ORIGINAL ARTICLE

The Effect of Caffeine Use in Elite Female Basketball Players on Blood Pressure, Heart Rate and Accurate Shot

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ABSTRACT

Introduction: In this study, reinforcement caffeine consumption contributed to the performance of the athletes with the reaction time performance and the effect of blood pressure and heart rhythm..

Material and Methods: 12 elite female basketball players participated in the study. Groups were separated from 6 -charged and overcross test method was used. 4mg/kg caffeine supplements were given to 6 athletes who receive a group A caffeine and a placebo was given to the 6 -person control group. For 2 weeks, athletes used these products without consuming additional caffeine, then 1 week Washout Period was applied, the groups were changed and group B caffeine group (4mg/kg) and group A placebo groups were formed. The product used was powered by the measurements of the product and the dust of the caffeine dose was obtained by re -pressing 4mg caffeine per kilogram. In the study, pre -test and post -test measurements were performed for 2 -week periods. Measurement results were made between groups and group comparisons with Non-Parametric Kruskal Wallis H. The pre-test and post-test results between the groups have been compared with Non-Parametric Mann Witney U test and P <0.05 level significance comparison.

Results: According to the first and recent measurements, all groups and caffeine groups evaluated these changes as statistically non -significant significant (p <0.05), although different increases and decreases in terms of blood pressure, heart beat values and reaction time values (p <0.05).

Conclusions: For female basketball players at an elite level, the amount of 4 mg/kg caffeine taken daily is statistically significant and does not have a statistically positive contribution to the reaction time performance, as well as increasing blood pressure and heart rate.

Keywords: Women's Basketball, Caffeine Supplement, Blood Pressure, Reaction Time

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INTRODUCTION

Professional sports is becoming more ambitious with athletes and coaches with higher performance targets. Although the training of the training has a high contribution to performance development, the toughness of competition and personal expectations also take into account special nutrition aid and supplementary foods. Despite these needs, caffeine is a daily consumption of daily

consumption, as well as personally some stimulating effects are observed. Thanks to this activity, it is important in a sports branch where tough competition such as basketball passes, and this accurate shots and sudden passing during the game with a cognitive structure such as sudden decision -making and quick movement and rapid movement. is. For this reason, in our study, we evaluated the effect of caffeine on the reaction time as well as the effect of caffeine on blood pressure and heart beat rate.

Caffeine explained its effectiveness to people in order to identify the effects of coffee, which was isolated from the German chemist F.Ferdinan Runge coffee beans and consumed abundantly during the period [1]. Caffeine is found in various ways, including the leaves, fruits and seeds of more than 50 plants. Among the plants, caffeine is mostly found in products such as cocoa, coffee, yerba mate, tea [2]. Caffeine is a product of methylxanthine, which is known to be effective by blocking the adenosine binding to the adenosine A1 receptor as a central nervous system stimulant. Adenosine, which cannot be connected to the A1 receptor, causes the increase in neurotransmitter acetylcholine release [3,4].

Caffeine develops complex reactions as a result of changes in the liver to form many metabolites and are mostly excreted from the body through urine of metabolites. The caffeine mixes into the body after oral intake occurs about 45 minutes after the intake. Caffeine concentration reaches the maximum plasma level at the end of 45-90 minutes of consumption [5]. Cafein's splitting life in plasma, the drugs used by the person, the level of liver enzyme function, pregnancy and age, depending on factors such as varies between individuals, while healthy adults, half life of 3.5-5 hours [6.7]. It is known that the ergogenic effect of the caffeine does not last 24 hours, although the caffeine has approximately 24 hours to remove completely from the whole body [8].

Caffeine is a reinforcing product in general classified by FDA (American Food and Drug Administration) [9]. EFSA (European Food Safety Authority) emphasized that caffeine up to 400 mg (approximately 5.7 mg/kg body mass per day), which will be taken on a daily basis, does not pose safety concern for healthy adults [10].

Caffeine has been subjected to work to observe performance. There are several assumptions and mechanisms on performance improvement with caffeine supplement. These; Calcium release from sarcoplasmic reticulum is the protection of muscle glycogen through inhibition of phosphodiesterase and the antagonistic effect of caffeine in the central nervous system (CNS) adenosin A1 and A2 receptors. As a result, the increase in exercise performance after caffeine intake is thought to occur through this activity [11].

The secondary metabolites formed caffeine increase the energy used in exercise as a result of antagonistic effect against adenosine in the central nervous system (CNS), while reducing the energy used in exercise, the muscle glycogen tank is protected and the increase in the release of the neuromuscular stimulus and the increase in calcium ions may increase in the muscle fibers [8].

The dose of caffeine, which is thought to be necessary to improve performance for an exercise, is consumed between 3-6 mg/kg 60 minutes before exercise. This dosage consumed

can improve performance (between 1-8%) for game sports, exercises with high glycolithic requirements (between 1-8%) for aerobic exercises. Research reports that caffeine doses in low (≤3 mg.kg) and high (6-9 mg.kg) ratio will improve exercise performance [11].

In their studies with 45 volunteer men with training, Virdinli and his team evaluated the effect of different doses of aggregation on cognitive performance. Participants were associated with 1.2%, 1.8%, 2.4%or water (PLA) dissolved in 25 ml of water before the test. After shaking, the participants participated in the measurement study designed for hand and foot reaction tests. As a result of the test, they observed that caffeine has a clear difference in the dose of 2.4% in all doses compared to placebo and control group in both hand and foot reaction tests [12].

They investigated the effects of caffeine use doses on performance and brain activation, which were detected as low (3 mg.kg), middle (6 mg.kg) and high (9 mg.kg). According to the study, it has been observed that the effect on cognitive functions and brain activation was higher in low caffeine doses (3 mg.kg), moderate and high doses (6 or 9 mg.kg) taken. [13].

Mesas et al. In 5 studies in their review, the application of 200-300 mg of caffeine, an average of 8.1 mm Hg HG in systolic blood pressure and diastolic blood pressure increased at the first hour after the intake of 5.7 mm HG and this condition was observed in the subjects for approximately 3 hours. In addition, it has been reported that the continuity of the studies is in the following results; In 3 studies, a long -term effect with caffeine intake for 2 weeks and in 3 studies, a diet with caffeinated coffee is consumed with a caffeinated coffee profile in which another subject profile was compared compared to comparison in comparison with a significant increase in blood pressure [14].

Han et al.; When they compile the studies of healthy and hypertension, hypercholesterolemia or overweight subjects, including 11 intervention attempts covering 485 people in total. Approximately 200-300 mg caffeine consumed with 3-6 coffee cups per day, the trial period of the studies ranging from 2 weeks to 24 weeks statistically generally combined analysis, as a result, causing a negligible increase in the number of coffee consumption of coffee consumption of 0.40 shots per minute (95% CI: -0.78 to 1.57; p = 0.506), which emphasized that it is statistically meaningless [15].

MATERIAL AND METHOD

This study is approved by Marmara University Medical Faculty Clinical Studies Ethics Committee (09.2023.181).

Creation of subjects and Study Plan

Professional and active elite women basketball players between the ages of 17-27 participated in the study. The study was conducted with a cross -group research method. In the study, the athletes participating in the study were grouped into 6 -grade groups in two random groups and were considered as a group that does not take caffeine and caffeine. Caffeine group 4mg/kg caffeine when the control group is given placebo. The study contained 2 evil 2 -week cycles, as the subjects will be applied and the subjects will be their own controls, the

reinforcement product used in each cycle remained constant. After the weekly cycle, a 1 -week washing period was given, and the changing groups were subjected to the new group procedure where they were grouped.

Group distinctions are as follows:

1. Current Group A; 2 weeks daily 4 mg/kg caffeine reinforcement, training and competition periods in the same way as the other group continued. It will not take any extra product supplements and did not consume foods containing daily external caffeine.

1. Current Group B; She took placebo training and competition periods in the same way as the other group. No extra product supplements and did not consume foods containing daily external caffeine.

2. Current group A; She took placebo training and competition periods in the same way as the other group. No extra product supplements and did not consume foods containing daily external caffeine.

2. Current group B; 2 weeks daily 4 mg/kg caffeine reinforcement, training and competition periods in the same way as the other group continued. It will not take any extra product supplements and did not consume foods containing daily external caffeine.

Physiological Analysis

Blood Pressure and Pulse Measurements

Esperanza ECB005 Brand Pulse and Blood Pressure Measurement Device and pulse and blood pressure measurements were made before the physical measurement of individuals.

Reaction Time

Blazepod ™ (Play Coyotta Ltd., Aviv, Israis) brand Blazepod ™ technology, rectation time measurement kit was used in the reaction time measurements of the athletes. This Kit De-Oliveira L.A. and his friends have been reported that he will provide reliable information during OLBA physically active young adults and evaluated that the level of security is suitable for research [16].

Caffeine and Placebo Preparation Used in the Study

In the study, 4 mg/kg doses for athletes were produced in personal doses of pills from 200 mg products. Genetic placebo Pills 200 mg products were used for placebo.

The product preparation process was as follows; Weight (Capacity 100 g / 0.001 g) to the products (Capacity 100 g / 0.001 g)), diameter and thickness (Spurta verier caliper indicator 0-150 mm 0-6 "Sensitive calipers measurement tool accuracy 0.02mm / 0.001" used), hardness (Thermomac TBH20 Tablet Hardness Metering Device is used), Disintegration tests (Thermomac ZT302 Tablet was made with disintegration test device) and products are not coated with the products that are homogeneous in the product and the products converted into dust into the tablet printing machine (Hansemay Brand Tablet Press Machine (6mm) was printed with a dose of 6 mm in diameter with the front edition and latest printing technique and placed in special boxes with 2 -week doses and delivered to the auxiliary coaches in a way that the names of the athletes were written [17].

Statistical analysis

The data was analyzed using SPSS 29.0 package program. The descriptive statistics of the arithmetic averages and standard deviations of the data were calculated. For dependent groups, multiple variable regression and variance analysis were used to compare the measurements within each group itself. If the groups are independent, Mann-Whitney U test, one of the nonparametric tests to look at the difference between the groups, was used to look at the difference in the groups if the groups are dependent, the Wilcoxon test was used to look at the difference in the groups. P <0.05 level was taken as a level of significance.

RESULTS

Table 1. Systolic blood pressure, diastolic blood pressure and SYS/DIA ** Averages of Blood Pressure Measurement Results

	Groups	N	Mean Rank	Sum of Ranks	Asymp.* Sig. (2-tailed)
SYS	Group A Caffeine Users 1. Measurement	6	5,92	35,50	0,572*
	Group A Caffeine Users 2. Measurement	6	7,08	42,50	
	Total	12			
DIA	Group A Caffeine Users 1. Measurement	6	5,42	32,50	0,297*
	Group A Caffeine Users 2. Measurement	6	7,58	45,50	
	Total	12			
SYS/DYS ratio	Group A Caffeine Users 1. Measurement	6	7,50	45,00	0,336*
	Group A Caffeine Users 2. Measurement	6	5,50	33,00	
	Total	12			
SYS	Group B Caffeine Users 1. Measurement	6	5,75	34,50	0,470*
	Group BCaffeine Users 2. Measurement	6	7,25	43,50	
	Total	12			
DIA	Group B Caffeine Users 1. Measurement	6	5,75	34,50	0,470*
	Group BCaffeine Users 2. Measurement	6	7,25	43,50	
	Total	12			
SYS/DYS ratio	Group B Caffeine Users 1. Measurement	6	7,08	42,50	0,575*
	Group BCaffeine Users 2. Measurement	6	5,92	35,50	
	Total	12			

** SYS/DYS: Systolic blood pressure and diastolic blood pressure ratio.*

Mann-Whitney Test and Pre-test and post-test mutual comparisons of group A caffeine users systolic blood pressure 1. Measurement value of 115.00 mmHg average value, group A caffeine users systolic blood pressure 2. The increase (p = 0.572) was found to be meaningless (p> 0.05).

Systolic blood pressure of group B caffeine users 1. Measurement value of 108.50 mmHg average value, group B caffeine users systolic blood pressure 2. Measurement value of 111.17 mmHg an average value (p = 0.470) was found to be significant (p> 0.05).

Diastolic blood pressure of group A caffeine in the mutual comparison of Mann-Whitney Test with Mann-Whitney Test. The increase (p = 0.297) was found to be meaningless statistically (p> 0.05).

Diastolic blood pressure of group B caffeine users 1. Measurement value of 72.83 mmHg average value, group B caffeine users diastolic blood pressure 2. Measurement value of 76.50 mmHg an average value (p = 0.470) was found to be significant (p> 0.05).

Mann-Whitney Test and Pre-Test and Post Test in the Group Mutual Comparisons S/D ratio of Group A Caffeine Users 1. Measurement value of 1.50 mmHg average value, group A caffeine users S/D ratio Blood Pressure 2. Measurement Value 1, The decrease caused by 45 mmHg average value (p = 0.336) was found to be meaningless (p> 0.05).

S/D ratio of Group B Caffeine users 1. Measurement value 1.59mmHg average value, group B/d ratio of the users of Caffeine 2. Measurement value of 1.47 mmHg average value (P = 0.575) with a statistically statistical value (p = 0.575) It was found meaningless (p> 0.05).

Table 2. Pulse measurement results

	Groups	N	Mean Rank	Sum of Ranks	Asymp. Sig.* (2-tailed)
Pulse	Group A Caffeine Users 1. Measurement	6	5,92	35,50	0,573*
	Group A Caffeine Users 2. Measurement	6	7,08	42,50	
	Total	12			
Pulse	Group B Caffeine Users 1. Measurement	6	5,83	35,00	0,520*
	Group B Caffeine Users 2. Measurement	6	7,17	43,00	
	Total	12			

** P <0.05 level was taken as a level of significance.*

Mann-Whitney Test with the Pre-Test and Post Test in the Group Mutual comparisons of group A caffeine users of the 1st measurement values of 62.67 sec average value, group A caffeine users pulse 2. p = 0.573) It was found to be statistically meaningless (p> 0.05).

Group B Caffeine users were found to be significant with the average value of 66.50 sec and the increase with the an average value of 69.33 sec (P =, 520).

Table 3. Reaction time test measurement results

	Groups	N	Mean Rank	Sum of Ranks	Asymp. Sig.* (2-tailed)
Reaction time values	Group A Caffeine Users 1. Measurement	6	6,83	41,00	0,749*
	Group A Caffeine Users 2. Measurement	6	6,17	37,00	
	Total	12			
Reaction time values	Group B Caffeine Users 1. Measurement	6	5,42	32,50	0,279*
	Group B Caffeine Users 2. Measurement	6	7,58	45,50	
	Total	12			

** P <0.05 level was taken as a level of significance.*

Mann-Whitney Test with the Group Pre-Test and Post Test Reaction Time Test of Group A caffeine users in mutual comparisons of the group 1. Measurement value 774.00 ms. Average value, Group A Reaction Time Test of Caffeine users 2. Measurement value 769.83 ms. The decrease with the average value (p = 0.749) was found to be significant (p> 0.05).

Group B Caffeine Reaction Time Test of the users 1. Measurement value 786.67 ms. Average value, Group B Caffeine Reaction Time Test 2. Measurement value 797.50 ms. The increase with the average value (p = 0.297) was found to be significant with the value of statistically (p> 0.05).

DISCUSSION

Although there are many ergogenic reinforcement products for performance development or recovery after training, it is one of the most operated products on caffeine. The fact that caffeine has different effects in different conditions makes us think about the need for more work for female athletes. For this reason, it was found that the daily 4 mg/kg caffeine reinforcement per day for 12 professional elite athletes related to caffeine did not show significant differences between

the groups during the pre -test and post -test results during the 2 -week use process.

Mesas et al. In 5 studies in their review, the application of 200-300 mg of caffeine, an average of 8.1 mm Hg HG in systolic blood pressure and diastolic blood pressure increased at the first hour after the intake of 5.7 mm HG and this condition was observed in the subjects for approximately 3 hours. In addition, it has been reported that the continuity of the studies is in the following results; In 3 studies, a long -term effect with caffeine intake for 2 weeks and in 3 studies, a diet with caffeinated coffee is consumed with a caffeinated coffee profile in which another subject profile was compared compared to comparison in comparison with a significant increase in blood pressure [14].

In our study compared to this study, the increase in 2 -week pre -test and post -test results in systolic blood pressure measurements in group A and group B athletes using caffeine supplements, respectively (p> 0.05), (p> 0,572) and (p = 0.470) Statistically did not yield a significant result.

In addition, the increase in diastolic blood pressure measurements in Group A and Group B athletes using caffeine supplements in 2 -week pre -test and post -test results (p> 0.05), respectively (p = 0.297) and (p = 0.470) statistically significant significant significant significant significant significant significance did not give results.

In addition, the increase in 2 -week pre -test and post -test results in S/D ratio in Group A and Group B athletes using caffeine supplements, respectively (p> 0.05), respectively (p = 0.336) and (p = 0.575) statistical did not give a significant result.

Han et al.; In a total of 485 people, approximately 200-300 mg/kg caffeine consumed with 3-6 coffee cups per day, the trial time of the trial time from 2 weeks to 24 weeks statistically generally combined analysis, as a result, the number of coffee consumption heart rate per minute 0.40 shot per minute He showed a negligible increase (95% CI: -0.78 to 1.57; p = 0.506), which emphasized that it was statistically significant [15].

In comparison with this study, the increase in pulse measurements in group A and group B athletes using caffeine supplements in 2 -week pre -test and post -test results, respectively (p> 0.05), (p = 0.573) and (p =, 520) It did not yield a significant result statistically.

Our results have shown that caffeine has no significant effect on the blood pressure and heart beat values of the athletes. Although there are partial increases, these increases do not statistically significant.

Virdinli and his team evaluated the effect of 45 volunteer men caffeine with training on cognitive performance. After shaking, the participants participated in the measurement study designed for hand and foot reaction tests. As a result of the test, they observed that caffeine affects performance in both hand and foot reaction tests, especially in all doses compared to placebo and control group, with a clear difference in a dose of 2.4% [12].

In comparison with this study, the decrease in 2 -week pre -test and post -test results in the reaction of reaction time test measurements in Group A and Group B athletes using caffeine supplements,

respectively (p> 0.05) and (p = 0.749) and (p = 0.297) Statistically did not yield a significant result.

The results of our study were seen that the daily 4 mg/kg caffeine loading to athletes for 2 weeks did not have a significant contribution to the reaction times of the athletes.

Our study has shown that the effect of caffeine does not provide a statistical activity on women athletes, both pulse and blood pressure measurement values and reaction time measurement values, but the dose used does not affect the athletes. However, it makes us think that the fact that the significant benefit in many studies is not observed in this study can be caused by the discontinuation of caffeine foods and beverages during the study and that the caffeine consumed during this time may occur due to the immune effect.

Although the work with higher doses of caffeine may affect significant results, it is possible to take this product at more doses on 5-7 mg/kg safe use values per day as a result of the health risks as well as the market doses of the product to be purchased and a large number of product supplements per day It will also be able to use the difficulty of using it.

In addition, the excess doses to be taken may cause dehydration in athletes for caffeine, which is a diyüette, and that the loss of minerals in the menstural cycle for female athletes may also cause a negative course with this dehydration.

Finally, in terms of caffeine usage and efficiency, the use in terms of reaction time is not considered as an ergogenic support product that can be significantly valued to athletes.

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