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The Effect of Caffeine Intake on Sleep Duration in College Students

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Abstract

The purpose of this study is to examine the effect of caffeine intake on sleep duration of college students. The data collection period was April 6 to June 30, 2023, and 381 samples were used for final analysis. The general characteristics of the subjects were 38.6% daily water intake of less than 1 liter, caffeine beverage intake was 36.5% once to twice a week, 25.2% three to four times, 13.9% five to six times, 14.7% zero times, and 9.7% more than seven times. The most common purpose of caffeine intake was "to wake up" at 54.6%. factors affecting the subjects' sleep were Caffeine drinks besides coffee and grades. Since this study confirmed that non-coffee caffeine drinks affect sleep duration among caffeine drinks available to students, it is necessary to provide education on caffeine intake control and information that the maximum daily intake is 400 mg for college students.

Keywords: caffeine, students, sleep

1. INTRODUCTION

College students suffer from interpersonal relationships, academic achievement, mental stress, and employment during the transition from adolescence to adulthood[1]. Unlike in high school, students who go to college are deregulated and their lifestyle changes in many areas, and these factors can affect many problems, including sleep[2].

Sleep is a physiological phenomenon that is involved in restoring homeostasis in tissues, especially the central nervous system, and performs functions such as energy storage, regulation of body temperature, and removal of inappropriate memory from the sensory overloaded brain[3]. Lack of sleep leads to reduced fatigue, mood change, and pain tolerance, which reduces the performance of everyday tasks, and affects memory and academic performance. Also, sleep is a very important factor in health and learning[4].

College students are likely to live irregularly as they leave their parents and begin to live independently, especially when they sleep irregularly. Irregular living and insufficient sleep affect the human autonomic nervous system, which negatively affects the overall daily life, including health, learning, stress, fatigue, and emotional problems[5].

As such, the college student period is a special time for individual growth and development, experiencing psychological stress because it separates from family and increases independence, social needs, and academic burden to find new identities[6]. In addition, during this period, students need to receive excellent academic type of caffeine. Caffeine drinks were classified into five groups: (high-caffeine) energy, coffee in coffee shops, liquid coffee (canned coffee, coffee milk, bottled coffee, etc.), caffeine besides coffee (green tea, black tea, coke, nourishing tonics, etc.), and instant coffee.

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studies such as lectures and reports, and various test results to increase the likelihood of desired employment, so they can be exposed to continuous stress. In this regard, lifestyle habits such as the use of electronic devices and increased caffeine intake occur, resulting in changes in overall sleep patterns such as lack of night sleep and increased daytime sleep. Caffeine is consumed as an easy way to relieve sleep deprivation and drowsiness, which helps wake up to study, recover from fatigue, and change mood. Still, it gradually leads to habituation of caffeine intake, which in turn leads to a vicious cycle of causing side effects of sleep disorders[7].

According to a survey conducted by the Korea Institute of Food and Drug Safety under the Ministry of Food and Drug Safety, the average daily caffeine intake per person in Korea for three years from 2015 to 2017 was 65.7mg, which is 17.6% compared to the maximum daily intake of 400mg for adults, but caffeine intake continues to increase[8]. People in their twenties consume the most beverages compared to other age groups, and the largest proportion of drinks are coffee drinks and soda. Caffeine, a favorite food, is socially favored, and is contained not only in drinks but also in cola and chocolate, which children and teenagers consume a lot, and in non-prescription drugs such as headache pills, cold medicines, diuretics, and appetite suppressants[9].

To date, many studies have been conducted overseas on the effects of caffeine on the body and mind, and positive effects such as increased performance due to caffeine's mental activation, that is, rapid pharmacological and arousal, have been recognized[10].

However, the unwanted effects of caffeine include caffeine withdrawal, addiction, and sleep disorders, and the dependence on caffeine has been controversial[11]. Excessive intake of caffeine can have side effects due to individual differences even in healthy adults, and in adults, it takes about four days to metabolize and completely decompose[12]. It can also interfere with deep sleep and cause withdrawal symptoms such as anxiety, nausea, vomiting, severe headache, and depression. Caffeine consumption in adolescence can increase blood pressure and increase the risk of hypertension [13].

Therefore, this study aims to develop standards for caffeine intake education by identifying the effect of caffeine intake on college students' sleep duration and using them as basic data for college students' health promotion.

2. Research Methods

2.1 Research design

This study is a descriptive research study to identify caffeine intake and sleep duration of college students and to identify factors that affect sleep duration.

2.2 DATA source and participants

Among the students attending two universities located in two cities, this study understood the purpose and method of the study and agreed to participate in the study. Data was collected from April 6 to June 30, 2023, and face-to-face surveys and online surveys were conducted through Google. A total of 381 data were used for the final study analysis, excluding missing or uncertain data.

When multiple regression analysis was performed using the G Power program 3.1, at least 153 samples were calculated when set to 7 predictors, effect size .15, significance level .05, and power .95. In this study, the number of samples was calculated as 381 in consideration of the dropout rate.

2.3 Research tools

2.3.1 Caffeine intake

The caffeine intake status consisted of three items: the number of intake, the purpose of intake, and the

2.3.2 Sleep duration

In order to measure sleep duration, the PSQI (Pittsburgh Sleep Quality Index) developed by Buysse et al.[14] was translated into a Korean version by Sohn et al.[15], and the sleep duration item was used as a research tool.

2.4 Statistical Analysis

The collected data were analyzed using the SPSS/WIN 29.0 program. The general characteristics of the study subjects and the frequency and percentage of caffeine intake were calculated. The relationship between caffeine intake and sleep duration

was analyzed by Pearson's correlation coefficient. Multiple linear regression analysis was used to find out the effect of caffeine intake on sleep duration.

3. Results & discussion

3.1 Caffeine Intake Characteristics in the Last Week

The general characteristics of the subjects were 32.5% in the fourth grade, 38.6% in a daily water intake less than 1 liter, and the caffeine beverage intake was 36.5% once to twice a week, 25.2% three to four times, 13.9% five to six times, 14.7% in zero times, and 9.7% more than seven times. The most common purpose of caffeine intake was "to wake up" at 54.6% (Table 1).

Table 1 Caffeine Intake Characteristics

Variables	Characteristics	N	%
Grade	1 st	70	18.4%
	2 nd	69	18.1%
	3 rd	118	31.0%
	4 th	124	32.5%
Water intake per day	< 1 L	147	38.6%
	1~1.5 L	132	34.6%
	1.5~2 L	76	19.9%
	2~2.5 L	24	6.3%
	≥ 2.5L	2	0.5%
Caffeine Drink intake per week	0	56	14.7%
	1-2 times	139	36.5%
	3-4 times	96	25.2%
	5-6 times	53	13.9%
	More than 7 times	37	9.7%
Caffeine intake purpose	To wake up	208	54.6%
	Habitually	103	27.0%
	Because it's delicious	180	47.2%
	To quench one's thirst	79	20.7%
	To improve concentration	92	24.1%
	Etc.	9	2.4%

3.2 Sleep duration per day and subjective quality of sleep

32.0% of college students slept less than 5 hours, 29.9% of "less than 5-6 hours," 23.9% of "less than 6-7 hours," and 14.2% of "more than 7 hours." (Table 2).

More than half of the subjects in this study were found to sleep less than six hours, compared to the results of ro's study[16], in which male students slept 395.15±94.26 minutes, female students 392.04±89.10 minutes, and overall average sleep time 393.60±91.60 minutes. In addition, compared to the findings of Kim and Park [17] that 61.1% of students sleep 6-7 hours, it can be seen that the overall sleep time of the subjects in this study is less.

Table 2. Sleep duration per day and subjective quality of sleep

Items		N	%
Sleep duration per day	more than 7 hours	54	14.2%
	less than 6-7 hours	91	23.9%
	less than 5-6 hours	114	29.9%
	less than 5 hours	122	32.0%
subjective quality of sleep	Very good	34	8.9%
	Good	230	60.4%
	bad	108	28.3%
	Very bad	9	2.4%

3.3 Correlations between related variables and sleep time per day

As for the sleep duration per day, the lower the grade, the higher the water intake, the more liquid coffee, the more caffeine drinks other than coffee, and the more instant coffee, the shorter the sleep duration. (Table 3).

Table 3. Correlations between related variables and sleep time per day

		sleep time per day	
		r	p
Grade		-0.238	<.001
Water intake		0.093	0.035
Caffeine Drink intake per	Energy drink	0.071	0.082
	Coffee in coffee shop	0.078	0.065

week	liquid coffee	0.203	<.001
	caffeine, not coffee	0.286	<.001
	Instant coffee	0.096	0.031

3.4 Factors affecting sleep duration per day

It was found that the factors affecting the subjects' sleep were Caffeine drinks besides coffee and grades. Caffeine drinks besides coffee include cola, green tea, black tea, and nutritional tonics; lower grades have less sleep time (Table 4). This can be thought of in connection with the fact that first graders are often exposed to irregular lifestyle habits immediately after graduating from high school.

In addition, due to the nature of college students, it is believed that they often encounter drinks such as cola through convenience stores rather than enjoying caffeine drinks at cafes and instant coffee. These results are similar to studies [18-21] that show the higher the caffeine intake, the lower the quality of sleep.

Table 4. Factors affecting sleep duration per day

Variables	B	S. E	β	t	p	
Constant	1.746	.189		9.251	.000	
Grade	-.196	.047	-.205	-4.182	<.001	
Water intake	.105	.054	.095	1.954	.051	
Caffeine Drink intake per week	Energy drink	.031	.045	.034	.697	.486
	Coffee in coffee shop	.037	.022	.082	1.689	.092
	liquid coffee	.064	.035	.099	1.848	.065
	caffeine, not coffee	.109	.026	.217	4.197	<.001
	Instant coffee	-.007	.034	-.010	-.200	.842

R²=.148
Adj R²=.132
F=9.240(p<.001)

4. CONCLUSION

This study showed that the factors affecting sleep duration are caffeine besides coffee. Rather than interpreting that other caffeinated drinks do not affect sleep duration, these results may mean that subjects had fewer opportunities to choose other caffeinated drinks. In addition, in this study, the amount of caffeine

contained per beverage was roughly classified, but in future studies, it is necessary to accurately calculate the amount of caffeine contained in the beverage to understand its relationship with sleep. In addition, it is necessary to analyze the effect on sleep duration by accurately considering the amount of water and the time to consume water regarding the relationship with water intake. Since this study confirmed that caffeine drinks other than coffee affect sleep time among caffeine drinks available to students, it is necessary to provide education on caffeine intake control and information that the maximum daily intake is 400 mg for college students.

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