (180 seconds). By the time you finish one trial, you will likely be well over a hundred squeezes!
4. Repeat steps 1-3, two more times, switching with your partner to allow your hand a chance to rest in between trials (meaning, you do one trial with your dominant hand, then your partner does a trial with their dominant hand. Then you do a second trial with your dominant hand, and then your partner does a second trial with their dominant hand, and so on). DO NOT switch dominant and non-dominant hands between trials!
5. Once you have completed three trials with your dominant hand, follow the same procedure with your **non-dominant hand**. Complete the remaining columns of the data table when finished.
6. Create a *line graph* on a piece of graph paper reflecting the average number of squeezes per ten second interval. Plot both sets of data on the same graph, color coding which line represents your dominant hand’s data and non-dominant hand’s data. Remember to title your graph, label each axis, provide the units for each axis and make your graph large enough to clearly see data points (in other words, choose an appropriate *interval* for your x and y axes). **10pts**
7. Use your graph and outside sources to respond to the analysis questions.

Data Table (Example data in *italics*; your partner should record the number of squeezes for each trial) **8pts**

Time (seconds)	Number of Squeezes (Dominant)					Number of Squeezes (Non- Dominant)				
	Trial 1	Trial 2	Trial 3	Avg.	# per Interval	Trial 1	Trial 2	Trial 3	Avg.	# per Interval
<i>0-10</i>	<i>24</i>	<i>23</i>	<i>21</i>	<i>22.7</i>	<i>22.7</i>	<i>22</i>	<i>19</i>	<i>21</i>	<i>20.7</i>	<i>20.7</i>
<i>11-20</i>	<i>44</i>	<i>41</i>	<i>40</i>	<i>41.7</i>	<i>19.0</i>	<i>43</i>	<i>43</i>	<i>40</i>	<i>42.0</i>	<i>21.3</i>
0-10										
11-20										
21-30										
31-40										
41-50										
51-60										
61-70										
71-80										
81-90										
91-100										
101-110										
111-120										
121-130										
131-140										
141-150										
151-160										
161-170										
171-180										

Analysis

Respond to the following questions *independently* in at least 2-3 complete sentences. Support your reasoning with data from your experiment and additional sources. Make sure you cite any sources used.

1. How did the number of squeezes per 10 second interval change over time? Why do you think this is? **2pts**

2. Compare your non-dominant and dominant hands' graphs? What does the shape of the graphs reflect about each hand? **2pts**

3. What muscle fiber type was most likely being used during this activity? Why do you think this? **2pts**

4. While squeezing the tennis ball, were your muscles working *aerobically* or *anaerobically*? How can you tell? What are some characteristics of aerobic muscle work versus anaerobic muscle work that would help you answer this question? **3pts**

Do some research to answer questions 5 and 6.

5. What is the cause or source of the “burn” you felt squeezing a tennis ball as hard and as fast as you could? Be detailed in your explanation using physiological terminology. **3pts**

6. How might muscle fatigue impact athletic performance? How could it influence an athlete’s risk of injury? **3pts**

Sources (include in-text citations) **2pts**

