

Relationship between Energy Drinks Consumption and Academic Performance among King Saud bin Abdulaziz University Students; Al Ahsa- kingdom of Saudi Arabia

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Abstract

Background: Energy drinks are drinks used to stimulate and energize mental and physical activity. Energy drinks have become increasingly popular among students in recent years, who often consume them to help combat fatigue, increase alertness, and try to boost academic performance. As a result, it can affect academic performance in a negative manner. **Aim of the Study:** assess the relationship between ED consumption and academic performance among KSAU students AlAhsa. **Setting:** King Saud Bin Abdulaziz University for Health Science. **Study Design:** A cross-sectional, quantitative study utilizing surveys and academic records. **Subjects:** 417 undergraduate students aged 18-25 years who enrolled at KSAU-AlAhsa. **Tool:** A self-reported questionnaire which comprises two main parts: Part I Bio-Socio-demographic data of the students Part II: ED consumption data: which include 14 question related to consumption of ED containing caffeine. **Results:** 27.58% of the KSAU students consuming energy drinks, Red Bull and Code Red are most consumed ED, 45.08 % of the students experience side effects of consuming drinks like; Palpitation, Hand shaking and or Inability to sleep. Students consumed ER has lower GPA. **Conclusions:** A significant proportion of students consume ED to manage academic stress such as Red Bull and code red, which cause side effects and affect negatively their academic performance. **Recommendation:** Awareness campaigns to clarify health risks associated with excessive energy drink consumption. Further research needed to assess the direct health impacts of prolonged energy drink use. Peer-led programs; promoting healthier alternatives and stress management techniques in educational institutions.

Key words: Energy drinks, academic performance.

Introduction

University students represent a critical demographic for studying energy drink (ED) use and related effects. Energy drinks have become increasingly popular among students in recent years, who often consume them to help combat fatigue, increase alertness, and try to boost academic performance. However, a growing body of research has raised concerns about potential negative impacts of high-energy drink intake on health and academic outcomes in student populations (**Hoffman, 2021**).

Energy drinks are drinks used to stimulate and energize mental and physical activity. ED or sport drinks, are a kind of functional drinks, which mainly designed to be used before exercising (**Nadeem et al., 2021**). Caffeine, which is a component of ED, is a central nervous system stimulant included in the xanthine group. Ninety Percent of the caffeine leaves the stomach in around 20 minutes. After an hour, the effect begins and lasts for three to four hours. The maximum concentration is reached after 40 to 60 minutes. Caffeine has a half-life of around six hours in healthy humans. Caffeine has been consumed frequently throughout human history. According to research, Caffeine is used by around 80% of the world's population. Caffeine content in a cup of coffee, which approximately contains 240 ml of coffee, is 137 mg and 2 mg in cup of caffeinated coffee, and un-caffeinated coffee respectively. In addition, there is 47 mg of caffeine in a cup of tea (**Fagan, Di Sebastiano, Qian, Leatherdale, & Faulkner, 2020**).

The public is concerned about energy drinks due to their high levels of sugar and caffeine as well as their increased popularity among teens and young people. Therefore, The Saudi Council of Ministers has decided to prohibit energy drink advertising and the distribution of free energy drinks to customers of all ages. There are many different kinds of energy drinks, and what makes them each effective is the particular mix of the chemicals contains the following active ingredients; calleine, laurine, ginseng mirba male, ginkgo biloba, carnitine, glucuronide, catteine, acai, milk thistle, and L-theanine (**Subaiea, Altebainawi, & Alshammari, 2019**). According to researches, caffeine is used by around 80% of the world's population (**Fagan et al., 2020**). Caffeine intake was proven to enhance performance, concentration, alertness and mood as reported by students in a previous study (**Riera-Sampol, Rodas, Martínez, Moir, & Tauler, 2022**). However, caffeine consumption was associated with poor quality of sleep, which has a negative impact on mental functioning. As a result, it can affect academic performance in a negative manner (**Alfonsi, Scarpelli, D'Atri, Stella, & De Gennaro, 2020**). Moreover; Caffeine consumption among students has been increasing dramatically because of media and social marketing of caffeinated beverages. Caffeine intake has gathered the attention in the last 10 years as result of broad exposure and the accessibility of these beverages, particularly among young people (**Kennedy & Scholey, 2022**).

In research conducted by The Aga Khan University, it was found that, 52% of medical students' utilized caffeine to cope with the pressure and stress associated with their academic and extracurricular activities (**Khan, Nisar, & Naqvi, 2019**). ED consumption rates in Saudi Arabia were reported by **Alabbad et al., (2022)** which were 45.63% from Dammam, 59.9% from Jeddah, 52.2% from Medina, 50.3% from Abha, and 60% from Hail that indicates the high consumption levels among people in Saudi Arabia. The consumption of these types of beverages seems to be related to factors such as male gender, friend gatherings and peer pressure (**Alabbad et al., 2022**). Also, based on a study conducted in 2018 on 667 students by a group of researchers; ED use is associated with stress. Mostly academic stresses are related to low academic performance (**Kreitzberg, Golaszewski, Ludden, Loukas, & Pasch, 2022**). As a result, 25% of university students reported regular energy drink consumption (**Kennedy & Scholey, 2022**).

Significant of the study

Most existing research has focused on Western student populations, with limited evidence specific to students in the Gulf region. Students at KSAU-Al Ahsa provide an opportunity to address this gap given the high prevalence of energy drink consumption previously observed in Saudi youth. This highlights the need to understand the patterns of energy drink consumption among university students and examine the effects of its consumption on their academic performance.

By surveying KSAU-Al Ahsa students about their energy drink intake habits and collecting academic performance data, this study can provide unique insights into the correlates of energy drink use and its potential impacts on academic outcomes among Saudi university students. Understanding these patterns and relationships is important for informing education and health promotion efforts addressing energy drink use on Saudi campuses. This research aims to provide evidence-based recommendations around energy drink consumption specific to the Saudi student context at KSAU-Al Ahsa.

Aim: assess the relationship between ED consumption and academic performance among KSAU students Al Ahsa.

Operational definition

Energy drinks: any beverage that contains high levels of a stimulant component, usually caffeine, as well as sugar and often additions, such as vitamins or carnitine, and that is promoted as a product capable of enhancing mental alertness, wakefulness and physical performance, increase energy, and improve mood.

Academic performance: is the measurement of student achievement across various academic subjects, teachers and education officials typically measure achievement using classroom performance, graduation rates, and results from standardized tests.

Research question

What is the relation between energy drinks use and academic performance of the university students?

Subjects and Methods

Setting: The study was conducted at King Saud Bin Abdul-Aziz University for Health Science

Study Design

A Cross-sectional quantitative descriptive and correlational research design study utilizing surveys and academic records.

Subjects

A convenient sample includes 417 undergraduate students aged 18-25 years who are enrolled at KSAU-Al Ahsa. Population sample targeting KSAU HS students was used to achieve the aim of the study, and all participants are chosen based on their availability and desire to participate in the study.

- The content validity of the developed tool was tested for clarity and applicability by seven experts in medical surgical nursing to ensure their validity and modifications were done. The reliability for the study tools was 0.832 calculated by using Cronbach's Alpha test.
- A pilot study: was carried out on 10% of the university students from the previously mentioned setting to test the feasibility and applicability, relevance and organization of the tools and to determine any obstacles that may be encountered during the period of data collection. Pilot study was excluded from the study sample.

Data Collection

A self-reported questionnaire was distributed to the students according to their availability to elicit the data of the study. The questionnaire comprises two parts:

1. Bio-Socio-demographic data: age, level, GPA, Marital status, number of children if any, presence of chronic disease, and income.
2. ED consumption data: which include 14 questions related to consumption of caffeine as; types; amount, time, causes, effect, and side effect of consuming ED, Caffeine consumption from other sources, Lifestyle factors like physical activity and sleep patterns, in addition to Academic performance data will be collected through students' grade point average (GPA) obtained from university records.

The questionnaire was given to jury of five faculties to examine its clarity and needed modification was done. Content validity and reliability was assessed before distributing the questionnaire. Questionnaire was distributed and collected after sign the informed consent according to the student' availability, Academic performance data was collected through students' grade point average (GPA) obtained from university records.

Data Analysis

Descriptive statistics summarize demographic variables, habits of energy drink consumption, and academic performance. Inferential statistics examined the relationships between energy drink intake and

academic performance using correlation and regression. Mediation analysis performed to assess if lifestyle factors mediate the relationship between energy drink and GPA.

Ethical Considerations

Research proposal was reviewed by CON-A research unit and institutional review board at KAIMRC, Approval was obtained with a number of SP23A/014/07, informed consent was obtained from each participant with maintaining of confidentiality and anonymity, each questionnaire was given a code instead of name, students were assured that their participation is voluntary and they have the right not to accept or withdrawn from the study without giving any reason which will not affect their grades, code was used instead of names, all data was used only for the purpose of the current research, data was kept in secured private personal computers, students' confidentiality was maintained at all time of the study period., so no participant identification was required.

Limitations

Limitations include the cross-sectional design, reliance on self-reported survey measures, and convenience sampling of students from a single university.

Results

The present study aims to assess the relationship between energy drinks consumption and academic performance among KSAU Students, Al Ahsa- KSA. Using a description, 417 students from KSAU Students were included. Results showed a mean age of 20.88 ± 1.02 years old,

majority of them 28.78% from level 7 followed by 24.94% from level 10, 64.03% were female and 87.05% were singles; moreover; considerable percent reported that they don't have enough income and no presence of chronic diseases 60.43% and 93.29% respectively. GPA of KSAU students ranged from 2.10 to 5.0 with a mean of 3.72 ± 0.61 . In addition, 34.77% did not practice any exercise or physical activity while 27.10% and 21.58% of them practicing walking and gym respectively with sleeping hours ranged from 2 to 12 hours with a mean of 6.41 ± 1.65 .

Caffeine containing drinks consumption;

Table 1 presents; distribution of the studied nursing students regarding consuming of caffeine containing drinks. It proved that among the 417 KSAU students, 75.78% of them drink tea with a mean of 5.61 ± 6.39 cup weekly, 78.18% drinks coffee with a mean of 5.97 ± 6.03 cup weekly and 44.6% drink the Arabic coffee. Night and morning is the time preferred time to drink tea and coffee by 47.96% & 47% of the students respectively, while they tend to drink caffeine-containing drinks when they feel tired 50.36%, followed by 48.92% during the examination time. In addition; students reported purpose of consuming tea and coffee that they like the taste, followed by improving the mode and to keep them awake 55.16%, 49.64% and 41.25% respectively with a majority 73.62% stated that consuming these drinks achieve the purpose of drinking and near to third 30.22% considered

themselves as a caffeine drinks addictive.

Energy & Soda drinks consuming;

Table 2 illustrates distribution of studied nursing students regarding soda and energy drinks consumption. Among the study sample, 72.42% of them did not consume energy drinks while cod red was the common used ED between the consumers (53.04%) followed by red ball 35.65% with a number of cans consumed per week ranged from 1 to 15 and a mean of 2.99 ± 2.65 can weekly.

Regarding soda drinks, it was found that 57.89% of the students drink Pepsi, 55.26% consume Coca-Cola and 32.33% & 34.96% drink Sprite and Seven Up respectively with a range of 1-25 cans consumed per week. Moreover, results illustrated that the majority 74.34% of the students recommended others to drink tea; followed by 69.54% recommended drinking coffee while only 24.94% who encourage consuming of energy drinks.

These findings indicate that a significant portion of nursing students recommend coffee and tea to others, while a smaller percentage recommend energy drinks and soda

drinks. The majority of students do not recommend energy drinks and soda drinks to others.

Common side effect of caffeine drinks consumption;

Table 3 presents distribution of studied nursing students regarding experience side effects of energy drinks. It showed that the most common side effects of energy drinks consumption reported by the studied students were: inability to sleep: 25.90%, stomach upset 17.51%, palpitation: 14.87% and hand shaking: 12.47% (Table3).

Effect of energy drinks on academic performance;

Table 4 presented the mean comparison of GPA of the studied nursing students based on their caffeine drinks consumption. The table presents that there was a significant difference between students' GPA and consuming of energy drinks where GPA of students who are not consuming energy drinks was higher than those who are consuming with $p = 0.027$; in addition students who considered themselves as caffeine addictive got lower GPA than those non addictive with $P = 0.004$.

Table (1): Distribution of nursing students regarding consuming of caffeine containing drinks

Caffeine containing drinks	The studied nursing students (n=417)	
	N	%
Drink tea		
- No	101	24.22
- Yes	316	75.78
Number of cups per week		
- Range	(1-40)	
- Mean \pm SD	5.61 \pm 6.39	
Drink coffee		
- No	91	21.82
- Yes	326	78.18
Number of cups per week		
- Range	(1-35)	
- Mean \pm SD	5.97 \pm 6.03	
# Type of coffee		
- Arabic	186	44.60
- Black	183	43.88
- Others	50	11.99
# Time of drinking caffeine drinks		
- Morning	196	47.00
- Afternoon	163	39.09
- Evening	150	35.97
- Night	200	47.96
# Situations to use caffeine drinks		
- When I feel tired	210	50.36
- When I feel exhausted	107	25.66
- When I fell stressed	106	25.42
- During exam time	204	48.92
- During family gathering	79	18.43
- When I feel bad mood	2	0.48
# Purpose behind consumption		
- To relive headache	85	20.38
- For good concentration	127	30.46
- To improve the mood	207	49.64
- To keep me awake	172	41.25
- I like the taste	230	55.16
- To improve memory	33	7.91
- To enhance academic performance	41	9.83
- Others	2	0.48
Caffeine drinks achieved the purpose		
- Yes	307	73.62
- No	110	26.38
I am a caffeine drinks addict		
- Yes	126	30.22
- No	291	69.78

Table (2): Distribution of studied nursing students regarding soda and energy drinks consumption

Soda and Energy drinks	The studied nursing students (n=417)	
	N	%
Consuming of energy drinks		
- No	302	72.42
- Yes	115	27.58
Types of consumed energy drinks (n=115)	41	35.65
- Red Bull	16	13.91
- Bison	61	53.04
- Code Red	7	6.09
- Power Horse		
- Others	20	17.39
Number of energy drinks can per week	(1-15)	
Range		
Mean ± SD	2.99±2.65	
Consume soda drink		
- No	151	36.21
- Yes	266	63.79
# Types of soda drink (n=266)		
- Coca-Cola	147	55.26
- Pepsi	154	57.89
- Sprite	86	32.33
- Fanta	65	24.44
- 7 UP	93	34.96
- Miranda	76	28.57
- Others	19	7.14
Number of soda drinks can per week	(1-25)	
- Range		
- Mean ± SD	3.95±3.49	
Recommendation to drink		
1. Coffee		
- Yes	290	69.54
- No	127	30.46
2. Tea		
- Yes	310	74.34
- No	107	25.66
3. Energy drinks		
- Yes	77	18.47
- No	340	81.53
4. Soda drinks		
- Yes	104	24.94
- No	313	75.06

Table (3): Distribution of studied nursing students regarding experience side effects of energy drinks

# Experience about side effects of consuming drinks	The studied nursing students (n=417)	
	N	%
- None	229	54.92
- Palpitation	62	14.87
- Hand shaking	52	12.47
- Inability to sleep	108	25.90
- Depression	28	6.71
- Anxiety	42	10.07
- Irritability	22	5.28
- Stomach upset	73	17.51
- Headache	32	7.67
- Nervousness	24	5.76
- Dehydration	25	6.00
- Hypertension	17	4.08
- Polyuria	39	9.35
- Others	10	2.40

Table (4): Mean comparison between GPA of the studied nursing students and caffeine drinks consumption

Drink consumption	The studied nursing students GPA	F P
	Mean ± SD	
Drink tea		
- No	3.70±0.64	0.234
- Yes	3.73±0.60	0.629
Drink coffee		
- No	3.75±0.55	0.153
- Yes	3.72±0.63	0.696
Consume energy drinks		
- No	3.77±0.62	4.953
- Yes	3.62±0.57	0.027*
Consume soda drink		
- No	3.70±0.62	0.471
- Yes	3.74±0.61	0.493
Caffeine drinks helped to achieve purpose		
- Yes	3.71±0.62	1.151
- No	3.78±0.58	0.284
I am a caffeine addict		
- Yes	3.60±0.64	8.409
- No	3.78±0.59	0.004*

Discussion

After analysis of the data collected and study the literature reviews which indicate that the consumption of ED containing caffeine, taurine, herbal extracts, vitamins, and amino acids is prevalent among population particularly university students. Here is a comparison of the findings from the literature reviews with the data presented:

ED Consumption among Medical Students: Literature: 52% of medical students used caffeine, possibly in the form of EDs, to cope with academic and extracurricular stress (**Khan et al., 2019**), moreover, 74.8% of medical students reported using ED, with various brands mentioned, including Code Red, Red Bull, Bison, Powerhouse, and Monster (**Edrees et al., 2022**).

ED consumption rates varied across different regions, such as Dammam, Jeddah, Medina, Abha, and Hail, in Saudi Arabia, with high consumption levels among males associated with factors like peer pressure (**Alabbad et al., 2022**). The literature also stated high consumption rate among students, associated with academic pressure and possibly peer influence, as a significant percentage of students reported using ED (**Edrees et al., 2022**).

Smith (2016) reported high prevalence of caffeine consumption among the nursing students where 84% of college students drink caffeinated beverages regularly. **Hoffman et al. (2021)** stated that 25% of university students reported regular energy drink consumption. Red Bull being the most common choice

(**Kennedy, & Scholey, 2019**). Using caffeine to improve concentration and academic performance relates to **Jones, Fernyhough, de-Wit, Meins, & Weisberg, (2019)** who identified cognitive enhancement as a key motivator for college students' caffeine use.

The association between energy drinks and lower GPA corroborates **Peters, DePuy, Belcher, & Savvides, (2021)** who reported lower GPAs among students consuming energy drinks frequently compared to infrequent consumers. The adverse side effects reported support **Temple, Dewey, & Briatico, (2017)** where students drinking more than two energy drinks per week had higher rates of sleep disturbances, nervousness, and fast heart rate with palpitation. Another study by **Sampasa-Kanyinga, Hamilton, Chaput, & Ferraro, (2018)** found that consumption of energy drinks resulted in sleep disturbance and low academic performance in high school students.

These studies suggest that higher consumption of energy drinks, which contain caffeine, may have a detrimental effect on academic performance among university students. It is important to notice that while caffeine can afford short-term advantages frequent and regular consumption may lead to adverse effects on sleep patterns, memory span, level of concentration, and overall cognitive functioning.

However, the present study provides new evidence specific to nursing students at KSAU in Saudi Arabia, a relatively understudied population

regarding caffeine intake patterns and effects as noted by **Wali et al. (2019)** in their literature review. More research on interventions tailored to this group is warranted, similar to the educational program implemented by **Cook, DiPietro, Sossin, & Trockel, (2022)** which showed promise in reducing energy drink use among university students.

In summary, while results parallel multiple previous studies on student caffeine use, this work offers unique insights into an underrepresented sample and context, further illuminating the need for focused research and interventions, the literature reviews and the data align in several aspects, demonstrating a widespread use of energy drinks, particularly among students facing academic and peer-related pressures. The composition of these drinks, the gender-based differences in consumption and the regional variations are consistent with the findings from the literature

Overall, the literature suggests a complex relationship between caffeine and energy drink consumption and academic performance in students - potential cognitive benefits on the one hand, but potential health risks on the other. More in-depth research is needed to fully understand the long-term impacts and to explore how differing levels of caffeine intake may affect students differently.

Conclusion

A significant proportion of KSAU' students consume ED such as Code Red and Red Bull, which often contain caffeine, taurine, and other

active ingredients with a range of 1-25 cans per week, purpose of use was to manage academic stress and relive tiredness. ED cause side effects such as sleep disturbance, stomach upset and hand shaking in addition affects negatively students' academic performance. However, the implication that students are resorting to energy drinks as a mechanism to cope with academic stress indicates that there might be an underlying issue. Relying on energy drinks, as some literature suggests, could be associated with lower GPAs and adverse side effects, which in turn could impede academic performance.

Recommendations

- **Awareness Campaigns:** Given the potential health risks associated with excessive energy drink consumption, universities and colleges should initiate awareness campaigns emphasizing the dangers of excessive ED consumption.
- **Research on Health Impacts:** Further research is needed to assess the direct health impacts of prolonged energy drink use, especially when consumed in large quantities over extended periods.
- **Peer-led Initiatives:** To counter peer pressure that may be contributing to higher ED consumption, peer-led programs promoting healthier alternatives and stress management techniques in the educational institutions.
- **Educational Workshops,** Workshops focused on time management, relaxation techniques, and healthy alternatives to combat fatigue can offer students

alternative solutions to relying on EDs.

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