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by Fitri Agung Nanda

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Caffeine supplementation in the sport of futsal: How does it impact athletes' endurance and speed?

Anggo Widcaksana Ilmawan^{1abcd}, Ria Lumintuarso^{1bcde},
Aulia Gusdernawati^{1abde}, Fitri Agung Nanda^{2abde*},
Muhammad Tafwidh Alzaid^{3acde}

Universitas Negeri Yogyakarta, Indonesia¹
Universitas Lampung, Indonesia²
Selçuk Üniversitesi, Turki³

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ABSTRACT

Endurance and speed are important components in supporting the success of futsal athletes. To increase this ability, many things can be done, one of which is to provide caffeine before exercising for maximum results. This study aims to determine the effect of caffeine on the endurance and speed of futsal athletes in Mataram. The research used is the type of experiment. In this study, the instrument for measuring endurance is the bleep test, while the speed is measured using the 100-meter sprint. This study is a population study because all populations are the research sample. The entire population is used in this study because all 16 samples are national athletes in the Vamos Mataram futsal group, and the research focuses on that one elite club. Data analysis was carried out using ANOVA with the help of SPSS. Based on the results of the data analysis of the futsal athletes of Vamos FC Mataram with the administration of caffeine, the significance value for endurance was 0.000 and the significance value for speed was 0.038. Based on the results of the significance test for the two variables having a value lower than 0.05, the data stated that there was an impact caused by caffeine administration to increase endurance and speed. The research has limitations, namely only focusing on one elite futsal club, namely Vamos Mataram, but the results are expected to be able to refer to the use of caffeine in an exercise program to be able to improve endurance and speed. Further research is expected to be able to cover more than one club as well as the addition of variables.

Keywords: Caffeine; endurance; speed; futsal



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Corresponding Author: Fitri Agung Nanda, Department of Physical Education, Health and Recreation, Faculty of Teacher Training and Education, Universitas Lampung, Lampung, Indonesia
Email: fitriagungnanda16@gmail.com

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INTRODUCTION

Players for futsal and at all levels are not at the required level of physical fitness, which suffers a decline in its levels, which in turn affects the skillful and tactical performance, especially the accuracy of scoring, and

this appears clearly in the last third of the matches (Hilail & Alsulan, 2021). The Tabata training program is characterized as high-intensity interval training (Mulazimoglu et al, 2021). The compatibility of the physiological burden caused by this training program on futsal players with futsal characteristics is still a matter of debate. The results of the study examined the acute effect of Tabata training on heart rate and blood lactate accumulation in futsal players, especially on endurance and speed. Futsal players must have good leg muscle strength aimed at the strength of the kicks made by athletes or where the ball wants to be placed, in addition to the flexibility of the back muscles, speed, and endurance of successful futsal athletes (Supriadi, 2022).

In futsal, several components support success and maximum performance. In line with this statement, the success of futsal is supported by several factors, namely physical condition, psychological condition, and a good training program (Álvarez-Kurogi et al., 2019; Pardini & Saparudin, 2020). Futsal coaching and development aim to make it one of the sports achievements at the regional, national, and international levels (Muhsin et al., 2021). Hariawan and Kafrawi (2022) revealed that other supporting factors for the success of futsal participants include clear team organization, number of training sessions (preparation for competition), high motivation, and available training time.

Futsal athletes are expected to have good endurance because this game is a sport with a fairly high intensity of play (Kharisma & Mubarok, 2020; Wibisana, 2020). He continued, revealing that in futsal an athlete is required to be able to master game techniques such as dribbling, kicking, heading, passing, holding, and attacking (Wibisana, 2020). The perfection of basic technique is also very important because it determines the movement in general (Rusdi et al., 2022).

Other literature studies reveal that speed is one of the components that determine the success of futsal athletes in achieving maximum performance. Speed and acceleration in athletes are needed to adjust the design of the athlete's training program (Herman et al., 2020). Speed is used to be able to move in futsal games such as passing, running, dribbling, and passing opposing players (Romero et al., 2020). Purnomo and Irawan (2021) said that speed, agility, and physical condition play a very important role in futsal players' dealing with certain match situations and conditions that require elements of speed and agility in moving to control the ball.

Methods have been developed to improve endurance and speed, one of which is by providing drinks containing caffeine to increase energy intake. Caffeine is part of the supplements given before training sessions to athletes (Rothschild & Bishop, 2020). Caffeine-containing beverages increase energy in the body, allowing for maximum endurance training (Pickering & Grgic, 2021). Caffeine also has good content and should be used before doing speed training (Pickering & Grgic, 2021). Giving caffeine to athletes before doing a speed training program has a good relationship with athletes and can maximize their speed capabilities (Tamilio et al., 2021).

Previous researchers have conducted many studies on caffeine in sports, such as caffeine supplementation in soccer players or caffeine supplementation in cyclists (Papadopoulou et al., 2017), rugby players who take caffeine supplements (Klimešová et al., 2017). However, there are no researchers who have discussed the effects of caffeine on futsal players, specifically looking at endurance and speed. Therefore, this study is considered important to fill the research gap. This study aims to determine the effect of caffeine on increasing endurance and speed. These results are expected to be a reference for improving endurance so that it can get maximum results that are directly proportional to the maximum performance of athletes.

METHOD

This study shows the focus of research that is examined through experimental activities and aims to determine the symptoms or effects that arise from samples that carry out testing with the consumption of mineral water and caffeine contained in coffee, which is consumed 30 minutes before the test. The research sample consisted of 16 futsal athletes from Vamos FC Mataram. All samples were tested twice, but two days apart from the previous study. This study uses an endurance test with a beep test. The research procedure for endurance and speed indicators has the same system and type of test; namely, in the first test, all futsal athletes of Vamos FC Mataram did the test without consuming any drinks, except mineral water. Then, in the second test, which was carried out approximately 2 days after the previous study, 30 minutes before the test, all Vamos

FC Mataram futsal athletes consumed caffeine. The data were statistically analyzed using the SPSS 20 application with way ANOVA analysis; the data analysis in this study had a 95% confidence level, so the value for this study was 0.05.

RESULTS AND DISCUSSION

Based on the results of the study, there were differences in the average mileage logged by athletes when doing endurance and speed tests, carried out when athletes did not consume caffeine and when they did, as shown in the following Table 1.

Table 1. The Difference in Mileage on the Endurance Test (Bleep Test)

	N	Mean	Std. Deviation
No Caffeine	16	44.9750	2.25078
With Caffeine	16	51.1063	2.86763
Valid N (listwise)	16		

Table 1 shows that when athletes perform endurance tests with the bleep test instrument and do not consume caffeine during the test, they get an average mileage of 44.97, which is equivalent to running bleep test level 9 back and forth 5 or 6 times and a standard deviation of 2,245. Furthermore, when athletes consume caffeine, the average mileage is 51.1, equivalent to a level 11 bleep test run with 3 back-and-forth and a standard deviation of 2.867. Furthermore, it will be disclosed regarding the speed results in Table 2.

Table 2. The Difference in Travel Time on the Speed Test (100-Meter Run)

	N	Mean	Std. Deviation
No Caffeine	16	11.5894	.24349
With Caffeine	16	11.4031	.24179
Valid N (listwise)	16		

While in Table 2, the result of research by athletes when doing speed tests using a 100-meter running instrument shows that when athletes do not consume caffeine while doing speed tests, the average travel time is 11.58 and the standard deviation is 0.243. Furthermore, when athletes consume caffeine, average results are obtained, average travel time of 11.40 and a standard deviation of 0.241. From the two tables above, we can see the difference in the average and standard deviation of distance and travel time from the results of tests that have been carried out with and without caffeine consumption. Then, using the One-Way ANOVA test, determine whether there is an effect of caffeine on increasing endurance and speed in Vamos FC Mataram futsal athletes. The data presentation can be seen in Table 3.

Table 3: ANOVA Results: Durability and Speed

		Sum of Squares	df	Mean Square	F	Sig.
Durability (Bleep Test)	Between Groups	300.738	1	300.738	45.260	.000
	Within Groups	199.339	30	6.645		
	Total	500.077	31			
Speed (100 meters)	Between Groups	.278	1	.278	4.714	.038
	Within Groups	1.766	30	.059		
	Total	2.044	31			

The results of hypothesis testing are based on the results of pre- and post-test data calculations by testing the endurance and speed of the futsal athletes of Vamos FC Mataram by giving them caffeine, with a significant value for endurance of 0.000 and a significance value for speed of 0.038. Based on the results of the significance test for the two variables having a value lower than 0.05, the data stated that there was an impact caused by caffeine administration to increase endurance and speed.

Based on the results of the analysis conducted, it was found that the caffeine contained in coffee was able to increase the endurance and speed of athletes before exercising. Tritama (2019) explains that the caffeine content in coffee is influenced by where it is grown and the way the coffee is served. The coffee that enters

the body will be distributed throughout the body by the bloodstream from the digestive tract in about 5-15 minutes. Caffeine absorption in the digestive tract reaches a rate of 99% and then peaks in the bloodstream within 45-60 minutes. Giving caffeine before doing sports activities and endurance training can improve the athlete's ability. He continued by revealing that coffee can help increase exercise stamina (Ashabul, 2021). Recent research suggests drinking five cups a day (equivalent to 500 mg) can keep one from dehydrating during exercise, and coffee can fight fatigue.

Furthermore, caffeine can also affect physical and athletic performance (Wirama et al., 2019). Caffeine ingestion of 6 mg/kg body mass 1 h before an exercise in the heat provides a worthwhile improvement in EP of 2% while trivially increasing the rate of change in CT by 0.10 °C/h (Naulleau et al., 2020). McGarry et al. (2021) states that caffeine is a natural doping category that is officially harmless and can be used in doses according to the body's needs. Ergogenic substances can increase endurance, reduce stress, create a sense of pleasure, increase muscle mass, sharpen focus and concentration, and relieve aches and pains. One that contains ergogenic substances is caffeine, which can increase speed and reaction in athletes (Zharfani et al., 2022).

Coffee is a drink that is often consumed before exercise to improve performance and prevent muscle fatigue. He added that there are effects caused by consuming caffeine. The impact of consuming caffeine is that the body is more ready to go to the exercise zone so that it can improve performance to get maximum results (Wirama et al., 2019). He further explained that the effects of caffeine on producing more strength, total weight lifted, and improving sprint performance compared to placebo were higher in male than female athletes even though the same caffeine dose was administered (Mielgo-Ayuso et al., 2019). Intake of a low-to-moderate dose of caffeine before and/or during exercise can improve self-reported energy, mood, and cognitive functions, such as attention; it may also improve simple reaction time, choice reaction time, memory, or fatigue; however, this may depend on the research protocols (Calvo et al., 2021).

A tangible manifestation is that coffee is considered to be able to improve the goal to be achieved, namely increasing cardiovascular endurance ability (Sari et al., 2020). Caffeine administration is an ergogenic aid in many sports (Tan et al., 2022). Caffeine used as a supplement has been shown to improve physical and cognitive performance in several exercise modalities due to its effects on the central nervous system (López-González et al., 2018). Caffeine is thought to provide an energy boost to the muscles, increasing stamina before engaging in sports activities (Salinero et al., 2019). The results of the study explained that caffeine consumption of between 3 and 6 mg/kg before exercise was found to be effective in improving several physical performance variables (Lazić et al., 2022).

CONCLUSION

Based on the results of the research conducted, it can be concluded that the use of caffeine causes an increase in endurance and speed and that the administration of this caffeine must follow the recommended dose in this study, namely, 3 to 6 mg/kg/b.m. of caffeine to increase maximum strength. Although it influences the use of caffeine in futsal athletes, this study has limitations, namely that it only focuses on one elite futsal club, namely Vamos Mataram, and that the use of caffeine is only 3 to 6 mg/kg/b.m. and there is no comparison with other isotonic drinks. The results of this study are expected to contribute to references for the use of caffeine in training programs to increase endurance and speed. Future research is expected to include more than one club as well as additional variables.

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CONFLICT OF INTEREST

All authors declare that there is no conflict of interest whatsoever in this study.

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