Effect of caffeine on reaction times

This study was devised to compare the reaction time of humans before and after the consumption of caffeine in the form of coffee. A total number of 50 subjects were involved in this project. Their reaction time before drinking coffee was tested using a reaction time test on the computer. 30 minutes after drinking a fixed amount of coffee, their reaction time was tested again. Generally, the reaction times of the volunteers after drinking coffee were significantly shorter with the mean of 0. 2631s than their mean reaction time before consuming coffee which is 0. 2951s. A t-test was used to calculate the statistics of the results leading to the rejection of the null hypothesis which said that there is no noticeable difference in the reaction time of the subjects before and after intake of caffeine. In conclusion, this experiment proved that there is evidence from the statistical testing that suggested a decrease in reaction time after consuming caffeine.

Since the early 17th century, humans have already recognised the energising effect of the coffee bean plant towards the human body. [2] Thus, coffee has been widely consumed by people who needed to feel fresh and wide awake in the morning. In addition to that, coffee is also the popular beverage that keeps those on the road alert, especially for long-distance road trips. Caffeine is the reason behind this effect that coffee has as it is a form of stimulant. It has been said that caffeine will result in the stimulation of the cortex of the brain which consequently leads to greater sensitivity to stimuli, clearer judgment, alertness and better physical control.[3] Caffeine can also stimulate the muscles of heart so that it pumps blood more efficiently, causing increase in heart rate.

Caffeine comes from a variety of sources, not only coffee. The table below shows the estimated caffeine content in various forms. All the values are approximate as different coffee beans have diverse amount of caffeine. Overall, it can be seen that coffee has higher content of caffeine compared to the others.

Until now, there is still no agreement among scientists about the actual mechanism of how it works. One of the many theories proposed that caffeine competes with adenine for adenosine receptors in the brain as they have similar structures, without activating it. Brain adenosine had been said to play role in protecting the brain by suppressing neural activity and increasing blood flow to vascular smooth muscle. By counteracting adenosine, caffeine lessens resting cerebral blood flow and generally uninhibited the effect on neural activity. Adenosine receptor also interacts with the dopamine system which controls arousal in the brain. [5]

Two skeletal formulas: left â€” caffeine, right â€” adenosine.

Figure 1: Structure of caffeine and adenosine [5]

The rationale of this study is to prove that a small amount of caffeine can improve the physical coordination of the body by measuring the reaction time of a person. With better coordination of body, reflexes of the person will take shorter time, hence the decrease in reaction time. The improvement in the reflexes by the help of caffeine may help those involve in tasks that require them to be alert at all times, especially driving as drivers need to be able to response rapidly occasionally to avoid accidents from occurring.

I carried out a few trials before conducting the actual experiment to find out the most appropriate controls for it. Firstly, a pilot study was conducted to get the ideal volume of a fixed concentration of coffee to be given to the subjects to show significant difference in their reaction time. Six volunteers were used in this pilot experiment. Each of their reaction times was noted, before three were given a cup each 100ml of the coffee, while the other three were given 200ml of coffee each. After 30 minutes, the subjects were tested for their reaction time.

From the table, it can be seen that the decrease in reaction time is more noticeable from the volunteers given 200ml of coffee which is almost equivalent to one cup of coffee. The difference increased with the increase in volume as the caffeine content at a higher volume would be adequate to show its effect. Thus, I decided that the volume of coffee that can cause decrease in reaction time is used which is 200ml.

Next, another pilot experiment was conducted to determine the optimum time elapsed for caffeine to take effect in the subjects after drinking it. Another nine other subjects were used where similarly their reaction times were recorded before drinking a constant volume of 200ml of coffee. The three of the subjects were tested for their reaction time straight after drinking the coffee. Another three were tested at 30 minutes and the remainder at 60 minutes after coffee was consumed.

According to the data obtained the subject that was tested after 30 minutes have shown noticeable reduction in reaction time whereas the subjects tested before and after 30 minutes did not have a significant difference. One

of the reasons for this is that the caffeine has not yet been fully absorbed by the body within a short period whereas caffeine might not have any effect anymore after a long period. Hence, I chose 30 minutes as the most appropriate period before testing for the final reaction time in subjects.