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Pattern of Use and Effects of Caffeine Containing Drinks among Students of Qassim University

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Abstract: **Caffeine is the most commonly used and abused substance around the world. If used in large amounts and over a longer period of time it may have negative effects on health of individuals. Use of caffeine containing drinks is a common practice in Saudi Arabia. This study was conducted to know the pattern of use and effects of caffeine containing drinks among students of Qassim University. A cross sectional study was conducted among two hundred students of Qassim University; including both males and females. Results of the study showed that the most favorite drink was Pepsi and Saudi coffee. Majority of the students responded that they feel more active and their work output is increased (81%). Caffeine drink decreases their sleep hours (44.8%), has an irritable mood and gastric acidity (37.8%). There was no significant difference in pattern and effect of caffeine containing drink among males, females or college of study. We recommend to conduct similar studies at larger scales and on different population groups.**

Keywords: **Caffeine, Pepsi, Qassim university, Public health.**

1. INTRODUCTION

Caffeine addiction is a common problem, and the most commonly consumed psychoactive drug worldwide. As with other population across the globe; Saudi people also in a habit of using caffeinated drinks. consumption of Arabic coffee is a part of the breakfast drink as well as this is a cultural drink in many of the Arab countries.

Most people are unaware of caffeine's addictive properties. Those who consume 300 mg. or more per day, suffer from withdrawal symptoms if they abruptly cut off their caffeine supply. Acute and, especially, chronic caffeine intake appear to have only minor negative consequences on health. For that reason ordinary caffeine use has generally not been considered to be a case of drug abuse, and is indeed not so classified in DSM-IV (Diagnostic and Statistical Manual of Mental Disorder). However, some years ago it was pointed out that caffeine may be a potential drug of abuse[1], and more recently caffeine has been described as "a model drug of abuse"[2], and the possibility that caffeine abuse, dependence, and withdrawal should be added to diagnostic manuals has been seriously considered [4,5,6]

Caffeine exhibits the features of a typical psychoactive substance of dependence. It is valuable to recognize caffeine dependence as a clinical syndrome[4]. Although reports of caffeine withdrawal in the medical literature date back more than 170 years, the most rigorous experimental investigations of the phenomenon have been conducted only recently[7]. Of 49 symptom categories identified, the following 10 fulfilled validity criteria: headache, fatigue, decreased energy / activeness, decreased alertness, drowsiness, decreased contentedness, depressed mood, difficulty concentrating, irritability, and foggy /not clearheaded. In addition, flu-like symptoms, nausea / vomiting, and muscle pain /stiffness were judged likely to represent valid symptom categories[7]. In

experimental studies, the incidence of headache was 50% and the incidence of clinically significant distress or functional impairment was 13%. Typically, onset of symptoms occurred 12-24 h after abstinence, with peak intensity at 20-51 h, and for a duration of 2-9 days[7].

In general, the incidence or severity of symptoms increased with increases in daily dose; abstinence from doses as low as 100 mg / day produced symptoms[7].

Caffeine is present in a number of dietary sources consumed worldwide, i.e., tea, coffee, Arabic coffee (made from coffee beans roasted very lightly or heavily from 165 ℃ (329°F) to 210 ℃ (410°F) and cardamom cocoa beverages, chocolate bars, and soft drinks.

The content of caffeine of these various food items ranges from 40 to 180 mg / 150 ml for coffee to 24 to 50 mg / 150 ml for tea, 15 to 29 mg / 180 ml for cola, 2 to 7 mg / 150 ml for cocoa, and 1 to 36 mg / 28 g for chocolate[8].

Caffeine absorption from the gastrointestinal tract is rapid and reaches 99% in humans in about 45 min after ingestion[9,10,11]. Caffeine absorption is also complete in animals[12,13]. Absorption is however, not complete when the substance is taken as coffee[14]. The hydrophobic properties of caffeine allow its passage through all biological membranes. There is no blood-brain barrier to caffeine in the adult or the fetal animal[15,16], and the blood-to-plasma ratio is close to unity[17], indicating limited plasma protein binding and free passage into blood cells. In newborn infants, caffeine concentration is similar in plasma and cerebrospinal fluid[18,19]. There is no placental barrier to caffeine[20,21], and unusually high levels of caffeine have been reported in premature infants born to women who are heavy caffeine consumers[22]. Finally, saliva concentrations of caffeine, which are considered to be a reliable index of plasma caffeine levels, reach 65 to 85% of plasma concentrations[23,24].

Peak plasma caffeine concentration is reached between 15 and 120 min after oral ingestion in humans and equals 8 to 10 mg/l for doses of 5 to 8 mg/kg[10]. Ingestion of a single cup of coffee provides a dose of 0.4 to 2.5 mg/kg. It can therefore be estimated that this gives a peak concentration of 0.25 to 2 mg/l or approximately 1 to 10 μM.

Caffeine is metabolized by the liver to form dimethyl- and monomethylxanthines, dimethyl and monomethyl uric acids , trimethyl- and dimethylallantoin, and uracil derivatives[25]. The demethylation, C-8 oxidation, and uracil formation occur mostly in liver microsomes. The major metabolic difference between rodents and humans is that, in the rat, 40% of the caffeine metabolites are trimethyl derivatives as compared with less than 6% in humans[13]. Metabolism in humans is characterized by the quantitative importance of the 3-methyl demethylation leading to the formation of paraxanthine. This first metabolic step represents up to 72 to 80% of caffeine metabolism [13]. Many of the metabolic steps may be saturable in humans as the elimination half-time for not only caffeine, but also some of its metabolites, is dose- dependent[26].

Some metabolites of caffeine also have marked pharmacological activity. Thus, 1,3-dimethylxanthine (theophylline) and 1,7-dimethylxanthine (paraxanthine) must be taken into account when considering the biological actions of caffeine- containing beverages. In rodents, paraxanthine is the major metabolite in plasma, but levels of theophylline are also high. The metabolism of caffeine to paraxanthine can be used to phenotype individuals with regard to one subform of cytochrome P-450, CYP1A2[27,28]. By contrast, the formation of theophylline from caffeine does not correlate with any specific subform.

Because so much of the background information is derived from animal experiments, we must try to extrapolate the data to humans. However, it is not a trivial task to compare doses of caffeine in animals and humans.

2. MATERIALS AND METHODS

Study Design:

Cross sectional study using a structured questionnaire.

Study Population;

Male & female students of Qassim University from medical & non medical colleges.

Study Settings:

Qassim University.

Sampling & Sample Size:

Sample size was calculated by using the formula:

and $$n = \frac{Z_{\alpha}^2\, p\, (1-p)}{d^2}$$ accordingly a sample of 200 students was selected by systematic random sampling method.

Data Collection Tool:

Data was collected on a pre-designed, pre-tested, structured questionnaire; containing the questions on pattern / number and health effects of the caffeine containing drinks.

Ethical Considerations:

A verbal consent was taken before data collection. The objectives of the study were explained. Anonymous questionnaire was used and it was assured that information collected will not be used for other than research purpose.

Data Analysis:

Data was cleaned, coded, entered in SPSS-17 and was analyzed for different frequencies and percentages. Chi-square test was applied to compare different variables & calculate the P value.

3. LITERATURE REVIEW

The available literature suggests that acute ingestion of caffeine in large doses (at least 250-300 mg, equivalent to the amount found in 2-3 cups of coffee or 5-8 cups of tea) results in a short-term stimulation of urine output in individuals who have been deprived of caffeine for a period of days or weeks. A profound tolerance to the diuretic and other effects of caffeine develops, however, and the actions are much diminished in individuals who regularly consume tea or coffee. Doses of caffeine equivalent to the amount normally found in standard servings of tea, coffee and carbonated soft drinks appear to have no diuretic action.

Caffeinated beverages acutely stimulate the autonomic nervous system and increase alertness. Although caffeine can exert dose-dependent effects on a number of acute autonomic responses, caffeine level is not an important factor. Factors besides caffeine may contribute to these acute effects.

Results indicate that ingestion of caffeinated beverages may maintain aspects of cognitive and psychomotor performance throughout the day and evening when caffeinated beverages are administered repeatedly. This study also demonstrates that day-long tea consumption produces similar alerting effects to coffee, despite lower caffeine levels, but is less likely to disrupt sleep. Other differences between tea and coffee were more subtle, and require further investigation.

Energy drink consumption is not a risk at a population level because of the low prevalence of consumption. At an individual level, however, teenagers, adults (20-64 years) and females (16-44 years) were more likely to exceed the AEL by consuming energy drinks in combination with caffeine-containing foods.

In this paper we present the effects of Caffeine Containing Drinks on stimulation the autonomic nervous system, increase alertness, changes in sleeping hours and any effect on other body system.

4. RESULTS

Regarding the study population 47.3% (95) were males & 52.7% were females,. Frequency of the students belonging to medical college was 95 (47.3%) and the students belonging to non medical colleges was 111 (55.2%). Mean age of the students was 22 years. Results of the study showed that the most frequently consumed drink was Saudi coffee with cardamom (heil) followed by Pepsi & Nescafe.

It was noted that 11.4% (23) students consume more than five cups (about 600ml) of Arabic coffee with cardamom (heil) per day. One bottle / tin of pepsi (250-300ml) was consumed by 10.9% (22) students, while one cup of Nescafe (about 150ml) was consumed by 12.9% (26) students.

Consumption of Arabic coffee:

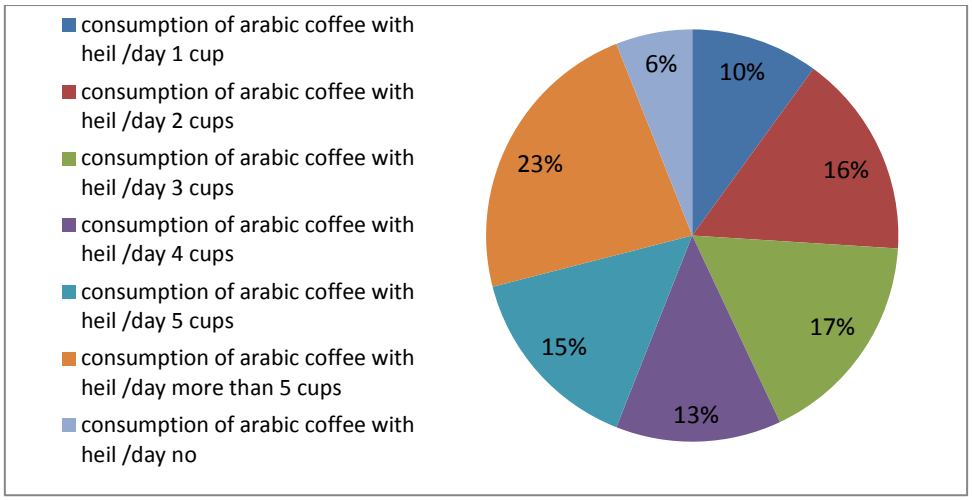

Fig. 1 Number of cups of Arabic coffee with cardamom (heil) consumed per day.

Consumption of Nescafe:

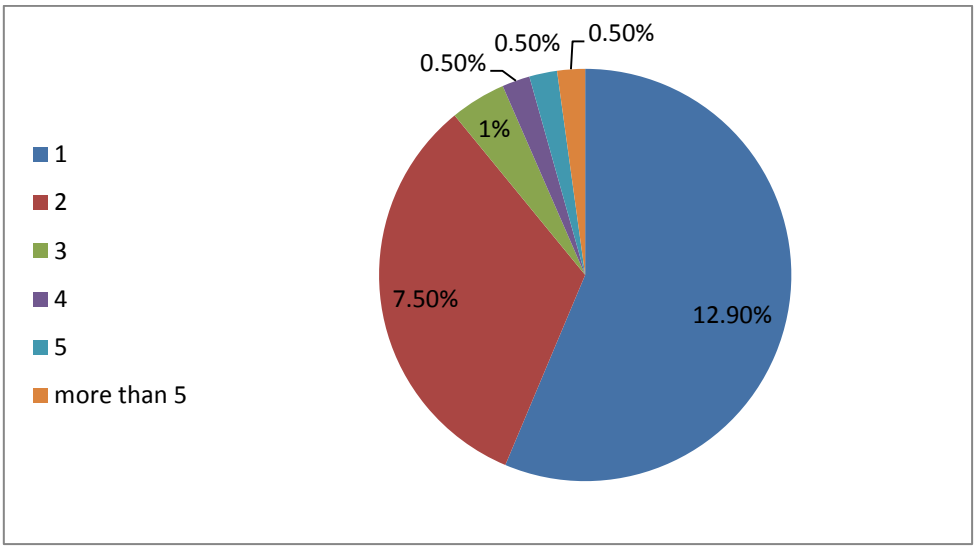

Fig. 2 Number of cups of Nescafe consumed per day.

Pepsi Consumption:

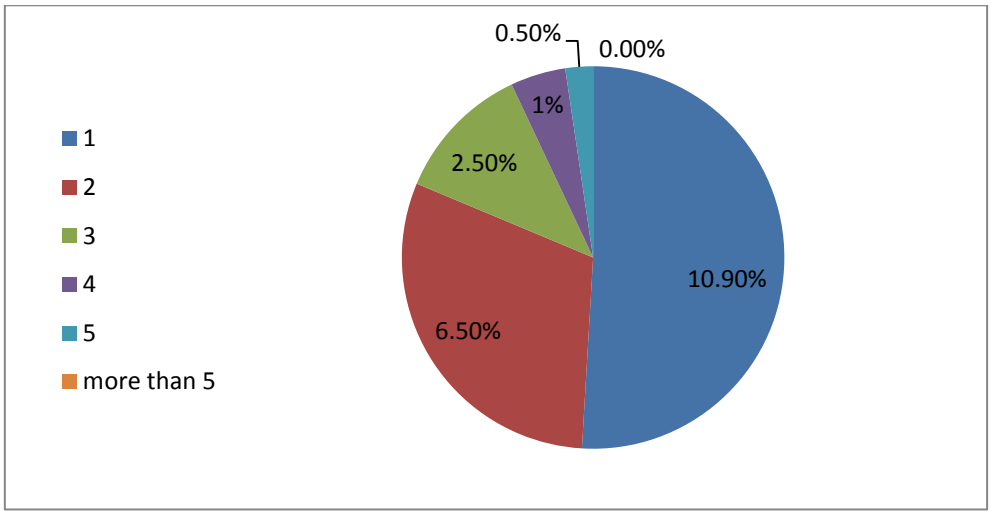

Fig. 3 Number of bottles / tins of Pepsi consumed per day.

Other caffeine containing drinks consumed by the students were Coke & Red bull. One bottle / tin of Coke was consumed by 8.5% (17) students, while 1% (2) of the students consume one bottle / tin of Red bull per day.

Effects of Caffeine Containing Drinks:

Most of the students 81% (164) responded that their work out put increases by taking their drink, but correlation was found to be significant with the consumption of Arabic coffee with cardamom (heil). (P=0.034)

There is an association between Arabic coffee with cardamom (heil) and mood, as the students responded that they feel irritable if they do not take their drink. (P=0.015)

The effect on GIT (acidity / indigestion) with the increase consumption of Arabic coffee was also significant. (p=0.026)

Correlation of feeling of stress with decrease consumption of Arabic coffee with cardamom (heil) was also significant. (p=0.042). No significant effect on any system on any system with Arabic coffee without cardamom (heil).

Feeling of acidity/indigestion was significant with increase consumption of Pepsi. (p=0.017). No other significant effect was observed on any system with increase consumption of Pepsi.

Although 12.9% of the students consume one cup of Nescafe /day, but no significant effect on any system was observed.

The students feel more active with the consumption of Coke. This was significant (p=0.023)

There was no significant effect on any system with the consumption of Red bull.

The students increase the consumption of Arabic coffee with cardamom (heil) and tea, (p=0.042) & (p=0.039) respectively.

The students increase the consumption of caffeine containing drink when they are under stress, the commonly used drinks during stress conditions are Arabic coffee with cardamom (heil) & tea, (p=0.042) & (p=0.039) respectively.

Although 44.8% of the students responded that the consumption of their favorite caffeine containing drink decreases their sleep hours, but the results were not significant for any of the caffeine containing drinks.

The study of Population	47.3% (95) males	52.7% (95)females
Frequency of the students belonging to Medical College /Non Medical College	95 (47.3%)	111(55.2%)
Mean age of the students	22years old	
The most frequently consumed drinks	Saudi coffee with cardamom(heil) followed by Pepsi & Nescafe.	

Consumption of Arabic Coffee with Cardamom(heil) per day	1cup(120ml)	10%
	2cups	16%
	3cups	17%
	4cups	13%
	5cups	15%
	More than 5cups(600ml)	23%
	No consumption	6%

Consumption of Nescafe per day	1cup(150ml)	12.90%
	2cups	7.50%
	3cups	1%
	4cups	0.5%
	5cups	0.5%
	More than 5cups	0.5%

Consumption of bottle/tin Pepsi per day	1 bottle (250-300ml)	10.90%
	2bottles	6.50%
	3bottles	2.50%
	4bottles	1%
	5bottles	0.5%
	More than 5 bottles	0%

Other caffeine containing drinks consumed by the students were Coke & Red bull	1bottle of Coke	8.5%
	1bottle of Red bull	1%

	Drinks				
	Arabic coffee With cardamom (heil) Most of the students 81% (164)	**Pepsi**	**Nescafe**	**Coke**	**Red bull**
Effects	Their Work output increases	Feeling of acidity/ indigestion with increase consumption of Pepsi.	No significant effect on any system was observed.	Feeling of activity with the consumption of Coke	No significant effect on any system with the consumption of Red bull
	Feeling of irritability if they do not take their drink.				
	Feeling of stress with decrease consumption.				
	Feeling of acidity / indigestion with increase consumption	No other significant effect was observed on any system with increase consumption of Pepsi			

5. DISCUSSION

The study was conducted among students belonging to medical and non medical college of Qassim university, as this is among the common age group consuming caffeine containing drinks.

Most frequently consumed drink among our study population (students) was Arabic coffee this finding goes in concordance with the national cultural/ traditional values, as this is the most commonly consumed drink among Arab population of all age groups.(ref)

Using this drink to elevate the mood so as to have more work out put and for reducing sleep hours among saudi students had been going on for decades but it was never studied before.

Results showed that significant number of students feel in high mood with consumption of Arabic coffee. This finding supports another result that the students increase the consumption of Arabic coffee when they are under stress especially during exams. Like other caffeinated drinks; Arabic coffee also seems to have habit forming / addictive properties as the students said that they feel irritable and stressed out if they do not take this drink.(Ref)

As far as the effects of Arabic coffee are concerned; there is significant increase in the work output and a positive effect on the mood of the students with this drink, this finding is similar with other studies that caffeine containing drinks makes the person active so their working capacity is increased. (ref)

The feeling of acidity and indigestion is significant with increased consumption of Arabic coffee, as the students do so during their exams. As with other studies it is seen that if the caffeine is consumed in access than the recommended dose (300mg), the person may have adverse health effects. This drink (Arabic coffee) also has addictive properties, as the students responded that they feel stressed out if they try to reduce the drink.

other frequently consumed caffeine containing drinks were Pepsi and Nescafe, followed by coke and Redbul. Out of these drinks the effect on increasing the activity was significant with coke although 8.5% of students consume 1 bottle/tin of coke (250-300ml) per day. This could be explained that one bottle/tin of coke may contains more caffeine as compare to Pepsi and Nescafe.

6. CONCLUSION

Caffeine containing drinks have a negative effect on physical health of the study participants. Some awareness campaigns should be started to make the students know about the adverse effects of the caffeine containing drinks. This is also recommended to conduct similar studies at larger scales and on different population groups. also Future research should identify if college students recognize the amounts of caffeine that are present in the wide variety of caffeine containing products that they are consuming, the amounts of caffeine that they are consuming in various situations, and the physical side effects associated with caffeine consumption.

REFERENCES

[1] Gilliland K and Bullock W. (1983-1984) Caffeine: a potential drug of abuse. Adv Alcohol Subt Abuse 3(1-2):53-73

[2] Holtzman SG (1990) Caffeine as a model drug of abuse. Trends pharmacol Sci 11:355-356

[3] Hughes JR (1992). Clinical importance of caffeine withdrawal. N Engl J Med 327(16):1160-1161

[4] Strain EC (1994) Caffeine dependence syndrome. Evidence from case histories and experimental evaluations. JAMA 5;272(13):1043-8

[5] Pickworth WB. (1995) Caffeine dependence. Lancet 29;345(8957):1066

[6] Hughes JR (1998) Endorsement of DSM-IV dependence criteria among caffeine users. Drug Alcohol Depend 1;52(2):99-107

[7] Juliano LM and Griffiths RR (2004) A critical review of caffeine withdrawal: empirical validation of symptoms and signs, incidence, severity, and associated features. Psychopharmacology (Berl) 176(1):1-29.

[8] Barone JJ and Roberts HR. (1996) Caffeine Consumption. Food Chem Toxicol 34(1):119-29

[9] Marks V and Kelly JF (1973). Absorption of caffeine from tea, coffee, and coca cola. Lancet 14;1 (7807):827.

[10] Bonati M, Latini R, Galletti F, Young JF, Tognoni G and Garattini S (1982). Caffeine disposition after oral doses. Clin Pharmacol Ther 32(1):98-106.

[11] Blanchard J and Sawers SJ (1983). The absolute bioavailability of caffeine in man. Eur J Clin Pharmacol (1):93-8.

[12] Arnaud MJ (1976). Identification, kinetic and quantitative study of [2-14C] and [1-Me-14C]caffeine metabolites in rat's urine by chromatographic separations. Biochem Med. (1):67-76.

[13] Arnaud MJ (1985). Comparative metabolic disposition of [1-Me14C]caffeine in rats, mice, and Chinese hamsters. Drug Metab Dispos. (4):471-8

[14] Morgan KJ, Stults VJ, and Zabik ME (1982). Amount and dietary sources of caffeine and saccharin intake by individuals ages 5 to 18 years. Regul Toxicol Pharmacol 2(4):296-307.

[15] Lachance MP, Marlowe C, and Waddell WJ (1983). Autoradiographic disposition of [1-methyl-14C]- and [2-14C]caffeine in mice. Toxicol Appl Pharmacol 71(2):237-41.

[16] Tanaka H, Nakazawa K, Arima M, and Iwasaki S (1984). Caffeine and its dimethylxanthines and fetal cerebral development in rat. Brain Dev 6(4):355-61.

[17] McCall AL, Millington WR, and Wurtman RJ (1982). Blood-brain barrier transport of caffeine: dose-related restriction of adenine transport. Life Sci 13;31(24):2709-15.

[18] Turmen T, Louridas TA, and Aranda JV (1979). Relationship of plasma and CSF concentrations of caffeine in neonates with apnea. J Pediatr (4):644-6.

[19] Somani SM, Khanna NN, and Bada HS (1980). Caffeine and theophylline: serum/CSF correlation in premature infants. J Pediatr 96(6):1091-3.

[20] Ikeda GJ, Sapienza PP, McGinnis ML, Bragg LE, Walsh JJ, and Collins TF (1982). Blood levels of caffeine and results of fetal examination after oral administration of caffeine to pregnant rats. J Appl Toxicol 2(6):307-14.

[21] Kimmel CA, Kimmel GL, White CG, Grafton TF, Young JF, and Nelson CJ (1984). Blood flow changes and conceptal development in pregnant rats in response to caffeine. Fundam Appl Toxicol 4(2 Pt 1):240-7.

[22] Khanna NN, and Somani SM (1984). Maternal coffee drinking and unusually high concentrations of caffeine in the newborn. J Toxicol Clin Toxicol 22(5):473-83.

[23] Cook CE et al (1976). Caffeine in plasma and saliva by a radioimmunoassay procedure. J Pharmacol Exp Ther 199(3):679-86.

[24] Khanna NN, Bada HS, and Somani SM (1980). Use of salivary concentrations in the prediction of serum caffeine and theophylline concentrations in premature infants. J Pediatr 96(3 Pt 1):494-9.

[25] Arnaud MJ (1987). The pharmacology of caffeine. Prog Drug Res 31:273-313.

[26] Kaplan GB et al (1997). Dose-dependent pharmacokinetics and psychomotor effects of caffeine in humans. J Clin Pharmacol 37(8):693-703.

[27] Fuhr U et al (1996). Evaluation of caffeine as a test drug for CYP1A2, NAT2 and CYP2E1 phenotyping in man by in vivo versus in vitro correlations. Pharmacogenetics 6(2):159-76.

[28] Miners JO1, and Birkett DJ (1996). The use of caffeine as a metabolic probe for human drug metabolizing enzymes. Gen Pharmacol 27(2):245-9.

[29] http://www.ncbi.nlm.nih.gov/pubmed/19774754

[30] http://www.ncbi.nlm.nih.gov/pubmed/?term=Caffeinated+beverages+acutely+stimulate+the+autonomic+nervous+system

[31] http://www.ncbi.nlm.nih.gov/pubmed/10823400

[32] http://www.ncbi.nlm.nih.gov/pubmed/25010189

[33] Performance effects and metabolic consequences of caffeine and caffeinated energy drink consumption on glucose disposal Jane Shearer and Terry E Graham, Nutrition Reviews® Vol. 72(S1):121–136

[34] Effect of energy drink and caffeinated beverage consumption on sleep, mood, and performance in children and adolescents Judith A. Owens, Jodi Mindell, and Allison Baylor

[35] Effects of caffeine on mood and memory, Wing Hong Loke Department of Social Work and Psychology National University of Singapore, Singapore 05, Volume 44, Issue 3, 1988, Pages 367–372, available online 2003.

[36] Psychopharmacology (2002) 164:188–192 DOI 10.1007/s00213-002-1175-2 ORIGINAL INVESTIGATION Carolyn F. Brice · Andrew P. Smith Effects of caffeine on mood and performance: a study of realistic consumption Received: 23 January 2002 / Accepted: 17 June 2002 / Published online: 4 September 2002 Springer-Verlag 2002

[37] Scand J Gastroenterol Suppl. 1999;230:35-9, Coffee and gastrointestinal function: facts and fiction. A review, Boekema PJ[1], Samsom M, van Berge Henegouwen GP, Smout AJ.