BioGecko

Vol 12 Issue 03 2023
ISSN NO: 2230-5807

A comparative study of high perceived stress and low perceived stress level among those students who consume caffeine.

Mariyam Farooqi[1*], Mohammad Irfan[2], Réka Oszlányi[3]

[1*]B.Sc. Food engineering, Hungarian University of Agriculture and Life Science, Institute of Food Science and Technology.
[2](Associate Professor), Head, Dept. of Psychology, Govt. College Malerkotla, Punjab India
[3]Assistant Professor, Hungarian University of Agriculture and Life Science, Institute of Food Science and Technology.

***Corresponding Author:** Mariyam Farooqi
*B.Sc. Food engineering, Hungarian University of Agriculture and Life Science, Institute of Food Science and Technology.

Abstract
The objectives of this research were to assess the perceived stress and caffeine consumption among students at universities of Hungarian and Indian Colleges and universities. The sample consisted of 118 students between the ages of 21 and 44 years. Male and female students. The Perceived Stress Scale (PSS) is a well-known tool for measuring stress. It is a 10-item questionnaire originally developed by Cohen et al.(1983) The results of the present study events that low-perceived-stress students who take caffeinated drinks regularly have a significant difference from high-perceived-stress students. students who receive education may experience less harmful consequences from mismanaged stress and caffeine usage.

Keywords:perceived stress, consume caffeine and college and university students

Introduction:
Students may experience stress during their stay in college and university due to their studies, assignments, projects, tests, jobs, and extracurricular activities. College and university students may take stimulants like caffeine to deal with this stress and meet the requirements of their classes. Since caffeine stimulates the central nervous system, it may help with memory and alertness. Caffeine belongs to the methylxanthine class of central nervous system stimulants. It is the most extensively used psychoactive substance on the planet. It is lawful and uncontrolled in almost all places of the world, unlike many other psychoactive drugs. It can be found in several caffeine beverages, which can be available in many shops (Fulgoni, Keast & Lieberman, 2015). Caffeine is often sought for by students who need to remain up late at night for work, school, or other commitments. Caffeine is used by them as a study help when they are under stress because of their views about it (McIlvain,Noland, and Bickel, 2011). Strong and reliable evidence indicates that moderate coffee drinking (3-5 cups per day or up to 400 mg of caffeine per day) does not raise the risk of major chronic diseases in healthy persons (USDA, 2015). However, numerous studies have revealed that caffeine consumption among college students is generally greater than advised. Caffeine intoxication can result from excessive caffeine intake. Caffeine intoxication symptoms include agitation, insomnia, anxiety, and a rapid or irregular heartbeat (McIlvain et al, 2011).

The caffeine can be found mainly in guarana plant (*Coffea arabica*) which is belong to Coffee genus of flowering plants in the Rubiaceae family. Coffee species are tiny trees or shrubs endemic to tropical and southern Africa, as well as tropical Asia. The fruit, leaves, and beans of the guarana, cacao, and coffee plants all contain naturally occurring caffeine. Caffeine common name is a methylxanthine alkaloid IUPAC name is 1,3,7-trimethylpurine-2,6-dione (Fig. 1.). The seeds of coffee, chocolate and kola nuts as well as the leaves and buds of tea, yuba mate, and the bark of yoco, all contain caffeine.

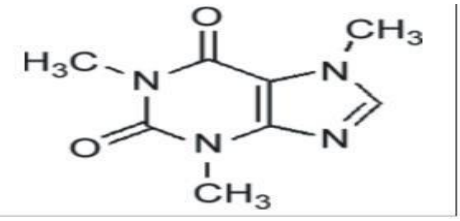

Figure 1. structure of caffeine (1,3,7-trimethylpurine-2-6-dione) (Mohamend &Al-Bayati, 2009).

For thousands of years, caffeine has been a part of our world's history. Each country has its own caffeine narrative and source. Ethiopia is home to one of the most unusual caffeine discoveries. According to a legend passed down through the years, a farmer who had lately relocated his goats to a new pasture discovered them restless and energetic. He observed them for the following several days and saw that they were feeding on little berries. Later, the berries were dried and referred to as "coffee beans.

Caffeine is harmful to plant cells, therefore it is kept in specialized cell compartments called vacuoles, which are similar to medicine cabinets in that they keep the caffeine safe and separate from the rest of the cell contents until it is needed.

Study of Caffeine

Caffeine, a widely used psychoactive drug, has the potential to disrupt sleep. Caffeine use among youngsters is rising, primarily as soda consumption. According to this research, students were not consistently able to identify caffeine content in some common beverages. The results of this pilot study show that caffeine literacy in adolescents warrants further investigation and educational intervention. The result shows that of the 635 seventh- and eighth-grade students who attended school on the day of the study, 555 (87%) participated. Lack of knowledge about the caffeine content of particular drinks was noted in seventh and eighth graders of both sexes with nearly 29% unaware that their favorite drinks contain caffeine and more than 50% unable to correctly identify the drinks with the most caffeine. A low percentage of students correctly identified light-colored sodas lacking caffeine: 7-Up (24.1%), Sierra Mist (38.9%), Ginger Ale (39.8%), Sprite (39.8%), and Fresca (53.7%). The percentages of students correctly identifying caffeinated light-colored beverages were: Arizona Green Tea (43.5%), Mello Yellow (50.9%), and A&W cream soda (67.6%). However, Mountain Dew was correctly identified by most (93.5%) as caffeinated (Tharke et al, 2015).

Chemical structure of the Caffeine

Caffeine common name is a methylxanthine alkaloid IUPAC name is 1,3,7trimethylpurine-2,6-dione. It is chemically related to the adenine and guanine bases of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) (Fig. 2). In the 1820s, a German scientist called Friedrich Ferdinand Runge distilled caffeine from cocoa beans into its purest form, a white powder.

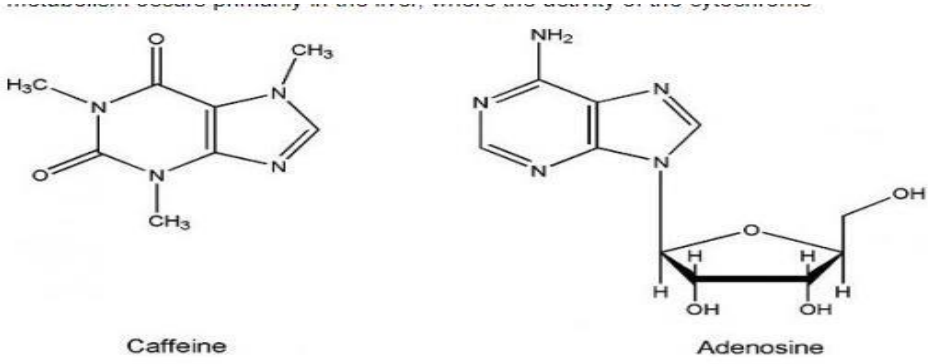

Figure 2. Caffeine's primary mechanism of action is as anadenosine receptor antagonistinthe brain (Higdon & Frei, 2006).

It is now readily extracted and utilized in a wide range of goods that are consumed on a regular basis. Both biosynthetic and chemical synthesis processes can be used to make caffeine (Hidgon & Frei, 2006).

Biosynthesis Pathway of caffeine

Caffeine biosynthesis is an example of convergent evolution across distinct species. Caffeine may be produced in the laboratory using dimethylurea and malonic acid as starting materials. Caffeine is not often synthesized synthetically in commercial quantities since the chemical is widely accessible as a result of decaffeination.(Fig. 3).

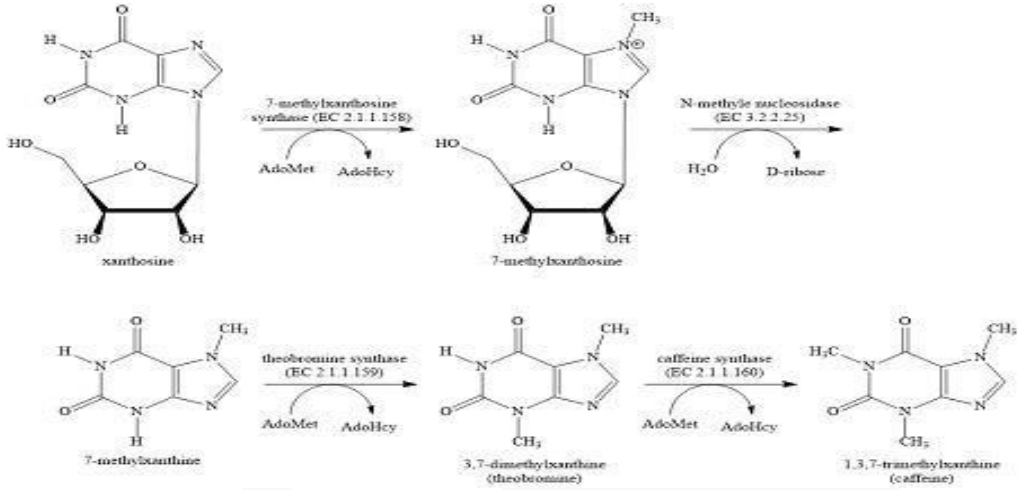

Figure 3. Onebiosynthetic routeof caffeine (Ashihara et al, 2004).

Caffeinated beverages

Caffeine may be naturally found in the leaves, seeds, and fruits of a variety of plant species all around the world but its most common occurrence is in coffee and cocoa beans, guarana, and tea leaves. For everyday use it can be found in several beverages like coffee, tea, and chocolate as a naturally occurring component in which the amount of this substance may be different (Table 1.) It is also used in soft drinks for the bitter taste it provides in little doses. This sharpness provides a welcome counterpoint to what some could consider an excessively sweet flavour.

The caffeine concentration of numerous meals and beverages is shown in Table 1. This can be a very useful tool for estimating overall caffeine intake in patients. When compared to a safe and moderate daily caffeine intake of 300 mg, It is clear that a person can drink up to three cups of coffee or 7.5 cups of tea each day.

Table 1. The caffeine content of the different caffeinated beverages.

Items	
Coffee	40
Decaffeinated	1
Espresso	212
Instant	3.142
Robusta beans	
Arabica beans	
Hell	32
Monster	36
Red bull	30
Coke	34
Diet coke	46
Tea	11

Coffee, tea, soft drinks ("colas"), energy drinks, other liquids, chocolate, caffeine pills, other oral items, and inhalation treatments are all caffeine-containing goods. Coffee is the most common source of caffeine among

middle-aged individuals, according to 2020 research in the United States, while soft drinks and tea are the most common sources in teens. Adolescents, as opposed to adults, are more likely to take energy drinks as a caffeine source (Dam et al. 2020).

STRESS:
The term "stress" comes from the Latin stringere, which means "to strain." The word refers to an organism's physical and psychological resources being stretched to fulfil demands. Stress is a scientific word describing the repercussions of a person or animal's inability to respond correctly to real or perceived emotional or physical dangers to the organism. Before the endocrinologist Hans Selye in the 1930s, psychologists were the first to adopt the term "stress."

Stress definitions are frequently based on numerous fields of research (e.g., psychology, physiology, sociology, theology, etc.). As a result, there exist a variety of stress definitions (e.g., loss of emotional control, wear and tear on the body, and an absence of inner peace (Weber,1991; Sharma, 2021). Sharma et al. (2016) in their study stated the use of various methods to curb stress. Doing one physical exercise on daily basis can address the concern of stress. One can also adopt various time management tools and get involved with leisure activities which can benefit students. Also, it was suggested that colleges should have a conducive ambiance to curtail stress.

Physiology of Stress
Human body is a complex organization of various tissues and each system of it should function properly and in a coordinated way. Moreover, it has to function within the physiological limits which are very restricted and narrow (see Table: 1). Technically this teamwork is called 'Milieu Interior or Internal Homeostasis'.

Table 1: Physiological range of certain blood parameters

	Analysis	Reference Range
1.	pH	7.36 - 7.45
2.	Bicarbonate	21 - 27.5 m mol / l
3.	Oxygen saturation	Normally > 97%
4.	Glucose	3.6 - 6.8 m mol / l

The normal physiological range of a few blood parameters is given above. It is just to show how narrow the physiological limits are. The body has to function within these narrow limits maintaining internal homeostasis. Acuta consumption of 3mg/kg of caffeine boosted peek lung ventilation and enhances peak aerobic performance. Additionally, under submaximal workloads, caffeine caused change in muscular oxygen saturation, indicating that this mechanism may possibly be involved in caffeine's ergogenic action. It was demonstrated in the previous study (ARVO 2014) that drinking too much of caffeine can cause a considerable reduction in blood volume and blood oxygenation in the capillaries of the human optic. The normal glucose level in a human body is 3.6-6.8m mol/l in normal conditions. When a person is under any kind of physical or emotional stress, the stress hormones increase the blood sugar level. But on the other hand, caffeine increase the insulin residence, decrease insulin sensitivity and raise blood glucose level. The human body is exposed every day to different people, species, situations, and stimuli. Some of the exposures are rewarding and certain others are hazardous. If the exposure is hazardous then the body prepares itself to face the situation, the reason being its 'Internal Homeostasis' and hence its normal functioning should not be affected. This response is called the Fight or Flight response which is to make persons cope with the situation successfully.

Relationship with stress and caffeine
Caffeine is a stimulating psychoactive substance, similar to amphetamines, which makes a person feel good after taking them, but it feels bad when they wear off. It boosts the release of dopamine, a neurotransmitter associated with pleasure. Adrenaline and other hormones that are active when a person is anxious and

released at the same moment. Our impulse to flee or fight is triggered by it, which activates the sympathetic nervous system. The body and mind are then prepared to be attention to the work at hand.
Stress can have a negative impact on one's health; depression, cardiovascular disease, and HIV/AIDS have been linked to psychological stress and disease (Cohen, Janiki-Deverts, and Miller, 2007). New research is also pointing to the detrimental effects of stress on the development of autoimmune illnesses, viral infections, and wound healing (Cohen et al, 2007). To ascertain if American college students' caffeine usage is good or detrimental in terms of stress and academic performance, more research is required to better understand their consumption habits. Students should be informed about caffeine and given resources to help them deal with stress because there may be harmful health impacts connected with both stress and excessive caffeine usage. (Cohen et al, 2007).

Positive and Negative Effects of caffeine consumption: -
Caffeine may be used by students to cope with the stress of college. According to studies, caffeine is the most often taken central nervous system stimulant on the planet (Fulgoni et al, 2015). Caffeine consumption has been shown to improve mood and alertness (Ferré, 2008; Kaplan et al, 1997; Lorist and Tops, 2003), exercise performance (Doherty and Smith, 2004), blood pressure (Riksen et al, 2009), ability to stay awake and mentally alert after fatigue (Smit and Rogers, 2002), faster information processing speed and reaction time, and heightened awareness and attention (Cysneiros et al, 2007). It indicates that when ingested in moderation, there are no severe adverse health consequences linked with its usage by adults (Nawrot et al, 2003) or children (Higdon and Frei, 2006; Mandel, 2002). However, people who are particularly sensitive should not drink more than 400 mg per day to avoid headaches, sleepiness, anxiety, and nausea (Nawrot et al, 2003).

Concerns have been raised about the relatively recent entry of 'energy drinks' into the consumer market (Reissig et al, 2009). Energy drinks are soft beverages with caffeine that makers say increase performance and endurance (Meadows-Oliver and Ryan-Krause, 2007; McLellan and Lieberman, 2012). These goods are frequently purposefully promoted to adolescents and young adults (Reissig et al, 2009), and 30-50% of adolescents and young people are now known to consume them (Seifert et al, 2011). Energy drinks have also been linked to behavioural issues and a range of major health concerns (Reissig et al, 2009; Richards et al, 2015a).

Energy drink usage may have a detrimental impact on health due to its link with risk-taking behaviours (Arria et al, 2014). Miller et al in 2008 found that the frequency of energy drink intake was positively linked with smoking, drinking, alcohol issues, use of illegal prescription medicines and marijuana, sexual risk-taking, fighting, seatbelt omission, and risk-taking on a dare in US students. However, it should be highlighted that such effects might be explained by personality traits of high energy drink consumers (for example, adherence to a 'toxic jock' identity rather than the goods themselves (Miller, 2008b).

Association between caffeine intake and stress: -
Caffeinated beverage consumption is known to be a coping strategy used by college students in the management of stressful academic situations (Lazarus, 1993; Thoits, 1995), with 49 percent of a representative stratified sample of Puerto Rican students reporting caffeinated products to be useful for stress relief (Ros et al, 2013). According to Pettit and DeBarr (2011) energy drink uses and perceived stress levels in undergraduate students have a favourable association. Caffeine usage is marginally associated with a variety of mental and drug use problems in the general population, although the associations do not appear to be causative (Kendler et al, 2006), and data from different research are mixed (for a review of the area see Lara, 2010). When considering the self-medication hypothesis, determining the nature and direction of correlations between such variables becomes much more complex (Khantzian, 1997). The concept is that people can self-medicate with legal and/or illegal drugs, with research already indicating that some people with mental health issues utilize caffeinated energy drinks for this reason (Chelben et al, 2008).

Caffeine has been shown to have good benefits in some circumstances. Low dosages, for example, have been demonstrated to lower anxiety and improve mood (Haskell et al, 2005; Lieberman et al, 1987, 2002; Smith, 2009a; Smith et al, 1999). In a population analysis, Smith (2009b) found that caffeine use was linked to a

lower risk of depression than non-consumption. Caffeine has also been shown to have negative impacts on stress and mental health. In a student sample, Gilliland and Andress (1981) found that moderate and heavy caffeine drinkers had greater anxiety levels than abstainers. Mania can also be produced by a high caffeine intake (Ogawa and Ueki, 2003) or energy drinks, according to case studies (Sharma, 2010). The findings of Kaplan et al. (1997), who discovered that 250 mg of caffeine promotes elation in healthy volunteers whereas 500 mg increases irritation, back up these findings. Other studies, on the other hand, have come up with no results. For example, James et al. (1989) found no link between coffee use and anxiety or depression among medical students.

Khaliland Antoun(2020) studied and found that University students consume high levels of caffeine from products other than coffee and energy drinks. During exams, the total daily consumption of caffeine is alarmingly above the Food and Drug Administration (FDA)approved daily intake.

Objectives:-The goals or objectives of this research were to assess the perceived stress and caffeine consumption among students at universities of Hungarian and Indian Colleges and universities.

Hypothesis

1. There is significant difference between high perceived stress and low perceived stress level who consume caffeine among students.
2. There is a significant difference between high perceived stress and low perceived stress level who consume caffeine among male students.
3. There is a significant difference between high perceived stress and low perceived stress level who consume caffeine among female students.
4. There is a significant difference in having high perceived stress levels in students who consume caffeine among male and female students.
5. There is a significant difference in having low perceived stress levels in students who consume caffeine among male and female students

MATERIALS AND METHODS

Participants:

The sample included 125 college and university students in total who participated in the poll on "caffeine consumption and perceived stress", but data from seven participants were excluded due to preselected age restrictions and incomplete questionnaires. Analyses were conducted on data obtained from 118 students between the ages of 21 and 44 years. Male and female students were recruited for this study and sex distribution (43.7 percent male, 56.3 percent female) was noted.

Apparatus/Materials

(1). Perceived Stress Scale (PSS)- The Perceived Stress Scale (PSS) is a well-known tool for measuring stress. It is a 10-item questionnaire originally developed by Cohen et al.(1983) and widely used to assess stress levels in young people and adults aged 12 and above. It evaluates the degree to which an individual has perceived life as unpredictable, uncontrollable, and overloading over the previous month. This scale inquires about your feelings and ideas from the previous month. You will be asked how frequently you felt each feeling or thought. Each item was rated 0 (never), 1 (almost never), 2 (sometimes), 3 (fairly often), or 4 (very often).

You can determine your PSS score by following these directions:

- First, reverse your scores for questions 4, 5, 7, and 8. On these 4 questions, change the scores like this: 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0.
- Now add up your scores for each item to get a total.
- Individual scores on the PSS can range from 0 to 40 with higher scores indicating higher perceived stress.

► Scores ranging from 0-13 would be considered low stress.
► Scores ranging from 14-26 would be considered moderate stress.
► Scores ranging from 27-40 would be considered high perceived stress.

Procedure:
First, I have selected the male and female students who consume caffeine in the form of coffee, tea and energy drinks from universities and colleges respectively. All participants received a consent form and information document with the questionnaire. Participation was voluntary. The signed consent forms and questionnaires were handed out separately. In comparison to the stress scale, this survey helps to distinguish between students who experience higher stress and low stress during test days.

Results and Discussion
The results have been shown according to hypothesis were taken in this study.

H.1: There will be a significant difference between high perceived stress and low perceived stress level among those who consume caffeine among students.:-

Table No. 1: Shows the Mean, SD, and t-value of perceived low-stress and perceived highstress levels who consume caffeine by students

STRESS LEVEL	GROUPS	N	M	SD	t
	Low Stress	57	17.40	4.11	
	High Stress	32	27.44	3.77	11.35

The results show in the above table that the means of perceived low stress who consume caffeine was found to be 17.40 with an SD of 4.11. Similarly, the means of perceived high stress who consume caffeine was found to be 27.44 with an SD of 3.77, and the ‘ t ‘ value was found 11.35, which is highly significant and much more than the required t value for the .01 significance level. It revealed that both male and female students who consume caffeine have a significant mean difference between high and low perceived stress.

The results of the present study evince that low perceived stress students who take caffeinated drinks regularly have a significant difference from high perceived stress students. Richards and Smith (2015) and Cappelletti et al (2015) found consistent results.

H.2: There will be a significant difference between high perceived stress and low perceived stress level who consume caffeine among male students.

Table No. 2: Shows the Mean, SD, and t-value of Male students having perceived low-stress and perceived high-stress levels who consume caffeine.

MALE	GROUPS	N	M	SD	t
	Low Stress	26	17.27	3.93	7.06
	High Stress	13	27.38	4.75	

The results show in the above table that the means of male students having perceived low stress who consume caffeine was found to be 17.27 with an SD of 3.93 Similarly, the means of males having perceived high stress who consume caffeine was found to be 27.38 with an SD of 4.75, and the ‘ t ‘ value was found 7.06, which is highly significant and much more than the required t value for the .01 significance level. It revealed that male students who consume caffeine have a significant mean difference between high and low perceived stress. Thus, the above results prove Hypothesis no.2. The previous studies by Pettit & DeBarr (2011) and Richards and Smith (2015) found consistent results.

H.3: There will be a significant difference between high perceived stress and low perceived stress level who consume caffeine among female students.

Table No. 3: Shows the Mean, SD, and t-value of Female students having perceived lowstress and perceived high-stress levels who consume caffeine.

FEMALE	GROUPS	N	M	SD	t
	Low Stress	31	17.52	4.32	8.74

	High Stress	19	27.47	3.08	

Table no.3 revealed that the means of female students having perceived low stress who consume caffeine was found to be 17.52 with an SD of 4.32 Similarly, the means of females having perceived high stress who consume caffeine was found to be 27.47 with an SD of 3.08, and the ‘ t ‘ value was found 8.74, which is highly significant and much more than the required t value for the .01 significance level. It revealed that female students who consume caffeine have a significant mean difference between high and low perceived stress. The results indicate that there is a lot of significant difference between low-stress and high-stress perceived female students who consume caffeine in any type of caffeinated drink.

H.4: There will be a significant difference in having high perceived stress levels in students who consume caffeine among male and female students.

Table No. 4: Shows the Mean, SD, and t-value of perceived high perceived stress levels in students who consume caffeine among male and female students.

HIGH -STRESS	GROUPS	N	M	SD	t
	Male	13	27.39	4.75	.06
	Female	19	27.47	3.08	

From table no. 4, It is evident that the t value is .06 which is non-significant at a .05 level of confidence. There is no significant difference between male and female students who consume caffeine with high perceived stress levels because the mean score of 27.39 for male students is not different from the mean score of 27.47 for female students. It clearly shows that there is no difference between males having low-stress levels who consume caffeine are not different from females having low-stress levels who consume caffeine.

H.5: There will be a significant difference in having low perceived stress levels in students who consume caffeine among male and female students

Table No. 5: Shows the Mean, SD, and t-value of perceived Low perceived stress levels in students who consume caffeine among male and female students.

LOW-STRESS	GROUPS	N	M	SD	t
	Male	26	17.27	3.93	.224
	Female	31	17.52	4.32	

The comparison of scores of male and female students who consumed caffeine with low perceived stress levels is performed in table 5 which shows that there is no significant difference between male and female students who consume caffeine with low perceived stress levels because the mean score of 17.27 for male students is not different from the mean score of 17.52 female students. The t value is .22 which is non-significant at a .05 level of confidence. The results of the study are clearly showing that males having low-stress levels who consume caffeine are not different from females having low-stress levels who consume caffeine. Thus, the above results do not prove Hypothesis no.5.

Conclusion:

The results of the present study events that low-perceived-stress students who take caffeinated drinks regularly have a significant difference from high-perceived-stress students. This hypothesis was proved through a t-test. In Hypotheses 2 and 3 show the significant result and prove that male students who consume caffeine have a significant mean difference between high and low perceived stress. In hypothesis 3 also same results has been shown in terms of female students but there is the non -significant difference between male and female students who consume caffeine with high perceived stress and the same result is shown in hypothesis number 5 that there is no significant difference between male and female students who consume caffeine with low perceived stress.

Last, but not least, so we concluded that students who receive education may experience less harmful consequences from mismanaged stress and caffeine usage. The above result of this study serves as a foundation for additional investigation into how caffeine consumption and perceived stress are associated among college and university students.

REFERENCES

1. Arria, A. M., Caldeira, K. M., Bugbee, B. A., Vincent, K. B., & O'Grady, K. E. (2015). The academic consequences of marijuana use during college. *Psychology of addictive behaviors : journal of the Society of Psychologists in Addictive Behaviors*, *29*(3), 564– 575. https://doi.org/10.1037/adb0000108
2. Ashihara,H., Kato,M. & Crozier, A. (2011).Distribution, biosynthesis and catabolism of methylxanthines in plants. Handbook Exp. Pharmacology(200), 11-31. Doi:10.1007/978-3642-13443-2_2
3. Cappelletti, S., Piacentino, D., Sani, G., & Aromatario, M. (2015). Caffeine: cognitive and physical performance enhancer or psychoactive drug?. *Current neuropharmacology*, *13*(1),71–88. https://doi.org/10.2174/1570159X13666141210215655
4. Chelben, J, Piccone-Sapir A, Lanco L, et al. (2008). Effects of amino acid energy drinks leading to hospitalization in individuals with mental illness. *Gen Hosp Psychiatry* 30: 187–189. [PubMed] [Google Scholar]
5. Chelben, J., Piccone-Sapir, A., Ianco, I., Shoenfeld, N., Kotler, M., & Strous, R. D. (2008). Effects of amino acid energy drinks leading to hospitalization in individuals with mental illness. *Gen Hosp Psychiatry*, 30(2), 187-189. doi:10.1016/j.genhosppsych.2007.10.002
6. Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. *Jama*, 298(14), 1685-1687. doi:10.1001/jama.298.14.1685
7. Cysneiros, RM., Farkas D, Harmatz JS, et al. (2007). Pharmacokinetics and pharmacodynamic interactions between zolpidem and caffeine. *Clin Pharmacol Ther* 82: 54–62. [PubMed][Google Scholar]
8. Van Dam, R. M., Hu, F. B., & Willett, W. C. (2020). Coffee, Caffeine, and Health. *The New England journal of medicine*, *383*(4), 369–378. https://doi.org/10.1056/NEJMra1816604
9. Doherty, M., & Smith, P. M. (2004). Effects of caffeine ingestion on exercise testing: a meta- analysis. *Int J Sport Nutr Exerc Metab*, 14(6), 626-646. doi:10.1123/ijsnem.14.6.626Ferré, 2008;;
10. Fulgoni, V. L., Keast, D. R., & Lieberman, H. R. (2015). Trends in intake and sources of caffeine in the diets of US adults: 2001–2010. *The American journal of clinical nutrition*, 101(5), 1081-1087.
11. Gilliland, K, Andress D. (1981). Ad lib caffeine consumption, symptoms of caffeinism, and academic performance. *Am J Psychiatry* 138: 512–514. [PubMed] [Google Scholar]
12. Tan, S. Y., & Yip, A. (2018). Hans Selye (1907-1982): Founder of the stress theory. *Singapore medical journal*, *59*(4), 170–171. https://doi.org/10.11622/smedj.2018043
13. Haskell, CF, Kennedy DO, Wesnes KA, et al. (2005). Cognitive and mood improvements of caffeine in habitual consumers and habitual non-consumers of caffeine. *Psychopharm acology* 179: 813– 825. [PubMed] [Google Scholar]
14. Higdon, J. V., & Frei, B. (2006). Coffee and health: a review of recent human research. *Crit Rev Food Sci Nutr*, 46(2), 101-123. doi:10.1080/10408390500400009
15. James, JE, Bruce MS, Lader MH, et al. (1989). Self-report reliability and symptomatology of habitual caffeine consumption. *Br J Clin Pharmacol* 27: 507–514. [PMC free article][PubMed] [Google Scholar]
16. Kaplan, GB., Greenblatt DJ, Ehrenberg BL, et al. (1997). Dose-dependent pharmacokinetics and psychomotor effects of caffeine in humans. *J Clin Pharmacol* 37: 693–703. [PubMed][Google Scholar]
17. Khalil, M., & Antoun, J. (2020). Knowledge and consumption of caffeinated products by university students in Beirut, Lebanon. *Clinical nutrition ESPEN*, *37*, 213–217. https://doi.org/10.1016/j.clnesp.2020.02.014
18. Kendler, KS, Myers J, Gardner CO. (2006). Caffeine intake, toxicity and dependence and lifetime risk for psychiatric and substance use disorders: An epidemiologic and co-twin control analysis. *Psychol Med* 36: 1717–1725. [PubMed] [Google Scholar]
19. Khantzian, EJ. (1997). The self-medication hypothesis of substance use disorders: A reconsideration and recent applications. *Harv Rev Psychiatry* 4: 231–244. [PubMed][Google Scholar]
20. Lara, DR. (2010). Caffeine, Mental health and Psychiatric disorders. *J Alzheimer Dis*., 20:239-48.

21. Lazarus, RS. (1993). Coping theory and research: Past, present, and future. *Psychosom Med* 55: 234–247. [PubMed][Google Scholar]
22. Lieberman, H R;Wurtman, R J;Emde, G G;Roberts,C ; Coviella,I C (1987). The effects of low doses of caffeine on human performance and mood. *Psychopharmacology (Berl).* 92(3):308-12. PMID: 3114783, doi: 10.1007/BF00210835.
23. Lorist, MM and Tops M. (2003).Caffeine fatigue, and cognit ion. *Brain Cogn*. ;53:82-94.
24. McIlvain, G. E., Noland, M. P., & Bicl, R. (2011). Caffeine consumption patterns and beliefs of college freshmen. *American Journal of Health Education*, 42(4), 235- 244
25. Mandel, H G (2002). Update on caffeine consumption, disposition and action. Food Chem Toxicol. 2002 Sep;40(9):1231-4. doi: 10.1016/s0278-6915(02)00093-5.
26. Miller, KE. (2008a) Energy drinks, race, and problem behaviors among college students. *JAdolesc Health* 43: 490–497. [PMC free article][PubMed][Google Scholar]
27. Miller, KE. (2008b). Wired: Energy drinks, jock identity, masculine norms, and risk taking. *JAm Coll Health* 56: 481–490. [PMC free article][PubMed][Google Scholar]
28. Mohammed, Muthanna & Al-Bayati, Firas AY. (2009). Isolation, identification, and purification of caffeine from Coffea arabica L. and Camellia sinensis L.: A combination antibacterial study. *International Journal of Green Pharmacy*. 3. 10.4103/09738258.49375.
29. Meadows-Oliver, M., & Ryan-Krause, P. (2007). Powering up with sports and energy drinks. *J Pediatr Health Care*, 21(6), 413-416. doi:10.1016/j.pedhc.2007.08.005
30. Nawrot, P., Jordan, S., Eastwood, J., Rotstein, J., Hugenholtz, A., & Feeley, M. (2003). Effects of caffeine on human health. *Food Additives & Contaminants*, 20(1), 1- 30.
31. Ogawa, N., & Ueki, H. (2007). Clinical importance of caffeine dependence and abuse. *Psychiatry Clin Neurosci*, 61(3), 263-268. doi:10.1111/j.1440-1819.2007.01652.x
32. Pettit ML, DeBarr KA. (2011). Perceived stress, energy drink consumption, and academic performance among college students. *J Am Coll Health* 59: 335–341. [PubMed] [GoogleScholar]
33. Cysneiros RM, Farkas D, Harmatz JS, et al. (2007). Pharmacokinetics and pharmacodynamic interactions between zolpidem and caffeine. *Clin Pharmacol Ther* 82: 54–62. [PubMed][Google Scholar]
34. Richards Gareth and Smith A. (2015). Caffeine consumption and self-assessed stress, anxiety, and depression in secondary school children. *J Psychopharmacol*.29(12): 1236–1247.
35. Riksen NP, Rongen GA, Smits P. (2009) Acute and long-term cardiovascular effects of coffee: Implications for coronary heart disease. *Pharmacol Ther* 121: 185–191.[PubMed][Google Scholar]
36. Ríos, JL, Betancourt J, Pagán I, Fabián C, Cruz SY, González AM, et al. (2013). Caffeinated- beverage consumption and its association with socio-demographic characteristics and self- perceived academic stress in first and second year students at the University of Puerto Rico Medical Sciences Campus (UPR-MSC). P R Health Sci J.;32(2):95-100
37. Seifert SM, Schaechter JL, Hershorin ER, et al. (2011). Health effects of energy drinks on children, adolescents, and young adults. *Pediatrics* 127: 511–528. [PMC freearticle][PubMed][Google Scholar]
38. Sharma, K H. (2016). Stress and Relaxation in Relation to Personality, *SAGE Open*, 1–7 DOI: 10.1177/2158244011418533 http://sgo.sagepub.com
39. Sharma, K H.& Mann G. (2021). *Psychology for nurses*. 7th edition, Bukhari Publishers,Lahore.
40. Sharma, V. (2010). Red bull and mania. *German J Psychiatry* 13: 178–180. [Google Scholar]
41. Smith, AP. (2009a).Effects of caffeine in chewing gum on mood and attention. *Hum Psychopharmacol* 24: 239–247. [PubMed] [Google Scholar]
42. Smith, AP. (2009b). Caffeine, cognitive failures and health in a non-working community sample. *Hum Psychopharmacol* 24: 29–34. [PubMed] [Google Scholar]
43. Smith, AP, Sturgess W, Gallagher J. (1999). Effects of a low dose of caffeine given in different drinks on mood and performance. *Hum Psychopharmacol* 14: 473–482. [Google Scholar]
44. Thoits, PA. (1995). Stress, coping, and social support processes: Where are we? What next? *JHealth Soc Behav* 35: 53–79. [PubMed][Google Scholar]
45. U.S. Department of Health and Human Services and U.S. Department of Agriculture.(2015 – 2020).Dietary Guidelines for Americans. 8th Edition. December 2015. Available at http://health.gov/dietaryguidelines/2015/guidelines/.