

Muscle Fatigue Lab “Feel the Burn”

Background: Just as an automobile must be supplied with gasoline as a source of energy before it can move, so too your muscles require energy in order to contract. This energy, in the form of ATP, can be produced with oxygen (Aerobic respiration) or without oxygen (Anaerobic respiration). In animal cells the anaerobic process is called Lactic Acid Fermentation, and it occurs when there isn't any oxygen available in the cells for aerobic respiration. This buildup of lactic acid, as a product of this anaerobic respiration, reaches a point where the muscles have a reduced ability to contract, until eventually exhaustion sets in and contraction of the muscle will stop. This is muscle fatigue. Similarly, in the case of the automobile when the waste products (exhaust) cannot be removed and build up inside the engine, the automobile will stop (stall).

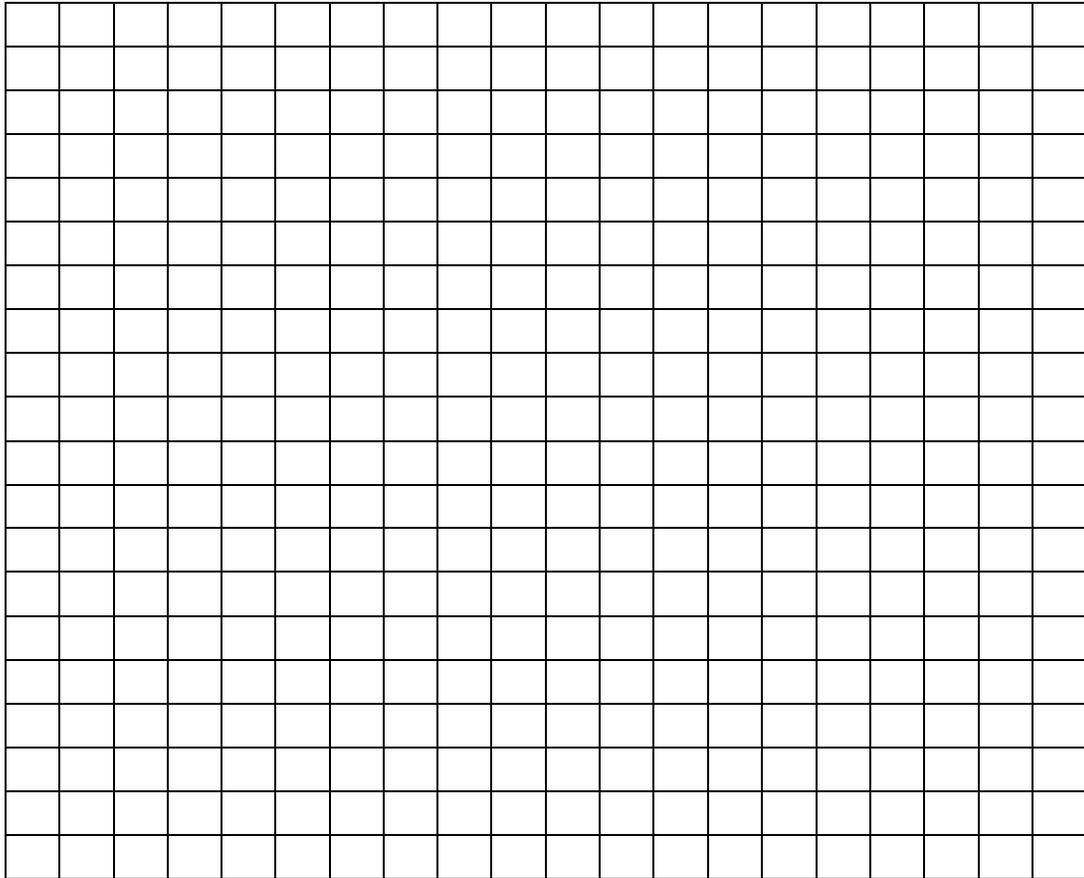
Procedure:

1. Hold a clothespin in the thumb and index finger of the dominant hand and open and close it while the other fingers of the hand are held out straight. The number of times the clothespin is opened to its maximum distance in 30 seconds is recorded in the data table below. Students should attempt to squeeze quickly and completely, to get the maximum number of squeezes for each trial.
2. Repeat this process for nine more 30 second trials recording the result for each trial. **Do not rest the fingers between trials.**
3. Repeat steps 1 and 2 for the non-dominant hand.

Trial	# of Complete Squeezes in 30 seconds	
	Dominant Hand	Non-Dominant Hand
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

4. What is the independent variable _____ The dependent variable? _____
5. Prepare a **line graph** of the data you collected. There is a graph on the next page. Make sure to label your axes clearly (use the information from #4 above), give your graph a clear, detailed title and provide a key for dominant and non-dominant hand lines.

Graph:



Investigation Questions

1. What happened to your "strength" as you progressed through each trial? How does your graph show this?
2. What physiological (body) factors might cause one to get more squeezes, in other words, to have less fatigue? (Hint: Consider how the reactants of aerobic respiration get to your muscle cells.)
3. Explain how the products of anaerobic respiration cause your cells to be less efficient.
4. Explain why the body must use anaerobic respiration (fermentation) instead of only aerobic respiration during intense physical exercise.
5. Your muscles would probably recover enough after 10 minutes to operate at the original efficiency. Explain why.