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EFFECTS OF CAFFEINE ON ATHLETE'S PERFORMANCE

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ABSTRACT

Caffeine is most widely available and used compounds in sport. Although the use of Caffeine either is not considered a doping infraction. The aimed of this study was to investigate the effects of caffeine on athletes' performance through a classic survey method of paper pencil. For this purpose, N=149 athletes, males=100 and females 49, ages 19-24 years were selected from Public and Private sectors universities for this study. A self-developed questionnaire on Caffeine was employed for data collection. The chi square test of Statistical Package for the Social Sciences (SPSS) was used to analyze the data with 4-PointsLikert Scale, which showed very good and reliable result with significant value of every question, which was .000 to 0.01.According to the results, it is concluded that the Caffeine intake improve levels of strength, power and upper arm muscular endurance of athletes. When caffeine used in small or recommended amount, it enhances the athletic performance but more intake quantity disturbs the athlete's body systems like digestion, absorption and it also becomes addiction for him.

1. INTRODUCTION

Caffeine (1, 3, 7 - trimethylxanthine) is the most widely consumedbehaviorallyactive drug in the world (Bastia and Schwarzschild, 2015). It is found naturally in more than 60 species of plants (e.g., coffee, tea, cocoa) and added to a variety of food products (e.g., carbonated beverages) and medications (Juhano et al., 2011). Approximately 87% of children and adults in the United States report regular use of caffeinated products (Frary et al., 2005) with an average of daily intake among adult consumers of approximately 280 mg, or the equivalent of about two cups of coffee (Barone and Roberts, 2005). The pharmacological effects of caffeine are well documented and are most likely mediated via antagonism of the endogenous neuromodulator adenosine and functional relationships between adenosine and other neurotransmitter systems (e.g., dopamine) (Ferré et al., 2008). Low-to-moderate doses (e.g., 20-200 mg) of caffeine produce positive subjective effects including increased energy, alertness, feelings of well-being, and sociability and decreased sleepiness and fatigue (Juliano and Anderson, 2011)

Furthermore, caffeine may improve cognitive and behavioral performance, especially under conditions of fatigue, sleeplessness, or caffeine abstinence (James, 1997) and may improve athletic performance under certain conditions (Ganio et al., 2012) At higher acute doses (> 200 mg), caffeine is more likely to produce negative subjective effects such as anxiety, jitteriness, and gastrointestinal disturbances, and at very high doses it can produce restlessness, tremors, tachycardia, and psychomotor agitation (cf. caffeine intoxication as described in the Diagnostic and Statistical Manual of Mental Disorders, 4th ed., text rev. [DSM-IV-TR]; American Psychiatric Association, 2000). Caffeine also has negative effects on planned sleep, including delaying sleep onset and decreasing the reported quality of sleep (Alfordt et al., 2011).

Although caffeine is generally safe at typical dietary doses (i.e., <400 mg per day), some behavioral features of caffeine use closely mirror behaviors associated with commonly recognized dmgs of dependence. For example, chronic use of caffeine produces tolerance, as well as a characteristic withdrawal syndrome (e.g., headache, fatigue) among individuals who use as little as 100. On a typical day around 89% of the US adult population consumes caffeine (Fulgoni et al., 2015). Data from 2001 to 2010 indicate that beverages provide 98% of ingested caffeine, with coffee contributing the highest proportion (64%) (Fulgoni et al., 2015). Caffeine and coffee are commonly ingested by athletes as part of their habitual diet, but also in a supplementary capacity to enhance performance. One report shows that up to ~74% of athletes had detectable levels of caffeine in their body during competition (Del Coso et al., 2011). Average urinary caffeine concentration was similar across genders but varied with age, with older competitors (> 30 years) having higher levels than younger (< 20 years), and was higher in athletes from endurance sports (Del-Coso et al., 2011). A wealth of research has reviewed caffeine's potential to enhance exercise performance (Davis Green et al., 2009). The majority of the caffeine and performance literature focuses on anhydrous (pure) caffeine with a paucity of research examining other ingestion methods such as caffeine in coffee. While the effects of caffeine on other modes of exercise (e.g., resistance training or anaerobic work) have been examined (Da Silva et al., 2015) studies have not examined the effects of coffee ingestion on these other odes of exercise, thus our review was limited to endurance exercise. Within the existing coffee literature, no extensive reviews have been performed, thus, the focus of this review is to examine the ergogenic potential of pre exercise coffee ingestion on endurance performance and perceived exertion. In the context of this review, coffee will refer to

caffeinated coffee or decaffeinated coffee with added anhydrous caffeine. Although coffee is the main focus, a brief discussion of other ingestion modes is warranted. (Higgins et al., 2016)

2. MATERIAL AND METHOD

Research methodologies are developed in order to examine the practical side of the research and to drive suitable results for the study. They usually consist of different techniques and methods by the help of which researcher collects data and continues the further researches. Researcher selects the methodology by examining the nature of his research. With reference to this research, researcher wants to examine the "Effects of Caffeine on Athlete's Performance" and for this purpose, suitable methodology will be selected.

2.1. Nature of the Study

It includes research designs and approach mainly. Research design defines as the application of a particular strategy. It is also defined as the, **"**overall strategy that you choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring you will effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data." ("Types of Research Designs - Organizing Your Social Sciences Research Paper, 2014) There are mainly two types of research designs that are used in various researches which include fixed research designs and flexible research designs. On the other hand, major styles of research include quantitative and qualitative ones. In this research, quantitative research style is used in the form of survey method. Survey method is the convenient technique by applying which researcher gets results in quantitative form.

2.2. Population of the Study

Population of the study consisted of134 maleand 56 female athletes who participated in interuniversity sports activities being representatives of public and private universities situated in the Lahore.

2.3. Sample of the Study

It is not easy to examine the entire population. For this reason, researcher always takes out sample from the population and conduct research on it. Sample basically represents the entire population. Sample can be selected by applying different sampling techniques. In this research, population of the study is all those male and female athletes who represented their universities in various sports competitions. Total 149 male & female athletes who fulfill the criteria were included in this study.

Strata 1 Male Athletes	Strata 2 Female Athletes
n= N/1+Ne 2 n= 134/1+134(0.05) 2 n= 100	n= N/1+Ne 2 n= 56/1+56(0.05) 2 n= 49

Moreover, Stratified randomsampling procedure has been used through random number generator. There were 149 participants(100male + 49female) selected as sample by using Yamane formula 1967.

2.4. Tool for data collection

Survey

In this research, survey methodology has been used. It is a quantitative technique in which researcher gets the desired answers in numeric form. Moreover, the data collected from the participants has been analyzed by using SPSS (Statistical Packages for Social Sciences), version 25.

2.5. Data Collection

This research has been divided in two types, primary research and secondary research. In case of the primary research, data has been collected through survey and university male and female students have selected for this purpose. In case of the secondary research, information is collected from different books and journal articles.

2.6. Instrumentation/ Questionnaires

A self-developed questionnaire was used for data collection, which was contained on 15 statements. These statements were observed through a 4-Points Likert-Scale (SA= Strongly Agree, A= Agree, DA= Disagree, SD= strongly disagree) by participants**.** The validity of the questionnaire was ensured through expert opinion. While, validity was checked through pilot testing. The reliability coefficient was .710 it shows that rating scale was reliable.

FINDINGS

3.1. Reliability Analysis

Table no. 3.1.1

Reliability Statistics

Cronbach's Alpha	N of Items
.710	15

To measure the effect of caffeine on athlete performance, self-developed Questionnaire has been used in this research which consists of 15 questions. On the basis of responses of participants, reliability of this data has been checked by using SPSS. Value of reliability from 0.7 to 1 has been considered accurate. In case of caffeine, it can be noticed that value is 0.710 which is near to 0.7. It shows that data is almost reliable and accurate.

3.2. Descriptive Statistics

Table no. 3.2.1

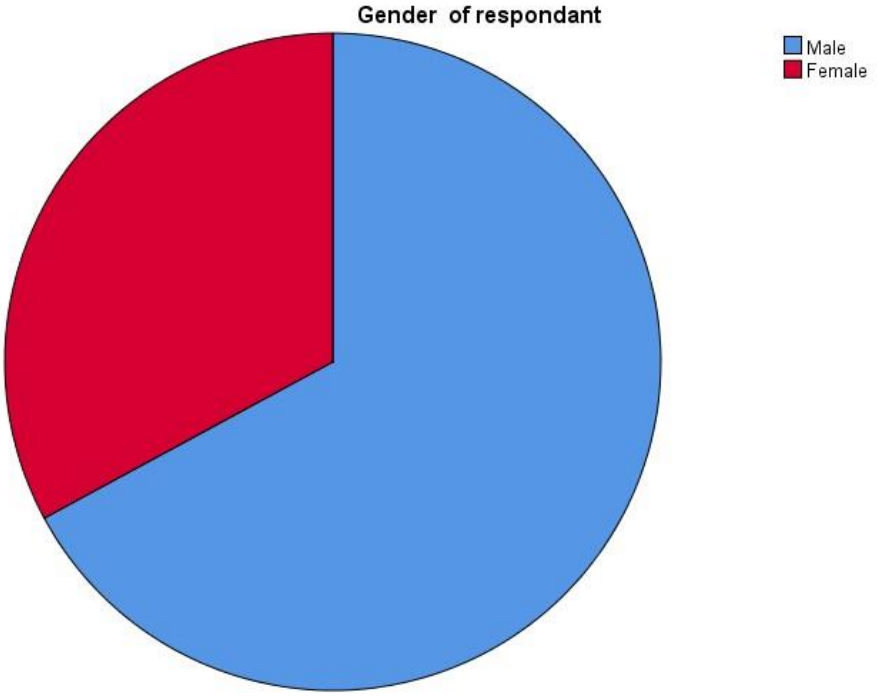
Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-22	73	49.0	49.0	49.0
	23-25	76	51.0	51.0	100.0
	Total	149	100.0	100.0	

Table no. 3.2.1 describes the age of the participants who took part in this survey. Results of the survey demonstrated that the dominant age group in this research was 23-25 years as 51% participants fall into this category. There were 49% Athletes were 20-22 years old.

Table no. 3.2.2 Gender of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	100	67.1	67.1	67.1
	Female	49	32.9	32.9	100.0
Total		149	100.0		

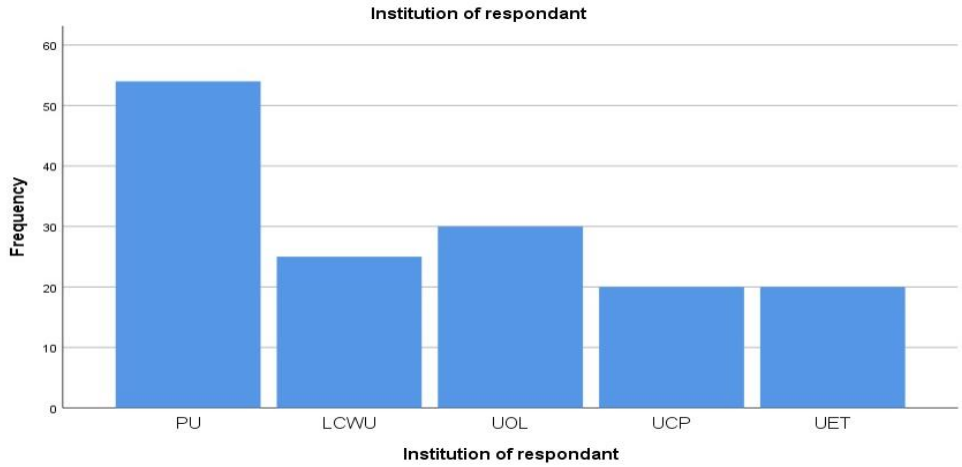


Above mentioned pie chart describes the gender of the participants associated with sports in this survey. Results of the survey demonstrated that the dominant category in this research was male as 67.1% participants fall into male category and there were 32.9% females.

Table no. 3.2.3

Institution of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PU	54	36.2	36.2	36.2
	LCWU	25	16.8	16.8	53.0
	UOL	30	20.1	20.1	73.2
	UCP	20	13.4	13.4	86.6
	UET	20	13.4	13.4	100.0
			100.0		
	Total	149		100.0	



The table no.3.2.3 and graphdescribes the institutions of the participants who took part in this survey. Results of the survey demonstrated that 36. 2 % respondents belong to university of the Punjab (PU),16.2% belong to Lahore college for women university(LCWU), 20.1% from University of Lahore (UOL), 13.4 % from University of central Punjab (UCP), and 13.4% belong to University of Engineering and technology (UET) Lahore.

3.3. RESULTS SUMMARY

Table no 3.3.1.

Caffeine has positive effects on Athlete's performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	99	66.4	66.4	66.4

Agree	31	20.8	20.8	87.2
Disagree	17	11.4	11.4	98.7
Strongly disagree	2	1.3	1.3	100.0
Total	149	100.0	100.0	

Table no. 3.3.1 describes the response of the participants towards hypothesis,"Caffeine has positive effects on Athlete's performance" Results of the survey demonstrated that the dominant category in this research was "strongly agree" as 66.4% participants fall into this category. Survey showed that 20% participants agree, 11.4% disagree and , 1.3% were strongly disagree with the statement.

Chi-Square Test

Table no 3.3.2.

Sr.no.	**Statement**	**4 Point Likert Scale Number Observed**					
		SA	**A**	**DA**	**SD**	**X^2**	**P**
1	Caffeine pick, me up when I feel tired	100	36	11	2	157.604	.000
2	Conversations are better when I use caffeine	112	16	18	3	203.564	.000
3	Caffeine improves my athletic performance	96	31	19	3	134.141	.000
4	Caffeine improves my reaction time	89	37	22	1	131.416	.000
5	I feel less sleepy after having caffeine	99	31	15	4	146.383	.000
6	When I used caffeine late in a day it gives me insomnia	89	37	22	1	139.295	.000
7	My workout like sports are better	108	24	16	1	186.416	.000
8	Caffeine makes me jittery	94	33	22	0	60.577	.000
9	I would feel caffeine withdrawal if I play without caffeine	80	47	20	2	92.960	.000
10	I would feel low energetic without caffeine	98	33	15	3	144.342	.000

11	Caffeine helped me to release anxiety while playing games	100	27	18	4	148.154	.000
12	I feel headache and body pain if I go to play without caffeine	102	30	14	3	159.966	.000
13	Caffeine helped me to release the negative physical effects of games	102	28	19	0	83.530	.000
14	Caffeine improves my attention towards games	98	33	15	3	144.342	.000
15	I feel more sociable after having caffeine	97	40	9	3	148.96	.000

Table no 3.3.2. Is related to Chi- Square. By the help of results, researchers rejected the null hypothesis and accepted the alternative hypothesis**,** "Caffeine has positive effects on Athlete's performance". Researcher analyzes that how positively or negatively significant relationship exists among the independent and dependent variables. In case of this research, independent variables of the study include caffeine whereas dependent variable is athlete performance.

4. DISCUSSION AND CONCLUSION

The present study was conducted on different public and private university athletes to take their opinion on the intake of caffeine. Players' responses on the use of caffeine were considered highly significant.It has proved thatCaffeine (1, 3,7 - trimethylxanthine) is the most widely consumed behaviorally active drug in the world (Bastia and Schwarzschild, 2015). It is found naturally in more than 60 species of plants (e.g., coffee, tea, cocoa) and is added to a variety of food products (e.g., carbonated beverages) and medications (Juhano et al., 2011). Approximately 87% of children and adults in the United States report regular use of caffeinated products (Frary et al., 2005) with an average daily intake among adult consumers of approximately 280 mg, or the equivalent of about two cups of coffee (Barone and Roberts, 2005). The pharmacological effects of caffeine are well documented and are most likely mediated via antagonism of the endogenous neuromodulator adenosine and functional relationships between adenosine and other neurotransmitter systems (e.g., dopamine) (Ferré et al., 2008). Where applicable, we propose the use of a double dissociation design and a mixed methods approach for studies assessing caffeine expectancies and/or generic caffeine intervention studies. With respect of generic caffeine intervention studies, it is important to standardize expectancies to prevent overlaps between caffeine psychology and pharmacology. This will increase the reliability when attempting to denote the true magnitude of effect for caffeine pharmacology. A double dissociation design not only permits direct comparison of CAF pharmacology and psychology through the use of active placebos, but also the synergistic effect of both. Within the current review, during the adoption of a double-dissociation design, synergism of CAF pharmacology and psychology generally resulted in the greatest performance improvements. A relationship between these properties is plausible. However, at present, limited information is available here and further research is required. A mixed methods approach entails quantitative analysis of the performance parameters employed, but also qualitative exploration of the psychological permutations associated with CAF achieved via the use of questionnaires.

Caffeine is either not considered a doping infraction. To measure the effects of caffeine on athletes and how caffeine effects on metabolism and how caffeine enhanced the performance of athletes, Caffeine Expectancy Questionnaire (CaffEQ) was developed and distributed among 149 athletes at different level in which 100 are male and 49 female athletes were participated and the athletes gave their perceptions about the effect of caffeine and positive results were analyzed. The result of the survey was analyzed and chi square test is also applied on it and it showed good and reliable result the significant value of every question was .000 to 0.01 and analyzed that the caffeine effect positively on the athletic performance and their reliability coefficients of co? was .701 that is reliable.

When caffeine used in small or recommended amount it enhanced the athletic performance but more quantity disturbs the systems like digestion, absorption and it also become addictive for athletes. Caffeine intake was also noted to improve levels of strength, power and upper arm muscular endurance. These effects were not paralleled by an increase in the exertion perceived by the athlete.

CONCLUSION

Finally, it is fundamental to employ qualitative analytical techniques, including the use of questionnaires and chi square analysis to gain a greater understanding how caffeine effect on athlete's performance.

For an athlete wishing to take caffeine as an ergogenic aid it is important to consider many factors. Firstly, it is important to try anything that you wish to take in competition in training to see how your body reacts to the substance in question.

Secondly, although neither caffeine 'banned' substances, it is important to check with current WADA guidelines for any substance that a top sport athlete consumes.

Thirdly, research studies report the average response and within the population there are responders and nonresponses. Consequently, if something does not appear to work for you, do not take it. Scientifically, there are no strong evidence that caffeine consumption will enhance high-intensity sprint or strength performance, but certainly no evidence that it would harm performance. Some athletes, especially those who are non-habitual caffeine consumers, may experience some pre-exercise gastrointestinal upset.

RECOMMENDATIONS

- Caffeine plays an important role in the performance of athlete
- Only limited and recommended amount by the coaches and doctors effect positively.
- Its excessive amount effects badly on the health of athletes, also, it may disturb the body functions of athletes.
- Its recommended amount is only allowed in sports but when athlete use it in increased amount it may be the cause of disqualification of athletes in sports.

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