The Effect of the Manipulated Variable on the Responding Variable

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1st Hour Honors Biology

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12 January 2016

**Introduction**

This is where you (as the writer) will give all the information necessary for the reader to understand the how and the why of this investigation. The rubric has several bullet points that must be addressed. You need to write this section in such a way that this paragraph flows and makes sense to the reader. Do not try to make this longer than it needs to be, but be SURE that you correctly address all of the points in the rubric. If you check your notes from the day we did the pre-lab (these notes are also posted on my website under the cell respiration link) you can be sure to have all of the correct information. Be sure to read this out loud to make sure all of your sentences are complete and not awkward sounding. After presenting all of the background information necessary, your final sentence will be the hypothesis, worded in proper hypothesis format. (“If what you change about the manipulated variable, then how the responding variable will change.”)

**Materials and Methods**

 This section is where you describe what you did as if you are telling a story. Write this in past tense. You must be clear enough in your description so that another group could follow your directions and perform the lab EXACTLY as you did so they would potentially get the same results. There should be no list of materials, but you mention the materials that you use as you discuss what you did. For example do not say, “one person collected cups, straws and solution”. Instead, just discuss what you did. For example “a ruler was used to make a line 3 cm from the bottom of a 532 mL clear plastic Solo cup. The cups were then filled with tap water to that line and a graduated pipette was used to transfer 1 mL Bromthymol Blue indicator solution to the cup etc…”

**Results**

 The first part of your results will be a paragraph (or sometimes more) describing exactly what you found. You must refer to each figure and graph that you are presenting when you discuss the information found there. For example… “It was found that the mean time a swimmer can hold his or her breath is 80.3 seconds, SEM ±3.0 seconds. The mean time a non-swimmer can hold his or her breath is only 54.1 seconds, SEM ±1.8 seconds (Fig 1). An unpaired t-test was conducted to compare the means. There was a significant difference in the times trained swimmers could hold their breath (Mean=80.3 seconds, SD=17.8 seconds) and times that untrained non-swimmers could hold their breath (Mean=54.1 seconds, SD=10.5 seconds); p <.001. This indicates the difference between the time a swimmer and non-swimmer can hold their breath is highly significant.”



Figure 1. The graph above compares the amount of time swimmers and non-swimmers can hold their breath. The mean time a swimmer can hold his or her breath is 80.3 seconds (SD 17.8 s, SEM ±3.0 s, n=34). The mean time a non-swimmer can hold his or her breath is only 54.1 s (SD 10.5 s, SEM ±1.8 s, n=34). The error bars on the graph represent the Standard Error of the Mean.

**Conclusion**

 The hypothesis that “\_\_\_\_\_\_\_\_\_\_\_*this is where you restate your hypothesis*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” was supported. (This is your CLAIM). Now present your results, it will feel very repetitive, and it is. Regardless, you need to restate the specific data from your results sections that supports your claim. (This is your EVIDENCE). Now go on to explain the biology behind why this makes sense. Look in your rubric to be sure you answer any questions posed there for full credit. Make sure you write the answers to these questions in a way that flows and is easy for a reader understand. (This is your REASONING). You are now finished!!!

*(Example conclusion using the results given above)*

*The hypothesis that if individuals are trained as competitive swimmers, then they will be able to hold their breath longer than non-trained individuals was supported. The mean time a swimmer can hold his or her breath is 80.3 seconds ±3.0 seconds. The mean time a non-swimmer can hold his or her breath is only 54.1 seconds ±1.8 seconds. When the means were compared using an unpaired t-test, p<.001 indicating the differences are highly significant. If a swimmer has trained properly, they will have greatly increased both their lung capacity and their red blood cells ability to hold oxygen compared with untrained participants. These two physiological responses to swim training allow swimmers to hold their breath longer than individuals that have not undergone the same type of training.*