C:\Users\kaemigh\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\3A2H7X3C\MC900241885[1].wmfMuscle Fatigue Lab C:\Users\kaemigh\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\3A2H7X3C\MC900320032[1].wmf

**Background:**

Your muscles need Glycogen (muscle sugar) in order to function. When the glycogen is broken down into energy for the muscles, a waste product called lactic acid is produced. A buildup of lactic acid decreases the muscles’ ability to contract and muscle fatigue sets in.

1. What is muscle fatigue?

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**Part 1: Weight Lifting**

**Procedure:**

1. Hold a book in each hand (same size book).
2. Start the timer as you raise one arm straight out parallel to the ground and the other arm down at your side (see photo 🡪 )
3. Time how long you were able to hold the book before fatigue got the better of you
4. Record your time here:

\_\_\_\_\_\_\_\_\_ minutes \_\_\_\_\_\_\_\_\_ seconds

1. Which arm felt the most fatigued? Straight arm Arm by your side
2. Which muscles experienced the most fatigue?

biceps triceps deltoids pectoralis major

**Part 2: Too Tired to Sit**

**Procedure:**

1. Sit against the wall with your

knees bent at a 90° angle.

Hold this position for as long as

it takes to feel muscle fatigue.

START THE TIMER as soon as your

knees are bent to 90°!

1. How long did you sit before your legs started to burn like crazy?

\_\_\_\_\_\_\_ minutes \_\_\_\_\_\_\_\_ seconds

1. How did it feel to try to walk right after sitting against the wall? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Fatigue is caused by a buildup of \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ in the muscle.

**Part 3:To Beat or Not to Beat**

**Background:**

Your heart is made up of a very special type of muscle called cardiac muscle. It keeps working hard from before the day you are born until the moment of your death. It never needs to stop and rest like your skeletal muscles do. Cardiac muscle does not experience muscle fatigue like skeletal muscles do. Here we will compare cardiac and skeletal muscles with the help of your strong arm and a “tennis ball heart.”

**Procedure:**

1. Extend your arm out in front of you

and using your hand, squeeze the

tennis ball HARD one time each second.

This is how hard your heart works…

and it doesn’t complain!

1. Record how many minutes you were able to “live” (squeeze the tennis ball HARD).

\_\_\_\_\_\_\_\_\_\_ minutes \_\_\_\_\_\_\_\_\_ seconds

1. How is your heart (cardiac) muscle different from your arm (skeletal muscle)? (just compare how tired your arm got doing the work of the heart!) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Is the cardiac muscle voluntary or involuntary? Explain your answer. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 4: Get a Grip**

**Background:**

After just 7 seconds of use, the muscle begins producing lactic acid as glycogen is broken down to provide energy. To help delay muscle fatigue, the muscle fibers are constantly switching on and off to allow individual fibers a moment to rest. This activity will demonstrate the effects of the action of muscle fibers.

**Procedure:**

1. Hold a popsicle stick in front of you,

Parallel to the table top.

1. Place a bent paper clip on the stick
2. Raise the stick until the legs of the paper

clip just touch the table.

1. The top of the paper clip should rest on

the stick

1. Hold the stick as steady as you can for

about 30 seconds and observe

1. Grip the stick tighter and repeat step 5.
2. What happened to the paper clip even when you kept your hand steady? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What caused this? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 5: Clothespin Calisthenics**

**Procedure:**

1. Hold a clothespin between your thumb and index finger and see how many times you can squeeze it in **30 seconds**. Record.
2. Now, without resting, squeeze it as fast as you can for the next 30 seconds. Record.
3. Continue recording number of squeezes for each 30 seconds up to 3 minutes.

**Data Table:**

|  |  |
| --- | --- |
| **Time** | **Number of squeezes** |
| 30 seconds |  |
| 60 seconds |  |
| 90 seconds |  |
| 120 seconds |  |
| 150 seconds |  |
| 180 seconds |  |

**Graph:**

1. Graph your data from the chart above
   1. Time goes on x-axis (include the units of “seconds”); Number of squeezes goes on the y-axis
   2. Graph your points; Connect the dots to create a line graph

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**Conclusion:**  
1. What happened to the number of times your could squeeze the clothespin during each 30 second interval? Why did this happen? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_