OPEN ACESS
Journal of National Kinesiology

ORIGINAL RESEARCH

Small-sided games in football: The effect of caffeine ıntake on physiological parameters and some selected technical actions

[1]Faruk Güven, [2]Hasan Nedim Çetin

[1]Karamanoğlu Mehmetbey University, Faculty of Applied Sciences, Karaman, Türkiye.
[2]Sakarya University, Faculty of Sport Sciences, Sakarya, Türkiye.

Received:
January 13, 2025

Accepted:
April 29, 2025

Online Published:
May 10, 2025

Keywords:
Caffeine, small-sided games, football, technical actions.

Abstract. The aim of this study was to examine the effects of caffeine intake on physiological responses and technical performance during small-sided games in football players. The study was conducted with 30 amateur male football players. The small-sided games were played on a 52x38 meter pitch in teams of 5 players, consisting of 3 sets of 6 minutes each, with 5-minute rest intervals between sets. Participants were assigned to three experimental conditions: caffeine group (KAF60), placebo group (PL), and control group (CG). The KAF60 group received 6 mg/kg of caffeine mixed with water, administered 60 minutes before exercise. The placebo group received only water, while the control group was not given any fluid. Each player participated in all three conditions with a 3-day washout period between sessions. Heart rate (HR) was measured every 5 seconds using a Polar device. Blood lactate levels and ratings of perceived exertion (RPE) were assessed before, between, and after the sets using fingertip blood samples. Technical performance was analyzed through video recordings and Mathball match analysis software, including variables such as number of shots, successful and unsuccessful passes, total passes, dribbles, ball recoveries, duels, and ball possession time. The results showed that both HR and RPE were significantly higher in the KAF60 group. In terms of technical performance, successful and total pass numbers were significantly higher in the KAF60 and PL groups compared to CG. Additionally, the number of unsuccessful passes was lower in the KAF60 group, while the number of duels was higher in the control group. In conclusion, appropriate doses of caffeine intake may positively influence physiological responses and passing performance during small-sided games in football. However, individual differences such as habitual caffeine consumption and tolerance levels should be taken into consideration when implementing supplementation strategies.

Introduction

The use of caffeine appears as a substance that is frequently used today and the scope of its use is increasing rapidly. This substance, whose scientific name is trimethylxanthine, is used rapidly and widely due to its stimulating effect and performance-enhancing feature (Brian et al., 2006). There are many reasons for the use of caffeine. The most well-known of these are important factors such as staying awake due to the stimulating effect of caffeine, increasing performance at a certain level by reducing physical fatigue, and increasing attention level. Studies have shown that caffeine not only affects the nervous system, but also has many effects on the heart, respiratory system, circulatory system, and endocrine system. There are many studies showing that caffeine has a positive effect on performance during long-term exercises (Ivy et al., 2009; Burke, 2008). On the other hand, there are studies showing that caffeine has little effect on anaerobic performance (Davis & Green, 2010). In their studies, they stated that caffeine does not have a significant effect on fatigue and muscle strength in short-term maximal exercises, and according to the sources, the main reasons for this difference may be related to experimental differences, physical and physiological performance levels of athletes, exercise intensity and duration (Greer et al., 2006; Pereira et al., 2010). Although the development of many new training programs in football causes an increase in the number and duration of training, By determining the training levels of the athletes coaches resort to different solutions in order to increase the athlete's individual technique, tactics and condition for their best performance (Sainz et al., 2005). Ergogenic supports are being sought. There is a widespread opinion that caffeine intake has a positive effect on psychomotor functions, reduces fatigue by increasing long-term attention, increases attention, increases physical performance and endurance (Howard & Marczinski, 2010). Small sided games in football: The effect of caffeine intake on some selected movement actions and physiological parameters should be known. In football training, various training drills are used by reducing the size of the field and reducing the number of players in the team. From this point of view, game drills designed for training in football terminology are called small

✉ F. Güven, e-mail: farukguven@kmu.edu.tr
To Cite: Güven, F., Çetin, H. N. 2025. Small-sided games in football: The effect of caffeine ıntake on physiological parameters and some selected technical actions, Journal of National Kinesiology . 6(1), 1-10.

group games, technical and tactical games, conditional games, endurance games (Impellizzeri et al., 2006). In order to increase the performance levels of the players, The players need to develop quick thinking, ball possesion, decision-making skills and tactical thinking by developing the football match-specific physical and physiological expectations (Casamichana, 2010). It is only through well-programmed trainings by determining the condition and skill level of the football player. Thanks to the drills made with narrow field games, the football player can improve his technical skills such as trick, passing, shooting, dribbling, and football condition level (Haas et al., 2010; Katis & Kellis, 2009). In recent years,with match analysis it has been tried to find answers to the questions of what level the match performance of the teams and players are or how this should be determined (Drust et al., 2000). The study aimed to investigate the effect of caffeine intake on physiological parameters and some selected actions. In line with this aim, it would provide a scientific perspective on the effects of caffeine intake on physiological parameters such as heart rate, blood lactate levels, and the development of practical strategies for coaches and athletes to improve technical skills by investigating how athletes' nutrition, training programmes and technical movements are affected by caffeine intake. These data will contribute to the existing knowledge in the field of sports sciences. The effects of caffeine supplementation on physiological performance changes before, during, and after the game will be monitored, and the movement actions that occur during the game will be identified to explore the differences between the caffeine, control, and placebo groups. Being adjustable allows it to be adapted according to individual needs (Özbudak, 2019). Research has also shown that reformer pilates plays an important role in improving quality of life, provides postural balance and helps individuals feel more confident, energetic and renewed (Bulut, 2019).

Method

The sample of the study consisted of football players competing in the Turkish Regional Amateur League, with a sports age of 6.80 ± 2.62 years, who actively participated during the competition period and trained at least five days a week. A total of 30 players were assigned to three groups: control, placebo, and caffeine supplementation. The aim of the study was to determine the effect of caffeine supplementation on movement-based actions and physiological performance in amateur football players by analyzing small-sided games, heart rate, and blood lactate levels. Prior to participation, the players were informed in detail about possible risks and discomforts related to the study, and informed consent forms were read and signed by the participants.

Caffeine supplement

The research was conducted with 30 amateur league football players. The small-sided games were organized on a 52m x 38m pitch, with players divided into 5-person teams. The games were performed in 3 sets of 6 minutes each, with 5-minute rest intervals between sets. The players participated in three experimental conditions: caffeine group (KAF60), placebo (PL), and control group (CG). While no fluid was given to the control group (CG), only water was provided to players in the placebo condition (PL). In the caffeine condition (KAF60), players received powdered caffeine mixed with water at a dose of 6 mg/kg of body weight, administered 60 minutes before measurements.

The Implementation of the Small Sided Game

In the 5 to 5 small sided game application, the playing field is 55 meters long and 38 meters wide. Small sided game practice was played in a free play format consisting of 3 sets of 6 minutes, targeting standard miniature goals and players were given 5 minutes of recovery time between eachset. The small sided game was applied twice with an interval of 3 days in the field where the athletes were training. In small sided game game practices, the field lines are clearly drawn. Enough balls are placed on the sides of the field and inside the goal in order to prevent the game from stopping and to minimize the loss of time during the practice of the small sided game game. The offside rule was not applied during the games (Brandes et al., 2012; Acquas et al., 2002; Castellano et al., 2012).

Measurement of Heart Rate

Heart rate (HR) data of the participants were recorded at 5-second intervals using a heart rate monitor (RS 800, Polar Vantage NV, Polar Electro Oy, Finland) before, during, and after the small-sided games. Prior to the session, the chest strap of the monitor was placed on the participant’s chest, and HR data were recorded through the device."

Determination of Blood Lactate Concentration

Subjects' blood lactate concentrations were determined with a portable lactate analyzer (Lactate Scout, SensLab, Leipzig, Germany) before each small sided game, between sets and at the end of the sets. Blood samples were taken from the finger tip (Rebecca et al., 2010).

Small Sided Games Analysis

Both small sided game were recorded simultaneously with 2 digital cameras. The cameras are approximately at a height of 5 m.and 10m.distance from the corner points located on the same side of both goals and are placed on fixed tripods located parallel to the playing field.

Computer-aided mathball match analysis software program (Algorithm Information Processing Co.Ltd.)

was used in order to have a better reach to the desired positions in small sided games, to evaluate the actions in a short time and to classify the analysis criteria. Actions in small sided games were examined with the computerized notation technique. Technical actions of each player are calculated in 8 categories and classified into 8 categories: Goal kick, number of passes, positive pass, negative pass, ball win, dribbling, tackle and ball possesion time. The notation analysis of the video recordings was carried out by 2 researchers and 2 times each. The average of 4 measurements was used in the evaluation (Fanchini et al., 2011).

Findings

Table 1. Descriptive Information of Subjects

	Control		Placebo		Caffeine	
Variables	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**
Age (years)	21.70	2.45	21.80	1.32	21.90	2.56
Height (cm)	1.75	0.06	1.76	0.03	1.76	0.07
Body Weight.(kg)	68.40	2.80	69.10	2.92	68.70	3.13
Sports Exp.(years)	6.40	2.54	6.20	1.55	6.80	2.62

Table 2. Comparison of Heart Rate Between Sets

Groups	Measurements	Mean Rank	Chi - Square	sd	p	Significant Difference.
Control						
Beginning	1.20	26.160	3	0.000*	B-Set 1, B-Set 2, B-Set 3, Set 1-Set 2, Set 1-Set 3	Beginning Set
Set 1	1.80					
Set 2	3.20					
Set 3	3.80					
Placebo						
Beginning	1.00	23.716	3	0.000*	B-Set 1, B-Set 2, B-Set 3, Set 2-Set 3	Beginning Set
Set 1	2.55					
Set 2	2.75					
Set 3	3.70					
Caffeine						
Beginning	1.00	21.990	3	0.000*	B-Set 1, B-Set 2, B-Set 3	Beginning Set
Set 1	2.45					
Set 2	3.05					
Set 3	3.50					

p<0.05

Table 2 shows the comparison of the mean HR according to the sets during the narrow field games applied in each of the 3 research groups. It was found that the baseline mean HR of the control group was significantly lower than Set 1, Set 2 and Set 3, and Set 1 was significantly lower than Set 2 and Set 3. In the placebo group, it was determined that there was a statistically significant difference between baseline and sets. As a result of pairwise comparisons, it was determined that baseline HR was lower than Set 1, Set 2 and Set 3, and Set 2 was lower than Set 3. In the caffeine group, HR was found to differ between baseline and sets. When the source of the difference was analysed, baseline HR was significantly lower than Set 1, Set 2 and Set 3. When BL levels during small sided games were analysed, it was found that the initial BL level of the control group was significantly lower than Set 1, Set 2 and Set 3, Set 1 was lower than Set 2 and Set 3, and Set 2 was lower than Set 3. In the placebo group, the BL level measured at the end of Set 1, Set 2 and Set 3 was higher than the baseline level, and the BL level of Set 2 was higher than Set 1. In the caffeine group, it was determined that the BL level measured at the end of Set 1, Set 2 and Set 3 was higher than the baseline level, and the BL level of Set 1 was higher than Set 2 and Set 3.

Table 3. Comparison of Blood Lactate Level Between Sets

Groups	Mean Rank	Chi -Square	sd	Significant Difference
Control				
Beginning	1.20	26.160	0.000*	B-Set 1, B-Set 2, B-Set 3, Set 1-Set 2, Set 1-Set 3, Set 2-Set 3
Set 1	2.00			
Set 2	3.10			
Set 3	3.70			
Placebo				
Beginning	1.20	16.394	0.001*	B-Set 1, B-Set 2, B-Set 3, Set 1-Set 2
Set 1	2.45			
Set 2	3.40			
Set 3	2.95			
Caffeine				
Beginning	1.10	18.888	0.000*	B-Set 1, B-Set 2, B-Set 3, Set 1-Set 2, Set 1-Set 3
Set 1	3.50			
Set 2	2.55			
Set 3	2.85			

$p<0.05$

Table 4. Comparison of Mean HR and BL Levels Between Control, Placebo and Caffeine Groups

Variables	Groups	Mean Rank	Chi-Square	p	Significant Difference
Mean HR	Kontrol	11.65	7.387	0.025*	K-KF, P-KF
	Plasebo	13.25			
	Kafein	21.60			
Mean LA	Kontrol	18.90	7.588	0.023*	K-P
	Plasebo	9.25			
	Kafein	18.35			

$p<0.05$ Mean HR: Mean Heart Rate, Mean BL: Mean Blood Lactate Levels, C-CF: Control and Caffeine, P-CF: Placebo ve Caffeine C-P: Control and Placebo

When the mean of the 3 sets applied in small-sided games was taken; it was determined that the BL level measured in the Caffeine group was higher than the Control and Placebo groups. It was determined that the BL level of the Placebo group was significantly lower than the Control group.

Football-specific technical actions obtained during the small sided games in the control group were presented. It was determined that the number of positive passes made in Set 3 was lower than in Set 1 and Set 2, and similarly, the total number of passes made in Set 3 was lower than in Set 1 and Set 2. football-specific technical actions obtained during small sided games played with caffeine supplementation are presented. As a result of repeated measures comparison, it was observed that goal kick, positive pass, negative pass, dribbling, winning the ball, tackle and possession times were not significantly different between sets in the caffeine-free group. In the caffeine supplemented group, it was found that the total number of passes during the narrow field game differed significantly between the sets. It was determined that the difference was caused by set 1 and set 3 and the total number of passes made in set 1 was higher than set 3.

Table 5. Comparison of Football-Specific Technical Actions in the Small Sided Game Performed in the Control Group According to Sets

Variables	Sets	Mean Rank	Chi-Square	sd	p	Significant Difference
Goal Scored	Set 1	2.20	0.706	2	0.703	
	Set 2	1.90				
	Set 3	1.90				
Positive Passes	Set 1	2.50	7.128	2	0.028*	Set 1 – Set 3, Set 2 – Set 3
	Set 2	2.15				
	Set 3	1.35				
Negative Passes	Set 1	2.25	1.226	2	0.542	
	Set 2	1.90				
	Set 3	1.85				
Dribbling	Set 1	1.75	2.067	2	0.356	
	Set 2	2.30				
	Set 3	1.95				
Ball Win	Set 1	2.15	0.412	2	0.814	
	Set 2	1.90				
	Set 3	1.95				
Tackle	Set 1	1.95	0.788	2	0.674	
	Set 2	2.20				
	Set 3	1.85				
Ball Posseion Time	Set 1	2.10	0.154	2	0.926	
	Set 2	1.95				
	Set 3	1.95				
Number of Passes	Set 1	2.50	6.526	2	0.038*	Set 1 – Set 3. Set 2 – Set 3
	Set 2	2.10				
	Set 3	1.40				

$p<0.05$

Table 6. Comparison of Football-Specific Technical Actions in Small Sided Game Game Performed with Caffeine Supplement According to Sets

Variables	Sets	Mean Rank	Chi-Square	sd	p	Significant Difference
Goal Scored	Set 1	1.95	1.400	2	0.497	
	Set 2	1.80				
	Set 3	2.25				
Positive Passes	Set 1	2.30	5.684	2	0.058	
	Set 2	2.30				
	Set 3	1.40				
Negative Passes	Set 1	2.20	5.630	2	0.060	
	Set 2	2.30				
	Set 3	1.50				
Dribbling	Set 1	1.80	0.727	2	0.695	
	Set 2	2.10				
	Set 3	2.10				
Ball Win	Set 1	1.60	3.931	2	0.140	
	Set 2	2.05				
	Set 3	2.35				
Tackle	Set 1	2.00	0.000	2	1.000	
	Set 2	2.00				
	Set 3	2.00				
Ball Posseion Time	Set 1	2.00	0.200	2	0.905	
	Set 2	2.10				
	Set 3	1.90				
Number of Passes	Set 1	2.40	7.400	2	0.025*	Set 1-Set 3
	Set 2	2.30				
	Set 3	1.30				

$p<0.05$

The comparison of the 3rd sets of the technical actions of the small sided games applied under control, placebo and caffeine conditions was presented. Positive passing, dribbling, ball winning, tackle, time of possession and total number of passes were not significantly different. It was determined that the number of negative passes differed significantly between the groups and the number of negative passes of the caffeine group was less than the control group.

Table 7. Comparison of the 3rd Sets of Football-Specific Technical Actions in Small Sided Games Applied in The Study Groups

Variables	Groups	Mean Rank	Chi-Square	p	Significant Difference
Set 3 Goal Scored	Control	14.10	1.208	0.547	
Placebo	17.85				
Caffeine	14.55				
Set 3 Positive Passes	Control	11.50	3.276	0.194	
Placebo	18.30				
Caffeine	16.70				
Set 3 Negative Passes	Control	18.10	10.182	0.006*	C-CF. P-CF
Placebo	19.70				
Caffeine	8.70				
Set 3 Dribbling	Control	12.85	1.445	0.485	
Placebo	16.95				
Caffeine	16.70				
Set 3 Ball Win	Control	15.35	0.252	0.881	
Placebo	14.65				
Caffeine	16.50				
Set 3 Tackle	Control	18.65	2.506	0.286	
Placebo	13.50				
Caffeine	14.35				
Set 3 Ball Posseion Time	Control	13.00	1.264	0.532	
Placebo	17.20				
Caffeine	16.30				
Set 3 Number of Passes	Control l	11.85	3.611	0.164	
Placebo	19.30				
Caffeine	15.35				

p<0.05 C-CF: Control and Caffeine, P-CF: Placebo and Caffeine

Table 8. Comparison of the Totals of Football-Specific Technical Actions in Small Sided Games Applied in the Study Groups.

Variables	Groups	Mean	Std. Derivation	Mean Rank	Chi-Square	p	Significant Difference
Total Goal Scored	Control	2.60	1.07	16.70	1.131	0.568	
Placebo	3.20	2.35	16.65				
Caffeine	2.30	1.89	13.15				
Total Positive Passes	Control	54.10	13.71	9.80	6.337	0.042*	C-P, C-CF
Placebo	69.20	11.68	17.95				
Caffeine	75.60	25.65	18.75				
Total Negative Passes	Control	5.20	1.14	19.45	7.766	0.021*	C-CF
Placebo	5.80	3.79	17.75				
Caffeine	2.70	1.70	9.30				
Toplam	Control	5.00	3.71	13.65	0.943	0.624	
Dribbling	Placebo	5.90	4.33	15.40			
Caffeine	6.20	3.08	17.45				
Total Ball Wins	Control	3.90	2.13	17.15	0.679	0.712	
Placebo	3.80	2.82	15.40				
Caffeine	3.00	1.94	13.95				
Total Tackles	Control	3.50	1.78	21.60	8.170	0.017*	C-P, C-CF
Placebo	1.70	0.82	12.95				
Caffeine	1.60	0.84	11.95				
Total Ball Possesion Time (sec)	Control	76.90	31.85	10.40	5.225	0.073	
Placebo	116.0	34.56	18.90				
Caffeine	106.1	39.32	17.20				
Total Number of Passes	Control	59.10	13.93	9.75	6.457	0.040*	C-P
Placebo	75.90	10.89	18.80				
Caffeine	78.80	26.83	17.95				

p<0.05 C-P: Control and Placebo, C-CF: Control and Caffeine

The total of the technical actions in the small sided games applied to the Control, Placebo and Caffeine groups and their comparison according to the groups are presented. It was determined that the total number of

positive passes in the Placebo and Caffeine groups was higher than the Control group. It was determined that the total number of negative passes performed in the caffeine group was less than the control group. It was determined that the total number of double tackles in the Control group was higher than the Placebo and Caffeine groups. It was determined that the control group had less total passes than the placebo group.

Discussion and Conclusion

This study aims to identify the effects of caffeine intake on certain technical actions and physiological parameters during small-sided games in football. The physiological parameters examined are heart rate (HR) and perceived exertion (RPE), while the technical actions include shooting, successful passes, erroneous passes, dribbling, ball recovery, duels, and ball possession time. In the control group, a significant difference in heart rate (HR) was observed when comparing repeated measurements. The baseline HR was significantly lower than in set 1, set 2, and set 3, with set 1 showing significantly lower HR than set 2 and set 3. Caffeine has been shown to enhance endurance during prolonged and high-intensity exercise, positively influencing performance during exercise (Spriet, 2014). In the placebo (PL) group, a statistically significant difference in HR was also found between the baseline and the sets during small-sided games, with the baseline HR being lower than in sets 1, 2, and 3. Similarly, the HR in the caffeine group displayed a statistically significant difference between the baseline and the sets, with the baseline HR being significantly lower than in sets 1, 2, and 3. Caffeine has been shown to improve endurance tests and match performance in football players, with studies indicating that caffeine intake enhances running performance and anaerobic capacity (Chtourou & Souissi, 2012). When examining RPE levels during small-sided games, a statistically significant difference was found in repeated measurements within the control group. During exercise, caffeine consumption increases fat oxidation, enhancing energy supply and combating fatigue in football matches (Jeukendrup, 2004). The baseline RPE in the control group was significantly lower than in sets 1, 2, and 3, with set 1 being lower than sets 2 and 3, and set 2 lower than set 3.In the placebo (PL) group, a significant difference was observed between the baseline and sets, with RPE levels measured at the end of sets 1, 2, and 3 being higher than the baseline level. Caffeine intake has been found to reduce perceived difficulty during exercise, contributing to enhanced exercise performance (Hodgson et al., 2013). Similarly, in the caffeine group, a significant difference in RPE levels was noted between the baseline and sets, with RPE levels measured at the end of sets 1, 2, and 3 being higher than the baseline level. Set 1 RPE was higher than in sets 2 and 3. Caffeine can reduce fatigue levels and speed up recovery times for football players (Cox et al., 2002). Comparing HR and RPE levels across the control, placebo, and caffeine groups during small-sided games revealed a statistically significant difference in baseline HR across the study groups. The control group showed a lower average HR than the placebo (PL) and caffeine groups, with the placebo (PL) group showing a lower average HR than the caffeine group. Individuals with higher caffeine sensitivity may benefit more from these effects, as individual responses to caffeine can vary and affect perceived exertion levels (Mancini et al., 2013). In set 1, a significant difference was found between the groups, with the caffeine group having a higher HR than the control group. Comparisons between the study groups also revealed a significant difference in HR at set 3, with the caffeine group having a significantly higher HR than the control and placebo (PL) groups. Caffeine can help reduce feelings of fatigue and increase alertness, supporting football players in maintaining energy during prolonged training and matches. In both small-sided game field sizes (26m x 34m and 34m x 26m), HR and RPE scores increased, but no differences were observed between the two field sizes (Arguz et al., 2023). No statistically significant difference was observed in baseline HR across the study groups. However, in set 1, a significant difference was found between the groups in RPE levels, with the caffeine group having higher RPE levels than the control and placebo (PL) groups. Caffeine enhances performance during short, high-intensity exercises, such as sprints and dribbling (Winger et al., 2016). The percent of maximal heart rate (% HRmax), blood lactate concentration (LA) and Rated Perceived Exertion (RPE) scale points were collected before the SSGs and at the end of each set. . Significant differences were found between% HRmax in before SSG and 1st set, 2nd set, and 3rd set in both SSG with 3 min recovery duration and SSG with 5 min recovery durati (Aktaş et al., 2014). Comparisons between the groups also showed a significant difference in RPE levels at set 3, with the control group having higher RPE levels than the caffeine and placebo (PL) groups. When the average RPE levels of the three sets in small-sided games were compared, a statistically significant difference was found between the study groups. The HR measured in the caffeine group was higher than in the control and placebo (PL) groups. An examination of the average RPE levels revealed that the placebo (PL) group's RPE levels were significantly lower than those of the control group. Caffeine intake has been shown to improve sprint performance in football players, leading to better results in short, high-intensity exercises (Kyle et al., 2018). While football players may be more sensitive to caffeine, not all individuals may experience the same effects. Individual differences and genetic factors can influence the effects of caffeine on performance (Grgic et al., 2019). A significant difference was found in the number of successful passes and total

passes between the repeated measurements. The number of successful passes made in set 3 was lower than in sets 1 and 2, and similarly, the total number of passes made in set 3 was lower than in sets 1 and 2. A study conducted with different field formats (30x20m, 40x30m, and 50x40m) reported that changes in field size led to more technical actions in small-sided games (Hodgson et al., 2014). Comparisons of measurements revealed no significant difference in goals, successful passes, erroneous passes, dribbling, ball recovery, duels, or ball possession time between the sets in the group without caffeine. Caffeine enhances muscle contractions by stimulating the nervous system, supporting football players in making powerful and effective shots, duels, and quick movements (Grgic, 2018). However, in the group with caffeine supplementation, a significant difference was found in the total number of passes made during the small-sided game between the sets. This difference was attributed to sets 1 and 3, with the total number of passes in set 1 being higher than in set 3. No significant difference was found between successful passes, dribbling, ball recovery, duels, ball possession time, and total passes. In small-sided games, more dribbling, duels, and shots on goal occur, while larger field games increase the number of passes and technical actions like kick-off and long passes in medium and large fields (Eniseler, 2018).

Caffeine has been shown to improve football players' technical skills (shooting and passing), with the stimulating effect of caffeine on the nervous system enhancing focus and attention, leading to improved technical skills (Martins,et al., 2020). Furthermore, the number of erroneous passes significantly differed between the groups, with the caffeine group having fewer erroneous passes than the control group. The total number of successful passes in the placebo (PL) and caffeine groups was higher than in the control group. The total number of erroneous passes also differed between the groups, with the caffeine group having fewer erroneous passes than the control group. A study reported that caffeine intake improved football players' successful passing and shooting quality (Gordon et al., 2010). In conclusion, caffeine improves football players' performance during small-sided games and reduces perceived exertion (RPE) during exercise. These findings suggest that caffeine may be an effective strategy to optimize football players' training and match performance. Based on the findings obtained in this study, it was observed that caffeine supplementation administered at appropriate doses before training or competition had positive effects on both physiological and technical performance in football players. In this context, coaches may strategically use controlled caffeine supplementation, particularly before matches, to enhance passing performance and in-game effectiveness. Similar studies conducted on different age groups, female athletes, or in various sports branches may provide more comprehensive insights into the effects of caffeine on athletic performance. It is also recommended.

Financial Support

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare that there is no conflict of interest regarding this article.

Ethical Approval

The study was approved by the decision of Karamanoğlu Mehmetbey University Ethics Committee dated 06.06.2023 and numbered 11-158-162. The study was conducted in accordance with the Declaration of Helsinki.

Authors' Contribution

Study Design: FG, HNÇ
Data Collection: FG, HNÇ
Statistical Analysis: FG, HNÇ
Manuscript Preparation: FG, HNÇ
Funding Acquisition: FG, HNÇ

References

Acquas, E., Tanda, G., & Di Chiara, G. (2002). Differential effects of caffeine on dopamine and acetylcholine transmission in brain areas of drug-naive and caffeine-pretreated rats. *Neuropsychopharmacology,* 27(2), 182–193.

Aktas, S., Erkmen, N., Guven, F., & Taskin, H. (2014). Effects of the different recovery durations on some physiological parameters during 3 x 3 small-sided games in soccer. *International Journal of Sport and Health Sciences,* 8(12), 134-139.

Anderson, C., & Horne, J. (2006). A high sugar content, low caffeine drink does not alleviate sleepiness but may worsen it. *Human Psychopharmacology: Clinical and Experimental, 21*(5), 299–303.

Arguz, A., Güven, F., & Erkmen, N. (2023). The effect of the depth and width of pitch sizes in small-sided games on physiological parameters and technical actions in football. *Spormetre: The Journal of Physical Education and Sport Sciences, 21*(4), 114–120.

Brandes, M., Heitmann, A., & Müller, L. (2012). Physical responses of different small-sided game formats in elite youth soccer players. *Journal of Strength and Conditioning Research, 26*(5), 1353–1360.

Brian, D., Keisler, M. D., Thomas, D., & Armsey, M. D. (2006). Caffeine as an ergogenic aid. *Current Sports Medicine Reports, 5*(4), 215–219.

Burke, L. M. (2008). Caffeine and sports performance. *Applied Physiology, Nutrition, and Metabolism, 33*(6), 1319–1334.

Casamichana, D., & Castellano, J. (2010). Time-motion, heart rate, perceptual and motor behaviour demands in small-sided soccer games: Effects of pitch size. *Journal of Sports Sciences, 28*(14), 1615–1623.

Castellano, J., Casamichana, D., & Dellal, A. (2012). Influence of game format and number of players on heart rate responses and physical demands in small-sided soccer games. *Journal of Strength and Conditioning Research*. Advance online publication. https://doi.org/10.1519/JSC.0b013e318267a5d1

Chamari, K., Hachana, Y., Kaouech, F., Jeddi, R., Moussa-Chamari, I., & Wisloff, U. (2005). Endurance training and testing with the ball in young elite soccer players. *British Journal of Sports Medicine, 39*(1), 24–28.

Chtourou, H., & Souissi, N. (2012). The effect of training and overtraining on hormonal and immunological parameters in athletes. *Journal of Sports Science and Medicine, 11*(4), 213–222.

Davis, J. K., & Green, J. M. (2010). Caffeine and anaerobic performance: Ergogenic value and mechanisms of action. *Sports Medicine, 39*(10), 813–832.

De Pauw, K., Roelands, B., Van Cutsem, J., Marusic, U., Torbeyns, T., & Meeusen, R. (2017). Electro-physiological changes in the brain induced by caffeine or glucose nasal spray. *Psychopharmacology, 234*(1), 53–62.

Dellal, A., Chamari, K., Owen, A. L., Wong, D. P., Lago-Penas, C., & Hill-Haas, S. (2011). Influence of technical instructions on the physiological and physical demands of small-sided soccer games. *European Journal of Sport Science, 11*(5), 341–346.

Drust, B., Reilly, T., & Cable, N. T. (2000). Physiological responses to laboratory-based soccer-specific intermittent and continuous exercise. *Journal of Sports Sciences, 18*(11), 885–892.

Eniseler, N. (2018). *Bilimin ışığında sınırlı alan oyunları*. Manisa, Turkey.

Fanchini, M., Azzalin, A., Castagna, C., Schena, F., McCall, A., & Impellizzeri, F. (2011). Effect of bout duration on exercise intensity and technical performance of small-sided games in soccer. *Journal of Strength and Conditioning Research, 25*(2), 453–458.

Foskett, A., Ali, A., & Gant, N. (2009). Caffeine enhances cognitive function and skill performance during simulated soccer activity. *International Journal of Sport Nutrition and Exercise Metabolism, 19*(4), 410–423.

Gabbett, T. J. (2005). Science of rugby league soccer: A review. *Journal of Sports Sciences, 23*(9), 961–976.

Gordon, L., Warren, Nicole, D., Park-Robert., D., Maresca, Kimberly I., McKibans, Melinda L Millard-Stafford. (2010). Effect of caffeine ingestion on muscular strength and endurance: a meta-analysis. Nationel Lıbrary of Medicine, 42(7):1375-87.

Greer, F., Morales, J., & Coles, M. (2006). Wingate performance and surface EMG frequency variables are not affected by caffeine ingestion. *Applied Physiology, Nutrition, and Metabolism, 31*(5), 597–603.

Grgic, J., Trexler, E. T., Lazinica, B., & Pedisic, Z. (2018). Effects of caffeine intake on muscle strength and power: A systematic review and meta-analysis. *Journal of the International Society of Sports Nutrition, 15*(1), 1–10.

Hadgson, C., Akenhead, R., & Thomas, K. (2014). Time-motion analysis of acceleration demands of 4v4 small sided soccer games played on different pitch sizes. *Human Movement Science, 33*, 25–32.

Hill-Haas, S., Coutts, A. J., Dawson, B. T., & Rowsell, G. K. (2010). Time motion characteristics and physiological responses of small-sided games in elite youth players: The influence of player number and rule changes. *Journal of Strength and Conditioning Research, 24*(8), 2140–2156.

Hodgson, A. B., Maughan, R. J., & Howard, A. (2013). Caffeine and exercise performance: A review. *Sports Medicine, 43*(6), 567–584.

Howard, M. A., & Marczinski, C. A. (2010). Acute effects of a glucose energy drink on behavioral control. *Experimental and Clinical Psychopharmacology, 18*(6), 553–561.

Impellizzeri, F. M., Marcora, S. M., Castagna, C., Reilly, T., Sassi, A., Iaia, F. M., & Rampinini, E. (2006). Physiological and performance effects of generic versus specific aerobic training in soccer players. *International Journal of Sports Medicine, 27*(6), 488–492.

Ivy, J. L., Kammer, L., Ding, Z., Wang, B., Bernard, J. R., Liao, Y. H., & Hwang, J. (2009). Improved cycling time-trial performance after ingestion of a caffeine energy drink. *International Journal of Sport Nutrition and Exercise Metabolism, 19*(1), 61–78.

Jeukendrup, A. (2004). Caffeine and sports performance. *Nutrition Reviews, 62*(6), 294–300.

Jones, S., & Drust, B. (2007). Physiological and technical demands of 4 vs. 4 and 8 vs. 8 in elite youth soccer players. *Kinesiology, 39*(2), 150–156.

Katis, A., & Kellis, E. (2009). Effects of small-sided games on physical conditioning and performance in young soccer players. *Journal of Sports Science and Medicine, 8*(3), 374–380.

Kyle, S., Kay, J., Rutherfurd-Markwick, Ajmol A. (2018). The Effect of Acute Caffeine Ingestion on Endurance Performance: A Systematic Review and Meta-Analysis. Nationel Lıbrary of Medicine, 48(8):1913-1928.

Mancini, J. S., & McCormick, R. J. (2013). The influence of caffeine on physical performance and perceived exertion. *Nutrition Reviews, 71*(2), 107–119.

Martins, GL., Guilherme JPLF., Ferreira LHB., Souza-Junior,TP. (2020). Caffeine and Exercise Performance: Possible Directions for Definitive Findings, *Frontiers İn Sport And Active Living*, (11) 2:574854.

McArdle, W. D., Katch, F. I., & Katch, V. L. (2007). *Exercise physiology: Energy, nutrition, & human performance* (6th ed.). Lippincott Williams & Wilkins.

McLellan, T. M., & Bell, D. G. (2013). Caffeine effects on physical performance: An update. *Journal of Strength and Conditioning Research, 27*(1), 158–167.

Nehls, N., & Thayer, J. F. (2008). Caffeine, mental performance, and fatigue: An overview. *Journal of Psychopharmacology, 22*(4), 297–306.

Pereira, L. A., Curti, J. O., Camata, T. V., Gonçalves, E. M., Leite, S. T., Costa, T. G., Gulak, A., Maia, G. B. M., Moraes, A. C., & Altimari, L. R. (2010). Caffeine does not change the anaerobic performance and rate of muscle fatigue in young men and women. *Medicina Sportiva, 14*(1), 67–72.

Reay, J. L., & Kennedy, D. O. (2005). The impact of caffeine on cognitive performance and fatigue during exercise. *Psychopharmacology, 177*(4), 273–280.

Rebecca, K., Tanner, R. K., Fuller, K. L., & Ross, M. L. R. (2010). Evaluation of three portable blood lactate analysers: Lactate Pro, Lactate Scout and Lactate Plus. *European Journal of Applied Physiology, 109*(3), 551–559.

Sainz, J. M., & Cabello, E. N. (2005). Biomechanical analysis of the load imposed on under-19 soccer players during some typical soccer training drills. In T. Reilly, J. Cabri, & D. Araújo (Eds.), *Science and Soccer V* (pp. 353–356). Routledge.