Effects of Smoking on Blood Oxygenation Level

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Abstract

Smoking kills 5.4 million people per year (Mackay, 2007). One possible reason people smoke is because of their lack of understanding of the harm it actually does to the body. For example, smokers may not be aware of the effect of smoking on their blood oxygenation levels, as the smoke inhaled damages the biological mechanisms needed to carry oxygen through the bloodstream (Witting, 2008; Polito, 2005). This research project examines the relationship between smoking and blood oxygenation levels by comparing two groups, smokers and non-smokers, and by using a pulse oximeter to measure blood oxygenation levels. Based on previous research, the results from this project should show that smokers’ blood oxygenation levels are lower than non-smokers, because smokers’ bodies transport oxygen less efficiently. Means, standard deviations, and t-tests were used to calculate the differences between each groups’ blood oxygenation levels. While it was hoped there would be a drastic difference between groups, no significant difference was found.

Keywords: blood oxygenation, smoking
Effects of Smoking on Blood Oxygenation Level

Smoking is a highly addictive trend in 21st century America. It is responsible for an array of illnesses including a multitude of cancers, heart disease, emphysema, and chronic bronchitis. Although the whole body is negatively affected by smoking, the heart and lungs are the most adversely affected organs. Carbon monoxide, which is a major component of cigarette smoke, binds to the hemoglobin and therein prevents oxygen from doing so. This causes a lower amount of oxygen to be transported through the blood and carried to the cells of the body (Witting, 2008). Hydrogen cyanide, another major component in cigarette smoke, prevents the lungs from cleaning themselves. This allows the cilia, the tiny hairs in the lungs that are responsible for ridding the lungs of toxins, to become damaged. With the cilia damaged, the lungs are not as effective at transferring oxygen into the bloodstream, which again causes blood to carry less oxygen than is needed (Polito, 2005). Because of these two factors, the blood oxygenation level of a smoker is going to be noticeably less than that of a non-smoker. Testing the blood oxygenation levels of smokers and non-smokers should demonstrate that smoking does cause the body to less effectively transport oxygen from the lungs to the cells of the body.

Method

The purpose of this experiment is to prove that smoking does cause a person to have a lower blood oxygenation level. To test the amount of oxygen in a person’s blood, a pulse oximeter was used. This machine uses two infrared lights (one on the bottom and one on the top of the finger), because oxygenated blood and deoxygenated blood absorb the lights at different rates. The machine can be used to calculate the percent of the blood that has absorbed oxygen or is oxygenated (Gareeb, 2009).
Thirteen non-smokers and 13 smokers were tested using the pulse oximeter. An average blood oxygenation level was found for each group and the data was compared.

Results

The results of the experiment were not different from the hypothesis. After testing 26 subjects (13 smokers and 13 non-smokers), the blood oxygenation level of smokers and non-smokers did not show significant difference. Table 1 shows that the average blood oxygenation level for smokers was 97% and the average blood oxygenation level for non-smokers was 98%. This is significantly less of a difference than expected. The standard deviation for the smokers’ data was .85, and the standard deviation for the non-smokers’ data was .72. The data was relatively close together in value. The t-test results are .244, meaning the data is too close together to be statistically significant. Graph 1 shows the difference in the average blood oxygenation levels of smokers and non-smokers.

Table 1

Statistical Analysis of Participants’ Blood Oxygenation

<table>
<thead>
<tr>
<th></th>
<th>M (%)</th>
<th>SD</th>
<th>T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smokers</td>
<td>97</td>
<td>.85</td>
<td>.244</td>
</tr>
<tr>
<td>Non Smokers</td>
<td>98</td>
<td>.72</td>
<td>.244</td>
</tr>
</tbody>
</table>
Graph 1

*Average Blood Oxygenation Levels*

![Bar graph showing average blood oxygenation levels for smokers and non-smokers. The graph indicates a small difference between the two groups, with non-smokers having a slightly higher average oxygenation level.](image)

**Discussion**

The small difference between the blood oxygenation level of the smokers and non-smokers was surprising, as the expected difference was drastic. One of the biggest limitations in the experiment and what caused these unexpected results was that most of the subjects tested were rather young. Therefore, subjects had not been smoking for a very long time. It is possible that the true ill-effects of smoking could take a few years to be seen and/or have a negative effect on the blood oxygenation level of the smoker and, therefore, would not have shown up in our experiment. It would be interesting to re-test the same smokers (assuming they still smoke) over a period of time to see if their blood oxygenation level decreases the longer they smoke.
References


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http://www.bio-medicine.org/medicine-news/1-Billion-People-to-Be-Killed-by-Smoking-22175-1/


http://whyquit.com/pr/092505.html
