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# The effect of caffeine on heart rate during and after both aerobic and anaerobic activity

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**ABSTRACT**

*Caffeine is an alkaloid synergistic properties of the troop, with little information on the effect of caffeine on heart rate during exercise and intermittent exercise protocol are aerobic an anaerobic. Hence, this study investigated the effect of caffeine on heart rate during and after exercise, both aerobic on athletic young introduction anal target. 30 young footballers in aerobic and anaerobic exercise intensity of 80% maximal oxygen uptake participated (the average age 23/60±3/7 year and average weight 83±31 kg). Height, weight, maximal oxygen consumption rate was measured in subjects be for and after exercise. The independents t test was for statistical analysis. The results showed that maximal oxygen consumption and anaerobic power were significantly increase in the experimental group (p<0/05). In contrast, showed a significant decrease in heart rate (p<0/05). The result of this research shows that consumption of at least 6 mg/kg of caffeine on aerobic and anaerobic average there were significant effects.*

**Key words:** Caffeine, anaerobic power, maximal oxygen consumption.

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## INTRODUCTION

Caffeine is an alkaloid that has variable effect on the human body, reduce the response time, delay the fatigue factor, increase focus and alertness, speed calling free fatty acid, facilitates nerve impulse, increasing contractility there should [1].This medication regularly in various forms by athletes in sport, aerobic and anaerobic power of taking advantage of the properties that are used in synergy. [2]

Effects of caffeine on aerobic exercise such as cycling[3], running[4], swimming[5] has been proven, while the power potential synergistic effects of caffeine on short0term strenuous activity is not clear [6]. Some studies have reported the effect of caffeine dramatically, while other studies show little difference between control and experimental groups have expressed [7, 8]. As Anselm and his colleagues have studied the effect of caffeine consumption before the action maximize short-time peak power, stamina or speed are not athletes (3). Williams and colleagues have also reported that caffeine ingestion on maximal anaerobic power of athletes is investment [9], While Kim and colleagues reported that caffeine before strenuous activity significantly increased peak anaerobic and aerobic power of athletes and non-athletes out to be [5]. There are the conflicting data on the effect of caffeine on heart rate during activity [3, 10].

After some research, caffeine consumption after, Exercise increase heart rate, some decrease, and some no effect of caffeine on heart rate [3, 5, 11]. According to investigations, the role of caffeine on aerobic and anaerobic physical activity patterns in the aura of ambiguity. Currently reviewing the scientific literature, the question is, authorized caffeine intake the medium term, the effect on heart rate during aerobic power in young footballers?

## MATERIALS AND METHODS

### Subjects

Quasi-experimental study dad been done in the form of a pre-test and post-test. Young football players voluntarily participated in this study. Inclusion criteria consisted of subjects haring at least six men this of regular exercise and the absence of any cardiovascular disease, renal failure, liver disease, infection and consumption of tobacco and alcohol was not a factor.The subjects in the treatment with steroids, special diets were not. After the study, 30 young footballers were left written informed consent was obtained from all participations.

### Procedures

Before initiating the tests, the participants underwent an anamnesis, a clinical evaluation and weight, height, body mass index (BMI) and body fat mass measurements. Then all of them underwent familiarization sessions and participated in evalutionvo2max test. The anthropometric characteristics of the subjects are shown in table 1. The BMI (kg/m2) of each subject was calculated on the basis of their weight and height, and percent body fat (PBF) was assessed using a bioelectrical impedance instrument (in-body -720, korea). Afterwards, participants carried out experimental session. Pre- and post-exercise heart rate subject collected measured and analyzed. Then estimate subject aerobic power with bruse test and anaerobic power with rast test. The subjects in the experimental group were eligible (age: 23.60±3.7 year, weight: 83±31 Kg, BMI: 182±4 Kg/m3, number: 30).

### Maximal oxygen uptake

In order to estimate aerobic capacity, athletes participate in maximal Bruce test. Subject on a treadmill with zero inclination and (44% m/s) speed of a warm-up operation began(75% m/s) 1 mile, the test with 10% slope of 1z percent and speeds increased by 2.5 mil/h (1.11 m/s) based on Bruce test exhaustion expressed by each subject continued.

### The exercise protocol

Experimental group, two exercise tests were performed. The first session of Rast testing at least 4 hours after meal was done. 5minute warm-up, subjects under the investigator who conducted the Rast test. Rast test consisted of 6 repetition of fast running distance of 35 meters with rest intervals of 10seconds of maximum intensity that can be done in between each repetition for recording records the optical system (photocell) was used, two pairs of photo cell was placed at the beginning and end of the 35 meters. Subjects in each iteration, the distance of 70cm from the starting lineup and hearing the sound of the instrument, all the more strongly than did start running [12].

Finally, after the passage of light to the eye, stop the timer and record the devices were recorded by the device. In order to remove the reaction time, the system was setting the timer light passes through the eye of a person first begins to work. For optimal results Roast test, all participants must be repeated with more intensity they do. Peak power, minimum power, mean power, and fatigue index was calculated according to instructions [12]. The second test a week later, just like the first meeting took place. As the subject were asked to continue their weekly activities and the use of nicotine, alcohol and Nutritional supplement products to avoid any irritants and that regular caffeine consumers continue to cut it 48 hours before taking the test. In this experiment (post-test), subjects an hour before the test caffeine or place (containing dextrose) to a value of 6mg per kg of body weight in the form of capsules gelatin 500mg of the same color that works, without reaching the level illegal take of the Olympic committee.

### Statistical methods

After confirming normal distribution of data using statistical analysis to compare the within-group t test for independent variables was used. All data as mean, standard deviation are presented. 16spss were calculated using statistical software and test significance level $p \leq 0/05$was considered.

## RESULTS AND DISCUSSION

**A:** the results of the physical and functional results of physical and functional characteristics of the experimental groups are shown in table 1. Within the group of subjects in the experimental group showed a mean weight values after training was reduced, but the redaction was not statistically significant.

**B:** results of physiological variable

Physiological variables measured results are shown in table2. Intergroup study showed that maximal oxygen consumption and anaerobic power were significantly increased in the experimental group. In contrast, the heart rate, time to return to the heart rate at rest and after aerobic exercise and time to return to the heart rate at rest and after aerobic exercise the pre-test and post-test showed a significant decrease.($p \leq 0/05$)

**Table 1: average characteristics of the subjects and compare the physical and functional characteristics of the functional groups in the control and experimental group after resistance training**

| Property | Before training M±SD | After the training M±SD |
|---|---|---|
| **Age (year)** | 22/33± 1/17 | - |
| **Length (cm)** | 172/86±5/39 | - |
| **Weight (kg)** | 68/7±4/74 | 67.7±4.24 |
| **BMI (kg/m2)** | 21/21±2/53 | 21.01±1.73 |

**significant differences within groups at p≤0/05 shows M±SD: standard± average*

**Table 2: comparison of biochemical indices in experimental and control groups before and after resistance training**

| Property | Before training M±SD | After the training M±SD |
|---|---|---|
| **Maximum oxygen consumption** | 68/81±1/84 | 75/65±1/22 |
| **Anaerobic power** | 934/39±20/25 | 938/93±25/95 |
| **Exercise hear rate** | 181±2/30 | 44/5±2/29 |
| **Back to HR /HRR 2min of aerobic activity** | 51/95±3/31 | 44/5±2/29 |
| **Back to HR/HRR 1min after anaerobic activity** | 75/65±1/22 | 68/81±1/84 |

** Significant differences within groups at p≤0/05show. M±SD: standard± average - the change= pre -test- post-test*

## CONCLUSION

The study found that 4 weeks of aerobic training a treadmill with a low dose of 3-5 mg/kg of caffeine reduce heart rate during low-to moderate intensity activity on subjects that hare caffeine consumption habits, are. Exposure on the cardiovascular effect of caffeine during Exercise, there are differences in opinions[13] some scholars in their research or no change in heart rate with increasing caffeine intake with physical activity reported, the results of this study are counter[14]. Sullivan and colleagues in their study of the reduction in heart rate with sub maximal exercise after caffeine consumption 3/3 mg/kg reported [6]. Also 5mg/kg caffeine decline in heart rate after aerobic activity can be seen in 30-70% of $vo_2$ max on a bicycle bat more than 75% $vo_2$ max was observed [14]. Gareth also recently observed that the heart rate of 5 mg/kg of caffeine in boys and girls in the 55-75% $vo_2$ max of the activity was reduced to 41-47% $vo_2$ max [15]. The results showed that bell at al. the 5mg/kg dose of caffeine (even in habitual and non-habitual) activity led to a significant increase in hear rate is 80-85% $vo_2$ max but no effect on heart rate during work on the bike is 50% $vo_2$ max[16]. Sine a clear mechanism of caffeine on heart rate after exercise has not been identified yet, we cannot properly explain the conflicting results of research. However, research has shown that low heart rate at moderate intensity activity is observed. Can increase stroke volume or stroke volume is optimized implications. Mechanisms seem likely to increase contracting flexibility. Gould and his colleagues studied the increase in stroke volume and ventricular end-diastolic increased by injecting caffeine for one [17].

Another reason for the in heart due to the reflex or receptors lowers heart rate in response to elevated blood pressure and try to bring it back to normal mode will be included and because this reflex is sensitive to caffeine consumers, so it HR does not change the results Sullivan

Confirmed that caffeine is caffeine reduce heart rate in. Also shown is the find effect of caffeine on the heart can be stressful [16]. It has been shown that coffee increases that rate response to mental stress is crested [17]. Sine heart rate is usually caffeine and so it is taking sides during stress is reduced heart rate.

Low-to moderate-intensity leisure activity in humans, Especially in healthily people do not put any stress our findings on the effect of caffeine on heart rate during high intensity activities do not interfere and maybe because of the stress is high(17). According to research, it is not clear why the reduction in heart rate during sub maximal work after taking 1/5-3 mg/kg occurs and the decrease in peak intensity nearly activities [6]. Based on the research results could be because the heart is unable to contract or downloads in high-intensity exercise at high efficiency. Another important of the present study subject after caffeine ingestion increases anaerobic to activity has been associated with the findings of the study, Jonathan [18], consistent. Jonathan and his (2006) colleagues reported on study of 5 mg/kg caffeine increased power and speed while working out [18]. Doherty and colleagues (1998) also showed that caffeine could mean the extreme short sprints improved [13]. It seem that caffeine has a stimulating effect on the central nervous system, limited duration of this activity because it is very short and narrow, which can significantly affect the amount of muscle's glycogen. Caffeine stimulates the central nervous system may influence processes determine motor performance increase [1, 2]. The proposed mechanism to explain the effect of caffeine can increasing the minimum power and mean power by inhibiting phosphodiesteras inhibitor, blocking AMP anal the central nervous system is stimulated there is also the possibility the caffeine affect stimulation processing of adenosine competitive receptors, from environment to central nervous system, such as reduced feelings of fatigue, muscle awareness [1,2]. at least part of this effect can be explained by the concert ration of calcium in muscle cells

or reduce the loss of potassium from the cells, during repeated con tractions process the analysis show that caffeine intake of 6mg has no significant effect on anaerobic power. This result is consistent with previous results Jyhafman and Aurlrew Lorraine while the results are inconsistent with Schnikr and colleagues. Andrew Lorraine and colleagues in their Study concluded that 6 mg of caffeine in young adults, who had low activity, has no significant effect on the power when measured by the win gate test. In spite, Schick and colleagues in a study of 6 mg caffeine compared with placebo in tests on a bicycle ergometer showed that 18 seconds with maximum speed bicycle kick with 2minutes to return to active mode with 4 repeated $vo_2$ max 60% percent peak, be increased [19]. Research shows that the return type of time between repetitions and the type of activity, the peak intensity can be effective.
The Rast test the return time was 10 second off. Whereas Aschnykr and colleagues test the return time of 2min activated. Results of caffeine consumption showed that at least 6 mg of caffeine consumption on aerobic and anaerobic mean power, the time of heart rate back to resting heart rate has a significant effect.

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