EFFECT OF COFFEE DRINKS TO THE REACTION TIME OF 18-22 YEARS OLD MALE UNIVERSITY STUDENTS

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ABSTRAK

Penelitian ini bertujuan mengetahui pengaruh kafein terhadap perubahan respon sebagai efek peningkatan kewaspadaan dan konsentrasi yang diukur dengan menggunakan alat tes reaction time. Metode sampling yang digunakan adalah purposive random sampling. Sampel berjumlah 27 orang yang dibagi kedalam 3 kelompok, yaitu kelompok kontrol dengan minuman air mineral, kelompok pemberian minuman kopi dengan kadar kafein 85 mg, dan kelompok pemberian minuman kopi dengan kadar kafein 170 mg. Kemudian sampel diukur nilai tes reaction timenya setelah 30 menit dan 1 jam pemberian minuman. Hasil yang didapat dianalisis dengan menggunakan ANNOVA. Hasil uji normalitas didapatkan distribusi data normal (p>0,05). Untuk homogenitas varian nilai reaction time 30 menit tidak homogen (p=0,032, p<⌐), sedangkan untuk nilai reaction time 1 jam homogen (p=0,392, p>⌐). Hasil ANNOVA untuk nilai reaction time pada 30 menit antara ketiga kelompok perlakuan (p=0,006, p>⌐), dengan nilai perbedaan hasil Post-Hoc pada kelompok kontrol dan kafein 85 mg (p=0,010, p<⌐). Sedangkan untuk 1 jam setelah perlakuan menunjukkan tidak adanya perbedaan yang nyata rata-rata nilai reaction time antara ketiga kelompok perlakuan (p=0,621, p>⌐). Terdapat penurunan waktu reaksi pada kelompok yang mengkonsumsi kopi dengan tingkat kafein 85mg setelah 30 menit, sedangkan untuk kelompok lain tidak terdapat perbedaan yang bermakna.(FMI 2014;50:48-51)

Kata kunci: kopi, kafein, waktu reaksi, mahasiswa

ABSTRACT

The study is conducted to determine the effect of caffeine to the response changes as the effect of increased alertness and concentration measured by using a reaction time test. Sampling method used was purposive random sampling. The sample consist of 27 people who were devided into 3 groups: control group with a drink of mineral water, a group of coffee drinks with 85 mg caffeine levels, and the provision of drinking coffee with 170 mg caffeine levels. The reaction time test was measured 30 minutes and 1 hour after administration of drinks. The result obtained was analyzed using ANNOVA. Normality test result showed normal data distribution (p>0.05). Homogeneity of variance values for 30 minutes reaction time was not homogenous (p = 0.032, p<⌐) while the value of 1 hour reaction time is homogenous (p=0.392, p>⌐). ANNOVA resulted to the value at 30 minutes reaction time among the three treatment groups (p=0.006, p<⌐), with the value of differences in the post hoc results in the control group and 85 mg caffeine levels (p=0.010, p<⌐). As for 1 hour after treatment showed no significant difference average value of reaction time among the three treatment groups (p=0.621, p>⌐). The result shosw impairment of reaction time only in the group who consumes coffee after 30 minutes with 85 mg caffeine levels, while for other groups not to be impaired the reaction time significantyl.(FMI 2014;50:48-51)

Keywords: coffee drinks, caffeine, reaction time test, student

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INTRODUCTION

In recent years, coffee is the most consumed beverage in the whole world after water and 71.5% coffee is consumed by developing countries (Grigg 2002). Demands for working in high performance motivate people to get the benefit of physiological and psychoactive substances in coffee. However, the effects of these substances force vital organs work hard and cause various diseases such as heart attack, stroke, heart failure, kidney failure, Parkinson's disease, cancer and others (Binns et al 2007). Further research on this issue becomes important due to the lack of attention to the caffeine content in coffee. Based on studies, caffeine can significantly stimulate the autonomic nervous system and increase concentration, the addition doses of caffeine can affect the autonomic nervous responsiveness (Quinlan et al 1997). Caffeine is able to improve the working performance by increasing the concentration but did not make any effect on memory. Measuring the value of brain activity to the specific response uses an experiment called Reaction time, a study that describes the concentration levels of the brain to stimuli. One of the factors affecting the value of the reaction time is the stimulating effects of caffeine on brain arousal (Kosinski 2009).

According to the fact that the number of people drinking coffee, especially students, is increasing, results in the problem which has not been extensively researched. It is about how much coffee drinks that can be consumed in general given the existence of the negative effects of

coffee are not used by conducting tests reaction time. Each standard cup of coffee contains around 150ml 71-120 mg of caffeine in coffee Arabica and 131-220 mg per cup of coffee Robusta. Caffeine, or 1,3,7-trimethylxanthine contained in coffee are the psychoactive substances that can increase alertness, energy and concentration, when consumed in adequate amounts (50-150mg), but the high number (> 150 mg) also reflect such, nervousness, anxiety, insomnia and tachycardia. Doses of caffeine via coffee consumption is effectively able to reduce drowsiness in the morning for the driver a vehicle for the first 30 minutes then followed by a loss at all feel sleepy for about 2 hours later (Horne & Reyner 1995). The purpose of this study is to determine the occurrence of a change in the value of reaction time on the Student in The Faculty of Medicine, Universitas Airlangga, Surabaya (FKUA), whose were male age 18-22 years, after coffee consumption.

MATERIALS AND METHODS

The sample of this study was 27 male students of Faculty of Medicine, Universitas Airlangga who were 18-22 years old. The sampling technique used simple random sampling and was divided into 3 groups. Inclusion criteria were male students of Medical Faculty of Universitas Airlangga who were in the 5th semester, 18-22 years old, and willing to be the subject of this research by filling in the consent forms. Exclusion criteria were they who have ever had hypertension, have taken the drugs, are intolerant of coffee, are ill, or have taken medicine previously. The research was conducted for 1 week at Physiology Practical Room of Faculty of Medicine, Universitas Airlangga in November 2011.

Independent variables in this study was drinking coffee, meanwhile the dependent variable was the sample's reaction time. The coffee used in this study was Kapal Api coffee, one of the coffee brands on the market, included in Robusta coffee. Kapal Api coffee used was in a sachet with 25 g net and 85 mg caffeine. The reason for using Kapal Api research in this research based on MARS Indonesia research in 2006 and 2007 stating Kapal Api coffee was still a winner in the coffee market with a fairly high amount of consumption of 44 % in 2006 and 44.3 % in 2007. Reaction time tests performed using the "Takei Whole Body Reaction" tool to measure a person's reaction to stimuli appeared. Reaction time used in this research was "Choice Reaction Time", which used three options. Stimuli used in this research was the sound stimuli/auditory with 3 sounds' frequency of 300 Hz, 500 Hz, and 1000 Hz. Reaction time was taken from an average of five times

expriments. Research data analysis used SPSS software with Analysis of Variance (ANOVA) programme.

RESULTS

This research took data from the treatment of research subjects. Data taken was reaction time value of the research subjects who were a control group drinking mineral water and the treatment group drinking coffee. Average data of the results are presented in Table 1

Table 1. Reaction time mean per treatment group

Groups	Reaction Time after 30 minutes (Mean ± SD)	Reaction Time after an hour (Mean ± SD)
Control	0.717125 ± 0.0397635	0.651317 ± 0.0758950
Caffeine 85 mg	0.576821 ± 0.1043164	0.586546 ± 0.1389787
Caffeine 170 mg	0.623887 ± 0.0959393	0.634639 ± 0.1941242

Through normality test with the Kolmogorov-Smirnov test obtained all the normal distributed data groups and can be analyzed using ANOVA. ANOVA results are presented in Table 2.

Table 2. ANNOVA significant value after 30 minutes and 1 hour

	F	p
30 minutes	6.354	0.006
1 hour	0.487	0.621

Annova value for 30 min p = 0.006 (p <α), indicated that there was a difference in the average value of reaction time at 30 minutes between the three treatment groups. Meanwhile, Annova value 1 hour p = 0.621 (p> α), indicated that there was not any difference in the average value of reaction time at 1 hour between the three treatment groups. To see the difference of the test results used Annova Post Hoc test. Pos Hoc test results can be seen in Table 3.

Thirty minutes Post Hoc test results revealed that control group and 85 mg of caffeine group, p-value = 0.010 (p <α), indicated that there were significant differences between the control group and the 85 mg caffeine group. Control group and 170 mg of caffeine group were found to have p-value = 0.060 (p> α), indicated that there was not any difference between the treatment groups.

Table 3. Post-Hoc test results per treatment group

Groups		30 minutes	1 Hour
Control	Caffeine 85 mg	0.010	0.352
	Caffeine 170 mg	0.060	0.809
Caffeine 85 mg	Control	0.010	0.352
	Caffeine 170 mg	0.690	0.487
Caffeine 170 mg	Control	0.060	0.809
	Caffeine 85 mg	0.690	0.487

Eighty-five mg of caffeine group and 170 mg of caffeine group had p-value = 0.690 (p> α), indicated that there was not any difference between the treatment groups. Because Annova results after 1 hour have Annova value p> α, then the value of 1 hour Post Hoc test needed not be performed because all the compared groups showed a p-value> α, which indicated that there was not any significant difference.

DISCUSSION

Coffee drinks contained caffeine which was a class of chemical compounds, Xanthine. Caffeine increased CNS/ Central Nervous System (CNS) work through the mechanism of the adenosine receptor antagonist, a nucleotide which could reduce the activity of nerve cells. Takeover of adenosine receptors by caffeine would reduce the performance of adenosine. This resulted in brain activity increasing which then stimulated hormone epinephrine releasing. Epinephrine (also called adrenaline) was a hormone and a neurotransmitter (a chemical compound that sent signals from neurons to the cell through synapses) that had sympathomimetic effects. The hormone then increased the heart rate, blood pressure, and the releasing of the dopamine neurotransmitter in the brain that stimulated arousal effects on the brain. The effects of these stimuli were able to facilitate clarity of mind and waking, increase the ability to concentrate at work on hand, and reduce fatigue (Binns et al 2007, Daniels et al 1998).

To measure the effect of caffeine to the reflect increasing as a result of the arousal effet, used Reaction time test , a test that measures the response of research subjects using sound stimuli. The faster response/reflex of someone would decrease the test reaction time value and concentration increasing is one factor that can decrease the Reaction time test value.

Reaction time values after 30 minutes of treatment

Based on research by Durlac et al in 2002, the effect of caffeine was to increase the ability to overcome interference or increase concentration level appeared within minutes after consumption. In addition, according to Daniels et al (1998) the caffeine effected on the brain since 20 minutes after consumption and increased blood pressure after 60 minutes consuming caffeine in which blood pressure increasing also contributed to facilitate the brain concentrations increasing (Durlac et al 2002).

This research results were the same like two researches above. In the research, indicated a significant difference (p < α) between 85 mg caffeine group and control group after 30 minutes. This is likely because the effects of caffeine 85 mg is an adequate effect, caffeine has been entered into the CNS and then triggers the sympathetic system to increase the response that is characterized by reaction time tests value decreasing.

Meanwhile, there was not any difference between 170 mg caffeine group and control group. This may be because 170 mg caffeine made research subjects agitate or tense that affect reaction time test value. This fits Welford research in 1980 that the reaction time becomes bad because the subject is too relaxed or tensed. As illustrated in the graph correlation between the reaction time and passion degree (Welford 1980).
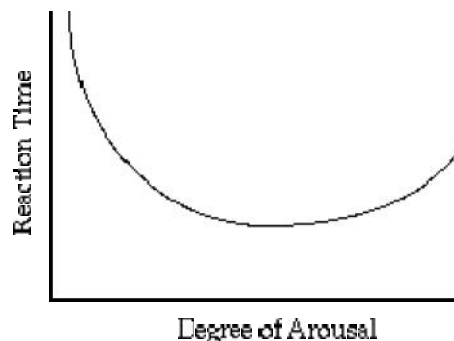

Figure 1. Correlation between the reaction time and passion degree (Kosinski 2009)

The graph shows that reaction time value is decreasing or response becomes faster when time the passion is increasing and attain the smallest value in moderate passion level, but the passion increasing excessively will cause tension so that increasing reaction time value/the slower response indicated.

Reaction time values after 1 hour trial

In this research found there is no significant difference between the control group and 85 mg or 170 mg caffeine group. This may be caused. Firstly, the coffee effect is up because the coffee level in the blood levels reached steady-state level. In pharmacology, each compound in the body undergoes pharmacokinetics and pharmacodynamics process. In terms of pharmacokinetics, drug or compound will be eliminated

after being metabolized in the body in a certain period of time. In terms of pharmacodynamics, drug or compound that achieves a maximum effect at certain doses, if the maximum effect has been reached dose increasing will not be followed by effect increasing. The both aspects are certainly influenced by genetic polymorphisms of each individual (Katzung 2001). In this research, caffeine consumed by the research subjects probably already passed the maximum effect and is level in blood has decreased so that the arousal effect and concentration increasing becomes inadequate.

Secondly, the possibility of adaptation mechanism to the research subjects. Introduction of the stimuli types of reaction time repetitively will result that the subject becomes familiar with the stimuli types. This is consistent with Sanders research in 1998 that the subject who had just knew the reaction time test had a less consistent reaction time than when they had had sufficient training and recognition. In this research, each research subjects did five tests reaction time in a single measurement and performed in the two measurements, which means each subject would perform 10 times the reaction time measurements. It was indirectly providing any sort of training and introduction to the research subject so that in the next reaction time test their reaction time would decrease/their response seemed to be faster. In the control group , the research subjects did not get any effect so their adaptation effect more clearly visible, while in the group of 85 mg of caffeine and 170 mg of caffeine, while measuring the effects of caffeine after 1 hour have decreased due to a pharmacological effect . It makes changes in the value of the caffeine group look worse or the response is slow, but the possibility of the condition group and 170 mg of caffeine 85 mg be the same as the control condition in the beginning without any influence of drink.

Effect of caffeine 75 mg and 170 mg to the reaction time after 30 minutes and 1 hour

Based on the Post-Hoc test results either 30 minutes or 1 hour after treatment, 85 and 170 mg of caffeine group had significant value $p<0.05$, indicated that there was no significant difference between the two treatment groups. To the reaction time after 30 minutes, this might be due to the fact that 85 mg caffeine had given adequate doses in the research subjects, whereas the 170 mg caffeine effected excessive agitation that affected research subject reaction time. After 1 hour, the effect of the pharmacological effects of caffeine in both treatment

groups had started to disappear so that the effect increasing happened without the influence of coffee, but rather on the effect of reaction time repeated stimuli adaptation.

CONCLUSION

Based on the analysis of the research results, there are conclusions can be made. Reaction time value decreases after drinking coffee (85 mg of caffeine) 30 minutes later. Meanwhile, reaction time value does not decrease after drinking coffee 1 hour, 30 minutes, and 1 hour later with contents 85, 170, and 170 mg of caffeine. Reaction time value does not decrease after drinking coffee 30 minutes and 1 hour later despite the caffeine content increasing.

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