Jonathan Quang 12/18/14

Biology - Ms.Prabhu

The Effect of Exercise on Book Lifting

Question: How does exercise affect the rate at which a person can lift a book?

Hypothesis: If a person does light exercise before lifting a book as much as he or she can multiple times, then that person can lift more books because the light exercise will stimulate the body to start pumping more blood.

Materials: Timers and books of roughly the same size and weight.

Procedure:  
1. Distribute a book to every student in the class and one timer to every lab group.  
2. Have each person at the lab group grab a book and have their elbow flat on the table. The book should be in a lifted position to start off with.  
3. Have one person at teach group set the timer for one minute   
4.Have the students begin lowering and lifting the books while their elbows remain flat on the desk as much as they can. The students should be counting each time they lift.  
5. Once the one minute is over, the students should stop and record the results.  
6.Repeat steps 3-5 as soon as possible, labeling the results as book lifts after exercise.  
7. Have each person record the difference between their results (lifts without exercise minus lifts with exercise) and hand their results to one person in the lab group  
8. Have that person from each lab group record their group's results in the class spreadsheet.

Data: Check next page

Data:  
 Book Lifts in One Minute

|  |  |  |
| --- | --- | --- |
| # book lifts before exercise | # book lifts after exercise | Difference |
| 90 | 127 | -37 |
| 68 | 92 | -24 |
| 68 | 90 | -22 |
| 86 | 105 | -19 |
| 80 | 97 | -17 |
| 74 | 90 | -16 |
| 82 | 98 | -16 |
| 63 | 78 | -15 |
| 60 | 75 | -15 |
| 65 | 80 | -15 |
| 86 | 100 | -14 |
| 56 | 70 | -14 |
| 53 | 65 | -12 |
| 35 | 47 | -12  Note that a negative decrease is an increase in book lifting rate. |
| 100 | 110 | -10 |
| 55 | 65 | -10 |
| 54 | 63 | -9 |
| 54 | 63 | -9 |
| 97 | 104 | -7 |
| 60 | 65 | -5 |
| 58 | 58 | 0 |
| 73 | 71 | 2 |
| 49 | 43 | 6 |
| 52 | 45 | 7 |
| 50 | 40 | 10 |
| 73 | 60 | 13 |
| 51 | 35 | 16 |
| 50 | 25 | 25 |

Analysis:  
1.The independent variable was whether or not light exercise was done before doing the book lifts.  
2.The variables that were attempted to be constant were book size, weight, time spent testing, and the fact that the elbows were flat on the desk. Book size and weight are important to keep constant because a larger and heavier book will be much more difficult to lower and lift. Time spent testing is important to keep constant because if a group spent much more time on one trial then the next, the difference of the averages will be even more negative. Keeping the elbows flat on the desk was important because different elbow positions either made lowering and lifting the book harder or easier.  
3. The dependent variable measured was the amount of lifts in one minute.  
4. It was helpful to use the entire class data instead of group data because a single group could have people with the same results. If they did not see the rest of the class' data, they would not recognize that their data is not the average data.  
5. A negative difference of the number of arm lifts represents the muscles becoming more effective. If a person is lifting more than they were before, then their muscles are performing better. A positive difference in the number of arm lifts represents the muscles becoming fatigued. If a person is lifting less than they were before, their muscles are likely lacking adequate oxygen and/or too much lactic acid buildup.  
6. The graph results indicate that more people did more arm lifts after light exercise than less arm lifts. In fact, the arm lift rate increased in 19 people while decreasing in only 8 people. Only one person's lifting rate did not change.  
7.There are at least three factors that could have created errors in the results of this experiment. One is people could have done the lifts incorrectly by accident, either making it harder or easier to do the lifts. Another factor is that people were supposed to do the second set of lifts as soon as possible. Some groups actually waited a few minutes before going on to do the second set of lifts. This could have gave them time for their rates of heart beats to slow down. A third factor is that people had different ways of holding the book. Doing the lifts while holding a corner of the book is considerably harder than doing lifts while holding onto an entire side of the book.  
8.This experiment could have improved if a uniform way of lifting and holding the books was established. This would eliminate the errors resulting in difficulty changes due to technique. The experiment could have also improved if everyone went right away to doing the second set of book lifts. Doing so would eliminate the errors that arise from the resting period discussed above.  
9.The next investigation that builds off this experiment would be how does heavy exercise affect the rate of book lifting. The rate of lifting after the exercise in this experiment was only light exercise, not heavy exercise.

Conclusion:  
1.Two body systems that work together to maintain homeostasis that were directly responsible in this experiment are the respiratory and circulatory systems. In the respiratory system, breathing will increase so that more oxygen can enter the bloodstream for cells to use in cellular respiration and more carbon dioxide can leave the blood stream. In the circulatory system, the heart also beasts faster so that blood can circulate around the body quicker. This allows oxygen to enter muscles cells and carbon dioxide to leave cells quicker.  
2. The data supports my hypothesis that doing light exercise will increase the rate at which the book lifts are done. The data shows that 19 out of the 28 students experienced some sort of gain in lifting rate after light exercise. That is over 60% of the class.