

# 대학생들의 에너지음료에 대한 인식 및 지식이 섭취행태에 미치는 영향

김유진, 전은민, 심성보, 서화정

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## Effects of Awareness and Knowledge of Energy Drinks on Consumption Patterns among College Students

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**Background:** We examined the consumption patterns and the knowledge and awareness of energy drinks to draw up a guideline for energy drink consumption and to give accurate information to college student.

**Methods:** Data from 324 subjects (186 males and 138 females) were collected using self-administered questionnaires. The study participants were recruited from the Gyeonggi-do, Seongnam area between March and June 2013.

**Results:** The results showed that there was a significant gender-based difference in awareness of energy drinks- 56.5% (78/139) of the males and 78.9% (71/90) of the females had negative awareness ( $P<.001$ ). As for recognizability of taurine by awareness of energy drinks, there were intergroup differences: the mean was 3.89 for the group with positive awareness and 3.31 for the negative awareness group ( $P=.001$ ). The odds ratio for awareness of energy drinks was 2.75 (95% CI:1.05-7.18) and those with positive awareness consumed more than those with negative awareness ( $P=.039$ ).

**Conclusions:** This investigation on the factors that affect energy drinks consumption behaviors is of significance in that it helps make known the high caffeine content of energy drinks, and accurate knowledge of the side effects and appropriate consumption.

**Korean J Health Promot 2015;15(1):31-38**

**Keywords:** Energy drinks, Caffeine, Economics, Awareness, Students

### INTRODUCTION

The global market of energy drinks is as big as about 15 trillion dollars, and the domestic market is about 100 billion won. As L drink company initiated its sales of H drink in March 2010, the general consumption of energy

drinks increased accordingly. Particularly among those in their 20s who are overloaded with duties and examinations, the consumption rates are increasing because of its concentration enhancement and fatigue-relieving effects.<sup>1-3</sup> Having changed trends in the domestic drink market during the recent growth for 2 to 3 years, the energy drink market reached 102 billion won in 2012. Compared to 30 billion in 2011, the sales tripled within one year.<sup>4</sup>

Energy drinks contain caffeine, guarana extracts, taurine, and sugar in addition to other ingredients.<sup>5</sup> The primary functional element is caffeine,<sup>6,7</sup> which is known for its overall effect of stimulation, mentally and physically.

■ Received : August 21, 2014    ■ Accepted : February 9, 2015

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As much as 400 mg of caffeine consumption may involve no negative effects,<sup>8,9)</sup> but when it exceeds 500 to 600 mg a day, there is a high risk of chronic toxicity.<sup>2,10)</sup> Chronic toxicity includes insomnia, headache, nervousness, annoyance, anxiety, nausea, vomiting, and cardiovascular disease.<sup>11,12)</sup>

Energy drinks are readily available through vending machines in colleges, and college students often drink alcohol mixed with these drinks.<sup>13)</sup> As such consumption could be dangerous, it is necessary to make available accurate information and a wholesome guideline for consumption based on the investigation of awareness and consumption behaviors of energy drinks in college students, who are the major consumers.

The goals of this study are as follows: 1) examine differences in consumption behaviors in relation to the awareness and knowledge of energy drinks, 2) examine the correlations between knowledge and the awareness of energy drinks, and 3) to examine their effects on the consumption of energy drinks.

This study assumed that the level of knowledge and consumption behaviors of energy drinks would be different depending on the positive or negative awareness of energy drinks among college students. Thus, the specific items regarding the subjects' awareness of energy drinks were examined. It was expected that the awareness of energy drinks would affect their knowledge of the ingredients of the energy drinks such as taurine and caffeine, reason for purchase, motive for consumption, and consumption behaviors. With the consumers of energy drinks are getting younger, the reasons for purchasing energy drinks, consumption behaviors, and consumption effects among college students, the major consumers, were investigated to provide accurate knowledge and to encourage the wholesome consumption of energy drinks.

## METHODS

### 1. Study participants

This study includes a survey conducted from May to June 2013, including 350 college students residing in Seongnam, Gyeonggi-do. Of the 350 copies of the questionnaire, 335 were collected and 324 were statistically analyzed with the other 11 excluded for incomplete

answers. This survey has not passed through the IRB approval procedure.

### 2. Survey contents

Five undergraduates from the Department of Healthcare Management and one master's student in healthcare policy and management from the College of Social Sciences created the questionnaire, which consists of 25 questions based on one thesis by Attila and Cakir<sup>14)</sup>, Miller<sup>15)</sup> and Reissig<sup>16)</sup>. The articles by Attila and Cakir<sup>14)</sup> and Miller<sup>15)</sup> were reviewed for the knowledge of energy drinks, the levels of energy drinks recognizability, and consumption patterns. The categories for knowledge and consumption patterns of energy drinks were drawn from Attila's work. Similarly, Miller's article<sup>15)</sup> was reviewed for variables of consumption patterns. Reissig's article<sup>16)</sup> was reviewed for classification and types of energy drinks; and among the indexes for the awareness levels in this study, the type items were drawn from this article as well.

The items included personal information (3 questions), awareness of energy drinks (6 questions), knowledge of energy drinks (10 questions), and energy drink consumption behaviors (6 questions).

#### 1) Awareness

Regarding the awareness of energy drinks, the image that subjects had about energy drinks were examined as the basis of their judgment on how such drinks would affect their health. They selected either a positive effect or a negative effect. In this study, it was assumed that whether the subjects had a positive or negative awareness of energy drinks would cause a difference in their knowledge or consumption behaviors.

Awareness of energy drinks was assessed in the following way: first, the respondents' awareness levels were assessed on a five-point Likert scale, ranging from 'very negative' to 'very positive'. Second, their awareness was divided into positive (vitamin drinks or restorative drinks) and negative (highly caffeinated drinks) based on their definition of energy drinks. The definition of energy drinks was only used to check errors in responses.

#### 2) Knowledge

To assess the level of knowledge of energy drinks, the

questionnaire asked if they knew the recommended quantity of caffeine per day, the quantity of caffeine contained in a bottle/can of energy drink, and other questions. Knowledge was classified as high, middle, or low. Of the 9 items (one item difficult to analyze was excluded), low was defined as 0-2 correct answers, middle was 3-5 correct answers, and high was 6-9, with 3 being the median.

**3) Consumption behaviors**

Motive and consumption behaviors including general times, effects, and side effects were assessed.

Multiple-choice (categorical) questions were used to assess consumption factors, consumption time, and consumption effects.

**4) Recognizability**

Recognizability is defined as the extent of recognizing a certain fact. This term is introduced to distinguish the concept from that of awareness. Recognizability was assessed with the question: do you know that the principal ingredient of energy drinks is caffeine (or taurine)? Recognizability of caffeine and taurine was assessed on a five-point Likert scale, ranging from ‘have never heard’ to ‘know well’.

Awareness is a perceptual concept used in articles, which refers to an understanding of an object; *recognizability* is a cognitive concept defined in this study.

**3. Data analysis**

Using IBM SPSS Statistics 19.0 (IBM Corp. Armonk, NY, USA), the data of this study was analyzed as follows: general characteristics of the subjects, the awareness and knowledge of energy drinks were analyzed through the

cross analysis process; and to examine the difference in their recognizability of caffeine and taurine, t-test was conducted. The motives for consumption were analyzed with multiple answers items. Lastly, the logistic regression analysis was conducted to analyze the effects of awareness and knowledge and general characteristics of energy drinks on whether to consume energy drinks.

**RESULTS**

**1. Awareness and Knowledge of Energy Drinks**

**1) Awareness of energy drinks by study participants**

The level of awareness of energy drinks was classified as positive or negative. As to the awareness of energy drinks depending on the gender, 61 males showed positive awareness (43.9%) and 78 negative awareness (56.1%). 19 females showed positive awareness (21.1%) and 71 negative awareness (78.9%). The results showed that this gender difference in awareness of energy drinks was significant. As to the difference in awareness between the upper and lower grades, no statistical difference was found. For awareness of energy drinks depending on consumption experiences, among those who had consumption experiences, 74 showed positive awareness (37.8%) and 122 negative awareness (62.2%). Among those without consumption experience, 6 showed positive awareness (18.2%) and 27 negative experience (81.8%). The results showed that in general, those who were positive about energy drinks consumed more often than those who were negative (Table 1).

**2) Knowledge of energy drinks by study participants**

The level of knowledge of energy drinks was classified as high, middle, or low. As to knowledge of energy

**Table 1.** Awareness and knowledge of energy drinks by study participants

Variables		Awareness		$\chi^2$	P	Knowledge			$\chi^2$	P
		Positive	Negative			High	Middle	Low		
Gender	Male	61 (43.9)	78 (56.1)	12.465	<0.001	17 (9.1)	98 (52.7)	71 (38.2)	7.031	0.030
	Female	19 (21.1)	71 (78.9)			4 (2.9)	67 (48.6)	67 (48.6)		
Grade	1, 2	37 (34.9)	69 (65.1)	0.000	0.993	10 (6.3)	82 (51.3)	68 (42.5)	0.033	0.983
	3, 4	43 (35.0)	80 (65.0)			11 (6.7)	83 (50.6)	70 (42.7)		
Consumption experience	Ever	74 (37.8)	122 (62.2)	4.761	0.029	18 (6.6)	140 (51.1)	116 (42.3)	0.074	0.969
	Never	6 (18.2)	27 (81.8)			3 (6.0)	25 (50.0)	22 (44.0)		

Awareness: The level of positive or negative awareness of energy drinks.

Knowledge: The level of basic knowledge of energy drinks, including the recommended daily consumption amount and the caffeine content.

drinks and gender, 17 males had high level (9.1%), 98 middle level (52.7%), and 71 low level (38.2%). Of the females, 4 had high level (2.9%), 67 middle level (48.6%), and 67 low level (48.6%). The results showed that there was significant difference in knowledge of energy drinks depending on the gender ( $P=.030$ ). For knowledge of energy drinks and grades, there was little difference between the upper and lower grades. More than 90% of the students had middle level knowledge of energy drinks, which is statistically insignificant. As to knowledge and consumption of energy drinks, the difference was small and statistically insignificant (Table 1).

## 2. Recognizability of Caffeine and Taurine in Energy Drinks

The difference in recognizability of caffeine depending on the gender was found to be statistically insignificant, as did the difference between the upper and lower grades. The difference in recognizability of taurine depending on the gender was statistically significant. The results showed that men were more highly aware of taurine than women. In contrast, the difference depending on the grades was

statistically insignificant (Table 2).

To compare the levels of recognizability of caffeine depending on their awareness of energy drinks, t-test was conducted, and the result was statistically significant. The group with positive awareness of energy drinks showed a higher level of recognizability of caffeine than the group with negative awareness. Analysis of the difference in recognizability of taurine depending on their awareness of energy drinks showed statistical significance with the group 'positive' to energy drinks more highly aware of taurine than the group 'negative' (Table 2).

## 3. Effects on Energy Drink Consumption

### 1) Reasons for using energy drinks

As to the reasons of energy drinks consumption, the multiple response cross analysis showed that among the males, 131 stated 'fatigue recovery' (79.9%), 48 'concentration enhancement' (29.3%), and 36 'curiosity' (22.0%). Among the females, 73 stated 'fatigue recovery' (66.4%), 24 'concentration enhancement' (19.1%), and 21 'suggestions from others' (19.1%). There was no difference in

**Table 2.** Recognizability of caffeine and taurine in energy drinks

Variable		Caffeine					Taurine				
		N	M	SD	$t^a$	$P$	N	M	SD	$t^a$	$P$
Gender	Male	180	4.03	1.098	1.347	0.179	164	3.51	1.185	2.154	0.032
	Female	135	3.87	1.071			105	3.21	1.044		
Grade	1, 2	155	3.99	1.162	0.403	0.686	130	3.42	1.213	0.455	0.649
	3, 4	160	3.94	1.014			139	3.36	1.070		
Awareness	Positive	78	4.45	1.136	3.229	0.001	71	3.89	1.271	3.433	0.001
	Negative	148	3.96	.975			124	3.31	1.053		

Abbreviations: M, mean; SD, standard deviation.

<sup>a</sup> $t$  value obtained from independent  $t$ -test.

Awareness: The level of positive or negative awareness of energy drinks.

Recognizability: The level of awareness of caffeine and taurine, which are principal ingredients of energy drinks.

**Table 3.** Reasons for using energy drinks

Variable		Curiosity	Suggestions from others	Concentration enhancement	Habit	Fatigue recovery	Feel good	With friends	To relieve stress
Gender	Male	36 (22.0)	24 (14.6)	48 (29.3)	6 (3.7)	131 (79.9)	6 (3.7)	10 (6.1)	11 (6.7)
	Female	19 (17.3)	21 (19.1)	24 (21.8)	0 (0.0)	73 (66.4)	0 (0.0)	13 (11.8)	8 (7.3)
Grade	1, 2	27 (20.8)	18 (13.8)	35 (26.9)	3 (2.3)	104 (80.0)	4 (3.1)	13 (10.0)	5 (3.8)
	3, 4	28 (19.4)	27 (18.8)	37 (25.7)	3 (2.1)	100 (69.4)	2 (1.4)	10 (6.9)	14 (9.7)
Awareness	Positive	9 (12.2)	7 (9.5)	26 (35.1)	0 (0.0)	62 (83.7)	3 (4.1)	5 (6.8)	7 (9.5)
	Negative	32 (26.2)	26 (21.3)	27 (22.1)	5 (4.1)	81 (66.4)	2 (1.6)	11 (9.0)	9 (7.4)
Knowledge	High	2 (11.1)	3 (16.7)	8 (44.4)	1 (5.6)	15 (83.3)	0 (0.0)	0 (0.0)	2 (11.1)
	Middle	34 (24.3)	28 (20.2)	35 (25.0)	3 (2.1)	107 (76.4)	5 (3.6)	15 (10.7)	7 (5.0)
	Low	19 (16.4)	14 (12.1)	29 (25.0)	2 (1.7)	82 (70.7)	1 (0.9)	8 (6.9)	10 (8.6)

Awareness: The level of positive or negative awareness of energy drinks.

Knowledge: The level of basic knowledge of energy drinks, including the recommended daily consumption amount and the caffeine content.

**Table 4.** Factors affecting consumption of energy drink

Variable		OR	95% CI	P
Gender	Male	0.97	(0.44-2.16)	0.940
	Female	-	-	-
Grade <sup>a</sup>	1, 2	0.50	(0.23-1.08)	0.077
	3, 4	-	-	-
Awareness	Positive	2.75	(1.05-7.18)	0.039
	Negative	-	-	-
Knowledge	High	1.27	(0.25-6.48)	0.773
	Middle	1.19	(0.54-2.63)	0.663
	Low	-	-	-

Abbreviations: CI, confidence interval; OR, odds ratio.

<sup>a</sup>adjusted variable

Awareness: The level of positive or negative awareness of energy drinks.

Knowledge: The level of basic knowledge of energy drinks, including the recommended daily consumption amount and the caffeine content.

motives according to grades. The major reasons were 'fatigue recovery', 'concentration enhancement,' and 'curiosity', in this order (Table 3).

Among those with positive awareness of energy drinks, 62 stated 'fatigue recovery' (83.7%), 26 'concentration enhancement' (35.1%), and 9 'curiosity' (12.2%). Among those with negative awareness, 81 stated 'fatigue recovery' (66.4%), 32 'curiosity,' (26.2%) 27 'concentration enhancement,' (22.1%), and 26 'suggestions from others' (21.3%). Among those neutral to energy drinks, 61 stated 'fatigue recovery' (78.2), 19 'concentration enhancement' (24.4%), and 14 'curiosity' (17.0%) (Table 3).

Of those with a high level of knowledge of energy drinks, 15 stated 'fatigue recovery' (83.3%), 8 'concentration enhancement' (44.4%), and 3 'suggestions from others' (16.7%). Among those with middle level of knowledge, 107 stated 'fatigue recovery' (76.4%), 35 'concentration enhancement' (25.0%), and 34 'curiosity' (24.3%). Among those with low knowledge, 82 stated 'fatigue recovery' (70.7%), 29 'concentration enhancement' (25.0%), and 19 'curiosity' (16.4%) (Table 3).

## 2) Factors affecting consumption

To examine the effects of general characteristics of the subjects and their awareness and knowledge on energy drink consumption, the logistic regression analysis was conducted. With the significance level at 0.05, awareness was found to affect consumption. The study showed that positive awareness facilitated energy drink consumption 2.75 times more than negative awareness. With the significance level at 0.1, additional factors that caused a dif-

ference in energy drink consumption included grades with younger students using energy drinks 0.49 times less than older students (Table 4).

## DISCUSSION

Those with positive awareness of energy drinks understood the main elements of energy drinks- caffeine and taurine, more accurately than those with negative awareness. Thus, it is expected that they would show different behaviors in consumption. As the domestic consumption of energy drinks increased drastically recently, examined were the awareness and knowledge of energy drinks and their major ingredients among college students in their 20's, who are the major consumers, as well as, the factors that would affect energy drink consumption.

The awareness of energy drinks in relation to their consumption was statistically significant. The results showed that those with positive awareness of energy drinks would consume more than those with negative awareness. As to the reason of high consumption rates in even some of those with negative awareness, marketing methods that would stimulate curiosity were examined. One of the reasons of consumption despite negative awareness of energy drinks is curiosity about trends of the public. In the case of the U.S. market, the major target of energy drinks in the early years was athletes, but it was expanded to youths and young adults from 16 to 35 yrs.<sup>2,15)</sup> Accordingly, the marketing methods including commercials emphasized positive effects of drinks and attracted curiosity.<sup>17)</sup> In particular, young consumers (aged 16-21)

view that consuming energy drinks would affect their social image positively and thus buy them more often.<sup>18)</sup> In Korea as well, a similar trend is observed. Commercials for energy drinks and social trends are thought to affect consumption significantly.

Awareness of energy drinks did not correlate with knowledge. Whether they had positive or negative awareness of energy drinks, students were found to have a low level of knowledge of energy drinks in general. They did not know much about the major ingredients, side effects, and appropriate consumption. Recently, as media frequently reported side effects of energy drinks, consumers developed a negative awareness of energy drinks. In other words, as the side effects became a social issue, more people had negative awareness. As a result, while the market of energy drinks explosively expanding from 2011 to 2012, sales turned downward in 2013.<sup>19)</sup>

There was no difference between male and female students in the recognizability of caffeine, a major component of energy drinks. Caffeine, an element commonly used in various drinks, seemed familiar among both male and female consumers. As it is found in coffee, tea, and soft drinks that college students enjoy consuming, they are highly exposed to caffeine. There was no statistically significant difference in recognizability of caffeine depending on the gender. In contrast, the difference in recognizability of taurine was found to be statistically significant. Taurine is one of the major elements of energy drinks. Men, who were found to work out or exercise more than women, were likely to consume energy and sports drinks more frequently. As women are less exposed to taurine, the result was statistically significant. Thus, it was concluded that men would be more exposed to taurine than women.

The positive effects of taurine include better liver function through detoxification and antioxidant properties, reduction of blood cholesterol, blood pressure control, and enhancement of exercise adherence ability. It is reported that taking taurine as a food additive causes little harm to health.<sup>5),12)</sup>

Two of the major reasons given for energy drink consumption were 'fatigue recovery' and 'concentration enhancement'. According to one report from Nutrition,<sup>14)</sup> college students in the U.S. consume energy drinks to gain energy despite lack of sleep and drink alcohol with

better flavors whether they had positive or negative awareness of them. Statistically, 67% stated 'because of insufficient sleep,' 65% 'to gain more energy,' and 54% 'in a party'.<sup>20)</sup> The study showed that parents, doctors, and teachers had little understanding of the reality in consumption of energy drinks among youths, and that the burdensome workload among college students including young students lead to consumption of energy drinks.

Awareness of energy drinks was found to affect consumption. Namely, the study showed that positive awareness of energy drinks facilitated consumption more than negative awareness. This is because of the incorrect recognition that energy drinks are a fatigue recovery agent and that major elements of energy drinks would be of help for fatigue recovery. Thus, it is vital to deliver accurate knowledge of energy drinks in the future.

According to a recent study conducted by a research team at Australian National University and published as part of a journal entitled 'Alcoholism,' individuals who mix and take in alcohol and energy drinks tend to drink more than intended.<sup>21)</sup> In the future, behaviors of mixing and consuming alcohol and energy drinks will continue to be examined in recognition of the resulting risks.

Since last June when the revision of the Food Sanitation Act was discussed, the regulations regarding the use of energy drinks have been strengthened. The sale of drinks with high caffeine contents popular as 'awakening drinks' among students is prohibited around schools, and their promotion is limited to advertisements. Art. 8 (prohibition of sales of high calorie and low nutrition, etc.) and Art. 10 (limitation to and prohibition of advertisement) of the Special Act on Children Eating Habit Safety Management (Korea Food & Drug Administration, 2013) were revised;<sup>22)</sup> and the amendment energy drinks [high caffeine content drinks] were added to items subject to sales prohibition and advertisement limitation or prohibition (2013.7.30. revised). According to the food and medicine safety policies in 2013, from January of this year, high caffeine content energy drinks including 0.15 mg caffeine per 1mL shall indicate 'high caffeine' and the caffeine contents and include the statement that those sensitive to caffeine should be careful when consuming. There is an opinion that the name, energy drink, itself needs to be changed to 'caffeine drink'.<sup>23)</sup>

In this study, a survey was conducted among students. After their knowledge of energy drinks was assessed, the correct information on caffeine and taurine was provided through an appendix in the latter part of the questionnaire. In addition, there should be policies and initiatives that help youths, the major consumers, acquire accurate knowledge of energy drinks and consume them appropriately. Currently, government agencies and the media are making efforts toward appropriate regulation and promotion of the use of energy drinks. Future studies need to include actual investigation on the side effects of each element of energy drinks and ways to make known accurate information regarding risks, as well as, the recommended amount per day. In addition, efforts need to be made by the government and consumers into effective and reasonable consumption of energy drinks.

Since this survey was conducted among college students living in Seongnam, Gyeonggi-do, it may not reflect the nationwide characteristics. Nonetheless, this investigation on the factors that affect energy drinks consumption behaviors is of significance in that it helps make known the regulations concerning related markets, the high caffeine content of energy drinks, and accurate knowledge of the side effects and appropriate consumption.

## ACKNOWLEDGMENTS

This study was supported by a grant from the National R&D Program for Cancer Control, Ministry of Health & Welfare, Republic of Korea (1420210) and the Basic Science Research Program funded by Gachon University (2014-R024).

## 요 약

**연구배경:** 본 연구에서는 에너지음료의 주 소비층인 대학생들에게 정확한 정보를 제공하고 올바른 에너지음료의 섭취의 지침을 마련하고자 대학생들의 에너지음료 섭취행태, 에너지음료에 대한 인식 및 지식에 대해 조사하였다.

**방법:** 본 연구의 대상자는 2013년 3월부터 6월까지 경기도 성남지역의 남자 186명, 여자 138명으로 총 324명을 대상으로 자기기입식 설문지를 활용하였다.

**결과:** 성별에 따른 에너지음료에 대한 인식 결과, 남자는 부정적 인식 56.5% (78/139), 여자는 78.9% (71/90)로

인식의 차이가 있는 것으로 나타났다( $P=.001$ ). 에너지음료의 인식에 따른 타우린의 인지 결과, 인식이 긍정적인 집단의 평균은 3.89이고 부정적인 집단의 평균은 3.31로 차이가 있는 것으로 나타났다( $P=.001$ ). 에너지음료에 대한 인식의 odds ratio는 2.75 (95% CI:1.05- 7.18)로 긍정적인 인식이 부정적 인식보다 더 많이 섭취하는 것으로 나타났다( $P=.039$ ).

**결론:** 본 에너지음료의 섭취 행태에 미치는 영향에 대한 조사연구를 통해 에너지음료는 고카페인 음료라는 꾸준한 홍보뿐만 아니라, 그 부작용과 올바른 소비 행태에 대한 정확한 지식의 제공이 중요함을 일깨운 연구라는 데에 의의가 있겠다.

**중심단어:** 에너지음료, 카페인, 섭취행태, 인식, 대학생

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