Journal of Physical Education and Sport ® (JPES), Vol. 22 (issue 1), Art 11, pp. 91 - 99, January 2022
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Analysis of goal scoring and performance indicators in the 2020-2021 Greek soccer league

ANDREAS STAFYLIDIS[1], YIANNIS MICHAILIDIS[2], ATHANASIOS MANDROUKAS[3], IOANNIS GISSIS[4], THOMAS METAXAS[5]
[1,4]Department of Physical Education and Sports Sciences, Aristotle University of Thessaloniki, Serres, GREECE
[2,3,5]Department of Physical Education and Sports Sciences, Aristotle University of Thessaloniki, Thessaloniki, GREECE

Published online: January 31, 2022
(Accepted for publication January 15, 2022)
DOI:10.7752/jpes.2022.01011

Abstract:
Problem Statement: Goals scored from open play or set play and performance indicators in soccer have been mostly investigated separately. **Purpose:** The present study aimed to analyze game-related performance indicators and goals scored from set play and open play, in the 2020-2021 Greek soccer league. **Methods:** In total, 140 goals scored from open play and 82 from set play (222 goals) were analyzed. The analysis of performance indicators and goals has been conducted using data from all 91 matches of the first round in the 2020-2021 Greek Soccer League. **Results:** Statistically significant differences ($p < 0.05$) were observed in goal scoring from open play (63.06%) and set play. During the 2nd half of the game 61.71% of goals were achieved. The fewest goals (9.01%) were scored during the first 15 minutes of the game, whereas most goals (30.63%) were scored during the last 15 minutes (75-90+'). Statistically significant ($p < 0.05$) lower averages were found in the game-related performance indicators of the winning teams in the defensive game and higher in the offensive compared to drawing teams and losing ones. Significant differences ($p < 0.05$) were also observed in the performance indicators in the offensive game (ball possession%, corners, total shots and shots on target) and in the defensive game (red cards, total shots and shots on target received). Furthermore, home advantage had an impact on game-related statistics, while achieving the first goal is essential for the teams' success. **Conclusions:** It is crucial for the teams' success to score the first goal in the match, while players should be prepared by the coaching staff to cope better with fatigue in the last minutes of the game, as well as to be more effective in set play.
Key Words: **match analysis, soccer, goal scoring, performance indicators, soccer match-related statistics**

Introduction

Performance analysis in soccer provides accurate, clear and objective data to players and coaches to improve and maximize team performance (McGarry, 2009). Match analysis refers to notational analysis by recoding the actions of individuals or teams, in terms of their athletic behaviour and level of performance, while emphasizing that the behaviour of an athlete is the result of many and complex procedures (Hughes, 2003; James, 2006; McGarry & Franks, 2003). However, recording a repetitive pattern-behaviour can be a critical and determining factor in athletic success (McGarry & Franks, 2003). The introduction of digital technology has changed the analysis of performance. The advent of digital cameras and ever-evolving commercial interactive analytics software is nowadays an important part of the performance analysis and the coaching process in soccer (Hughes, 2004). Several researchers have dealt with the goal-scoring analysis in various events, e.g., the Soccer World Cup (Castañer et al., 2016; Njororai, 2013; Smith & Lyons, 2017), the Women's World Cup (Wang & Qin, 2020), the European Soccer Championship (Michailidis et al., 2013b; Smith & Bedwell, 2021), the UEFA Champions League (Michailidis et al., 2018) and the national Soccer Leagues of various European countries (Bamplekis et al., 2021, Carpita & Golia, 2020; González-Ródenas et al., 2020; Papadopoulos et al., 2021; Sarkar & Chakraborty, 2018; Taylor et al., 2005). Differences have been noted in the way goals are scored from open play and set play, but also in the style of play among the Championships of different European countries, such as Italy and Spain (Papadopoulos et al., 2021). Therefore, there is an interest in the analysis of goal scoring of the various national Championships.

In particular, most goals are scored from open play rather than set play (Armatas & Yiannakos, 2010; Michailidis et al., 2018; Michailidis et al., 2013a; Michailidis et al., 2013b; Mitrotasios & Armatas, 2014; Njororai, 2013; Njororai, 2004; Tousios et al., 2018; Yiannakos & Armatas, 2006), while there are also differences in the style of play (Mundstock et al., 2021; Papadopoulos et al., 2021), e.g., Spanish teams build up their offensive game mainly on a combination game, whereas the Italian teams have a defensive style of play and score mainly from set play (Papadopoulos et al., 2021). Additionally, several researches indicated the effect of the first goal in the final result of the match (Michailidis, 2014; Michailidis et al., 2013b; Mitrotasios & Armatas,

Corresponding Author: ANDREAS STAFYLIDIS, E-mail: stafylid@phed-sr.auth.gr

2014; Tousios et al., 2018), likewise for the Greek Soccer League (Armatas et al., 2009a). Moreover, many studies examined the time period of the game, in which goals were achieved (Armatas et al., 2009a; Armatas & Yiannakos, 2010; Michailidis et al., 2018; Mitrotasios & Armatas, 2014; Njororai, 2013; Njororai 2004; Yiannakos & Armatas, 2006). The majority of goals was scored during the 2nd half of the match and particularly during the last 15 minutes (Armatas et al., 2009a; Michailidis et al., 2018; Mitrotasios & Armatas, 2014; Njororai, 2013; Njororai 2004; Yiannakos & Armatas, 2006). The home advantage did not have a significant impact on the final result of the games in some soccer competitions (Michailidis et al., 2013a), while on the other hand some researches mentioned that home teams regained possession of the ball nearer to the offensive third (Almeida et al., 2014), had greater number of shots inside the penalty area (Armatas & Pollard, 2014) and better performance in ball possession, goals scored from set play and fouls committed (Gómez et al., 2018). Moreover, teams' performance could also be affected by home teams' fans (Nevill & Holder, 1999).

Performance indicators refer to the selection of one and / or more variables that define certain aspects of performance and contribute to success (Hughes & Bartlett, 2002). Performance indicators and game-related statistics could be used from coaches, teams and players to maximize performance (O' Donoghue, 2005). As far as the offensive play is concerned, the successful teams had better statistics in goals scored, total shots (on target), ball possession and offsides (Bekris et al., 2013; Castellano, Casamichana & Lago, 2012; Harrop & Nevill, 2014; Vogelbein et al., 2014; Zhou et al., 2018), while in the defensive game the successful teams had better statistics in total shots received and shots received on target, likewise in red cards, rather than the unsuccessful ones (Castellano et al., 2012; Lago-Peñas et al., 2010). Most studies investigated the goals scored from open play - set play and performance indicators separately. Furthermore, the Greek Soccer League has not been analyzed deeply. The present study aimed to analyze the way of goal scoring from set play and open play, as well as the game-related performance indicators in the defensive and the offensive game in the 2020-2021 Greek soccer league.

Material & methods

Sample

For the analysis of performance indicators and goals all 91 matches of the first round in the 2020-2021 Greek soccer league (Super League Interwetten) were analyzed, in which 222 goals were scored.

Analysis procedure

All matches and game-related statistics presented and analyzed in the present work were collected from the platform-website Wyscout (https://wyscout.com), through Hudl. This platform has been used by researchers in the past in similar research processes (Beaudouin et al., 2019; Bransen et al., 2019; Della Villa et al., 2020; Gonzalez-Rodenas et al., 2015, 2017, 2019; Martín-González et al., 2017; Pappalardo et al., 2019).

The variables analyzed were:

- Total goals scored by each team.
- Total goals scored from open play (combination, cross, cutbacks, diagonals, forward pass, run with ball, long shots, own goal, after goalkeeper's/player's deflection-rebound, defensive errors).
- Total goals scored from set play (corner, foul, penalty).
- Goals scored in the 1st and in the 2nd half.
- Time in minutes of goals scored (0'-15', 15'-30', 30'-45', 45'-60', 60'-75', 75'-90'+ min.).
- The impact of scoring the first goal in the final result of the game.
- The location of game for each team (home / away).
- The teams' ranking in the first round (ranking position leading to play-off / ranking position leading to play-out).
- Variables related to the offensive game (number of goals scored in each match, ball possession, total shots, shots on target, shots off-target, offsides attributed, fouls and corners pro).
- Variables related to the defensive game (number of goals conceded in each match, total shots received, shots on and off-target target received, offsides attributed to the opponent, fouls and corners in favor of the opponent, yellow and red cards).

Statistical Analysis

The effect size calculation (ES) and statistical power were performed with G*Power software: Statistical Power Analyzes for Windows, Version 3.1.9.7 (Faul et al., 2007; Faul et al., 2009), according to Cohen's criteria (Cohen 1992, 2013). The analysis before conducting the research for *ES* (medium) = 0.25, alpha = 0.05 and expected statistical power, power ≥ 0.80, resulted in the requirement for sample collection N = 158, which could be achieved by the analysis of 79 games (79 games × 2 teams = 158). Finally, all the matches of the first round were analyzed (91 matches × 2 teams, $N = 182$) for the sample to be sufficient for the main objective of the present study and to allow further statistical analyses.

All the data were analyzed with the software IBM SPSS Statistics for Windows, Version 25.0, IBM Corp, (SPSS, 2018). The goal scoring analysis was repeated three weeks after the initial analysis by the same observer, as in similar studies (Vogelbein et al., 2014) and the intra-rater reliability was satisfactory (Cronbach's $\alpha = 0.979$). Differences between the way of scoring goals from set play and open play were investigated with

Chi-square (χ^2) goodness of fit test. Respectively, the impact of the first goal and the home advantage on the final result of the match were investigated with Chi-square (χ^2) goodness of fit tests. The achievement of goals according to the ranking of each team was investigated with Chi-square (χ^2) test of independence. In addition, One-Way Anova analysis was applied to ball possession, that followed a normal distribution, while non-parametric statistical tests (Kruskal Wallis H.) were applied for the rest game-related statistics in relation to final result of the matches (win, draw, lose). Parametric statistical tests (T-Tests) were applied for the relation between ball possession and the home advantage followed by normal distribution and non-parametric statistical tests (Mann-Whitney U) for the rest game-related statistics, which were not followed by a normal distribution. Teams' ranking and statistical performance indicators of offensive and defensive game were analyzed with parametric statistical tests (T-Tests) for ball possession which was followed by a normal distribution and non-parametric statistical tests (Mann-Whitney U) for the other variables. The statistical significance was set at $p < 0.05$.

Results

A total of 222 goals were scored in 91 matches ($M = 2.44$ goals/match). Of the 222, 140 were scored from open play and 82 from set play $\chi^2(1, N = 222) = 15.15$, $p < 0.001$ (Figure 1A & Table 1). No significant differences were noted between goals scored from set play and open play in relation to the teams' ranking $\chi^2(1, N = 222) = 2.76$, $p > 0.05$ (Table 1 & Figure 1B).

Table 1. Statistical tests for the achievement of the goals and the impact of home advantage and first goal in the final result of the match.

	N	χ^2	*df*	*p*
Differences in the way goals were scored from open play and set play.[1]	222	15.15	1	0.001*
Differences in the way goals were scored from open play and set play depending on teams' ranking. [2]	222	2.76	1	0.09
Differences in the way goals were scored from open play. [1]	140	73.00	9	0.001*
Differences in the way goals were scored from set play. [1]	82	10.56	2	0.005*
Differences in goals scored per half time. [1]	222	12.18	1	0.001*
Differences in goals scored per 15min. [1]	222	36.43	5	0.001*
Impact of first goal on the final result of the match. [1]	91	40.50	2	0.001*
Impact of home advantage on the final result of the match. [1]	91	0.95	2	0.62

*$p < 0.05$
[1] χ^2 goodness of fit test
[2] χ^2 test of independence

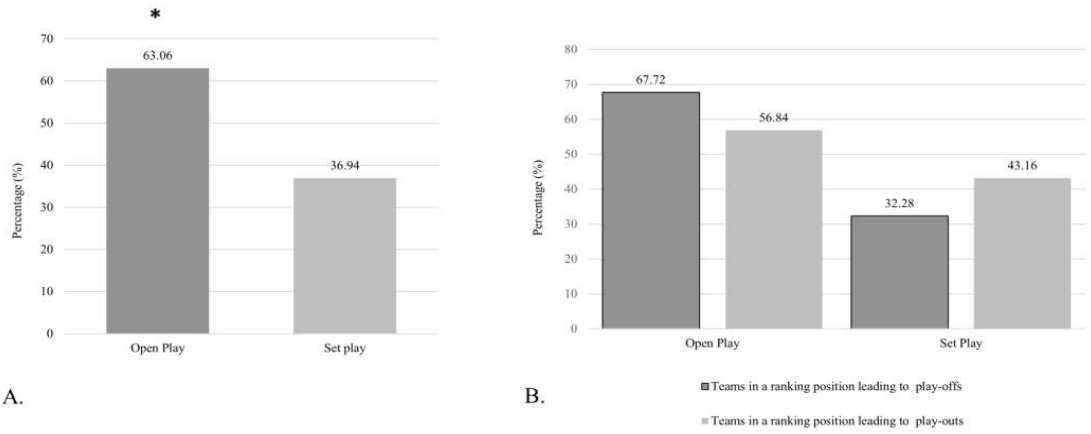

Fig. 1. A. Percentage of goals scored from set play and open play. B. Percentage of goals scored from set play and open play in relation to teams' ranking. ($p < 0.001$)

Statistical analysis indicated significant differences in goal scoring from open play $\chi^2(9, N = 140) = 73.00$, $p < 0.001$, where most goals were scored after crosses (27.86%) and in set play $\chi^2(2, N = 82) = 10.56$, $p < 0.05$, where the majority of the goals (47.56%) was scored after penalties (Table 1 & Figure 2).

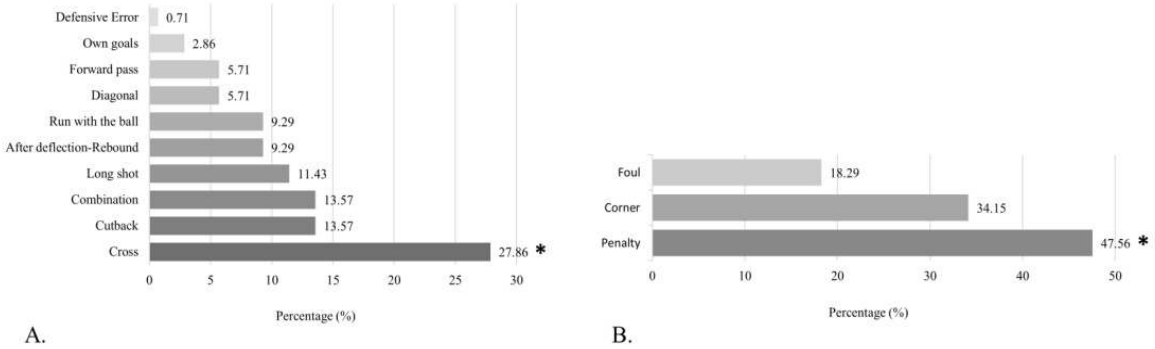

Fig. 2. Percentage of goals scored from: A. open play ($p < 0.001$) B. set play. ($p < 0.05$)

Significant differences were also found by the statistical analysis in goals scored per half time $\chi^2(1, N = 222) = 12.18$, $p < 0.001$, (Table 1 & Figure 3A). The majority of goals (137) was scored during the 2nd half, while 85 goals were scored during the 1st half of the game (Figure 3A). Significant differences were also identified regarding the goals scored per 15min of play χ^2 (5, $N = 222$) = 36.43, $p < 0.001$ (Table 1 and Figure 3B). Most goals were scored in the last 15' minutes (75'-90'+ min.), while the fewest in the first 15' minutes (0'-15' min.) of the game (Table 1 & Figure 3B).

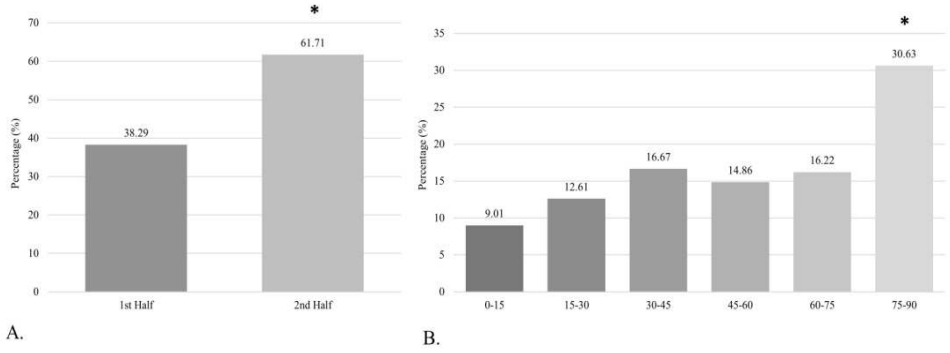

Fig. 3. Percentage of goals scored per: A. half time B. 15' min. ($p < 0.001$)

Statistical analysis also indicated a significant impact of the first goal in the final result of the match χ^2 (2, $N = 91$) = 40.50, $p < 0.001$ (Table 1). Most teams (62.64%) that scored the first goal, ended up winning the match (Figure 4A). However, the final result of the match did not get affected by the home advantage $\chi^2(2, N = 91) = 0.95$, $p>0.05$ (Table 1 & Figure 4B).

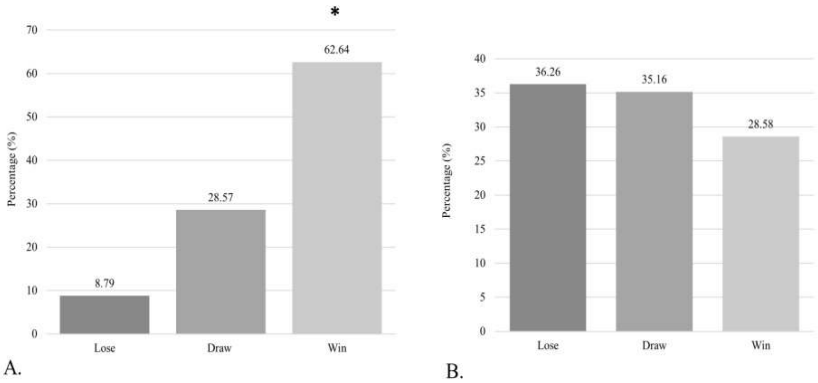

Fig. 4. A. Impact of first goal on the final result of the match. B. Impact of home advantage on the final result of the match. ($p < 0.001$)

From the statistical tests that were applied (parametric and non-parametric), significant differences were noted between the teams (winners, draws, losers) in relation to the offensive and defensive game. Statistically significant differences were noted in ball possession and goals scored, corners pro, total shots, shots on target, conceded goals, red cards, total shots received and shots on target received (Table 2).

Table 2. Results of parametric (One-way-ANOVA) and non-parametric (Kruskal Wallis H.) statistical tests, means, standard deviations and median for the indicators of the offensive and the defensive game.

Variables for Offensive Game	Win (n = 65)		Draw (n = 52)		Lose (n = 65)		*Test Statistic*	*p*	*ES*
	M–SD	*Md*	*M–SD*	*Md*	*M–SD*	*Md*			
Goals Scored[1]	2.09±1.07	2.0	1.15±0.83	1.0	0.40±0.58	0.0	χ^2=86.24	0.001*†‡	ε^2=0.48
Total Shots[1]	11.48±4.65	11.0	9.58±3.96	9.0	8.02±3.45	7.0	χ^2=20.88	0.001*†‡	ε^2=0.12
Shots on target[1]	5.18±2.57	5.0	3.69±2.05	3.0	2.49±1.69	2.0	χ^2=42.46	0.001*†‡	ε^2=0.23
Shots off-target[1]	6.29±3.03	6.0	5.88±3.01	5.5	5.52±2.69	5.0	χ^2=1.87	0.40	ε^2=0.01
Ball possession[2](%)	52.32±8.31	52.7	50.00±8.74	50.0	47.68±8.31	47.3	F=4.91	0.008†	ηp^2=0.05
Offsides Committed[1]	1.68±1.41	1.0	1.83±1.47	2.0	1.68±1.31	2.0	χ^2=0.32	0.85	ε^2=0.01
Corners[1]	4.88±2.86	5.0	4.62±3.04	4.0	3.66±2.39	3.0	χ^2=6.31	0.04†	ε^2=0.03
Foulds[1]	17.32±4.66	17.0	18.75±4.74	18.5	18.71±4.66	18.0	χ^2=2.63	0.27	ε^2=0.1
Variables for Defensive Game									
Conceded goals[1]	0.40±0.58	0.0	1.15±0.83	1.0	2.09±1.07	3.0	χ^2=86.24	0.001*†‡	ε^2=0.48
Total shotsreceived[1]	8.02±3.45	7.0	9.58±3.96	9.0	11.48±4.65	11.0	χ^2=20.88	0.001*†‡	ε^2=0.12
Shots on target received[1]	2.49±1.69	2.0	3.69±2.05	3.0	5.18±2.57	5.0	χ^2=42.46	0.001*†‡	ε^2=0.23
Shots off-target received[1]	5.52±2.69	5.0	5.88±3.01	5.5	6.29±3.03	6.0	χ^2=1.87	0.40	ε^2=0.01
Offsides[1]	1.68±1.41	2.0	1.83±1.47	2.0	1.68±1.31	1.0	χ^2=0.32	0.85	ε^2=0.01
Corners[1]	3.75±2.39	3.0	4.62±3.04	4.0	4.78±2.89	5.0	χ^2=4.28	0.12	ε^2=0.02
Fouls[1]	18.71±4.66	18.0	18.75±4.74	18.5	17.32±4.66	17.0	χ^2=2.63	0.27	ε^2=0.01
Yellow cards[1]	2.80±1.54	3.0	2.58±1.42	3.0	2.71±1.47	3.0	χ^2=0.31	0.86	ε^2=0.01
Red cards[1]	0.05±0.21	0.0	0.23±0.51	0.0	0.15±0.36	0.0	χ^2=6.41	0.04‡	ε^2=0.04

[1]Kruskal Wallis H. | [2]One-way-ANOVA
*Lose ≠ Draw. ($p < 0.05$) | †Lose ≠ Win. ($p < 0.05$) | ‡Draw ≠ Win. ($p < 0.05$)

Statistical analysis indicated significant differences in performance indicators (game-related statistics) of the defensive and offensive game depending on the location of the match -home advantage- (Table 3). Specifically, significant differences were observed between home and away teams in ball possession, total shots, shots off-target, total shots received and total shots off-target received.

Table 3. Results of parametric (T-test) and non-parametric (Mann-Whitney U) statistical tests, averages, standard deviations and median for the statistical performance indicators of the offensive and the defensive game depending on the location of the match (home / away).

Variables for Offensive Game	Home Teams (n = 91)		Away Teams (n = 91)		*Test Statistic*	*p*	*ES*
	M–SD	*Md*	*M–SD*	*Md*			
Goals Scored[1]	1.24±1.11	1.0	1.20±1.12	1.0	U=4038	0.76	r = 0.02
Total Shots[1]	10.54±4.69	9.0	8.86±3.68	9.0	U=3389	0.03*	r = 0.18
Shots on target[1]	4.04±2.63	3.0	3.55±2.16	3.0	U=3781	0.31	r = 0.09
Shots off-target[1]	6.49±3.21	6.0	5.31±2.44	5.0	U=3271	0.01*	r = 0.21
Ball possession[2](%)	51.60±8.49	50.9	48.40±8.49	49.1	t(180)=2.54	0.01*	d = 0.38
Offsides Committed[1]	1.70±1.40	2.0	1.74±1.38	2.0	U=4086	0.88	r = 0.01
Corners[1]	4.71±3.09	4.0	4.02±2.43	4.0	U=3664	0.18	r = 0.12
Foulds[1]	18.27±5.09	18.0	18.18±4.31	18.0	U=4055	0.82	r = 0.02
Variables for Defensive Game							
Conceded goals[1]	1.20±1.12	1.0	1.24±1.11	1.0	U=4038	0.76	r = 0.02
Total shots received[1]	8.86±3.68	9.0	10.54±4.69	9.0	U=3389	0.03*	r = 0.18
Shots on target received[1]	3.55±2.16	3.0	4.04±2.63	3.0	U=3781	0.31	r = 0.09
Shots off-target received[1]	5.31±2.44	5.0	6.49±3.21	6.0	U=3271	0.01*	r = 0.21
Offsides[1]	1.74±1.38	2.0	1.70±1.40	2.0	U=4086	0.88	r = 0.01
Corners[1]	3.96±2.43	4.0	4.78±3.07	4.0	U=3531	0.08	r = 0.15
Fouls[1]	18.18±4.31	18.0	18.27±5.09	18.0	U=4055	0.81	r = 0.02
Yellow cards[1]	2.69±1.43	3.0	2.71±1.53	3.0	U=4133	0.98	r = 0.01
Red cards[1]	0.15±0.42	0.0	0.12±0.33	0.0	U=4084	0.78	r = 0.01

[1]Mann-Whitney U | [2]T-test
$^{*}p < 0.05$

Regarding the performance indicators of the offensive and defensive game of the teams, depending on their place on the ranking table (ranking position leading to play-off / ranking position leading to play-out), significant dereferences were noted in goals scored, ball possession, total shots and shots on target, offsides committed, corners pro, fouls pro, conceded goals, total shots received, shots received on target and off-target, corners in favor of the opponent and red cards (Table 4).

Table 4. Results of parametric (T-test) and non-parametric (Mann-Whitney U) statistical tests, averages, standard deviations and median for the statistical performance indicators of the offensive and the defensive game depending on teams' ranking.

Variables for Offensive Game	Play-off Teams (n = 78)		Play-out Teams (n = 104)		*Test Statistic*	*p*	*ES*
	M–SD	*Md*	*M–SD*	*Md*			
Goals Scored[1]	1.63±1.23	1.0	0.91±0.90	1.0	U=2673	0.001*	r = 0.34
Total Shots[1]	11.10±4.69	10.0	8.64±3.66	8.0	U=2794	0.001*	r = 0.31
Shots on target[1]	4.79±2.58	4.0	3.05±1.99	2.5	U=2390	0.001*	r = 0.41
Shots off-target[1]	6.31±3.03	6.0	5.60±2.80	5.0	U=3522	0.13	r = 0.13
Ball possession[2](%)	53.59±8.24	54.4	47.31±7.91	48.0	t(180)=5.21	0.001*	d = 0.78
Offsides Committed[1]	1.99±1.48	2.0	1.52±1.29	1.0	U=3343	0.04*	r = 0.18
Corners[1]	5.22±2.93	5.0	3.73±2.52	3.0	U=2790	0.001*	r = 0.31
Foulds[1]	17.06±4.79	17.0	19.10±4.49	19.0	U=3060	0.005*	r = 0.25
Variables for Defensive Game							
Conceded goals[1]	0.79±0.78	1.0	1.54±1.21	1.0	U=2570	0.001*	r = 0.37
Total shots received[1]	8.01±3.03	8.0	10.96±4.66	10.0	U=2502	0.001*	r = 0.38
Shots on target received[1]	2.94±1.89	3.0	4.44±2.57	4.0	U=2640	0.001*	r = 0.35
Shots off-target received[1]	5.08±2.25	5.0	6.52±3.20	6.0	U=3008	0.003*	r = 0.26
Offsides[1]	1.86±1.26	2.0	1.62±1.48	1.0	U=3473	0.09	r = 0.14
Corners[1]	3.58±2.33	3.0	4.96±2.97	4.0	U=2933	0.001*	r = 0.28
Fouls[1]	18.17±4.10	18.0	18.27±5.13	18.0	U=4045	0.98	r = 0.01
Yellow cards[1]	2.59±1.56	2.5	2.79±1.41	3.0	U=3693	0.29	r = 0.09
Red cards[1]	0.08±0.31	0.0	0.18±0.41	0.0	U=3621	0.03*	r = 0.10

[1]Mann-Whitney U | [2]T-test
*$p < 0.05$

Discussion

The analysis indicated statistically significant differences between goals scored from set play and open play, where most of them were scored from open play. Significant differences were also observed in the way goals were scored from open play, where the majority of goals was scored after crosses. Similar differences were found in the achievement of goals from set play, where most of them were scored after a penalty kick. The goals were achieved to a greater extent from open play in relation to set play, as observed by other studies (Armatas & Yiannakos, 2010; Gonzalez-Rodenas et al., 2017; Michailidis et al., 2018; Mitrotasios & Armatas, 2014; Njororai, 2004; 2013; Tousios et al., 2018; Vergonis et al., 2019; Yiannakos & Armatas, 2006), while there are data from national team events that do not identify significant differences in goals scored from open play and set play (Hughes & Churchill, 2005).

No significant differences were found in the way goals were scored depending on the ranking position the team. However, on other European national Championships, Spanish teams base their offensive play mainly on combination play, while Italian teams show a variety of goal scoring patterns, scoring mainly from set play (Papadopoulos et al., 2021).

Significant differences were identified in the achievement of goals per half time, as well as per 15' minutes of play (0'-15', 15'-30', 30'-45', 45'-60', 60'-75', 75'-90'+ min.). Specifically, the majority of goals was scored in the 2nd half and more frequently in the last minutes (75'-90'+ min.) of the game, respectively. Several researchers refer to similar results for the achievement of goals to a statistically significant degree during the 2nd half and specifically during the last 15 minutes of the game (Mitrotasios & Armatas, 2014; Njororai, 2013; 2004). Similar results are observed in previous seasons of the Greek soccer league, where differences in the achievement of goals per half time were found, i.e., goals were scored during the 2nd half with higher frequency (Armatas et al., 2009b). On the other hand, there are researchers that report similar results for the Greek soccer league with no significant differences (Armatas et al., 2009a).

Regarding the impact of scoring the first goal on the final result of the match, a significant relation was found, as the achievement of the first goal led the respective team to win. Similar results were found on the

impact of scoring the first goal in the Greek soccer league (Armatas et al., 2009a; 2009b) as well as in other competitions (Mitrotasios & Armatas, 2014; Michailidis, 2014; Michailidis et al., 2013b; Tousios et al., 2018).

The analysis of the effect of ball possession percentage on the final result of the match, showed that the winning teams had higher ball possession rates than the losing ones. Similar analyses of European Championships (Hook & Hughes, 2001; Hughes & Franks, 2005) and World Cups (Castellano et al., 2012) indicated that successful-winning teams had longer possession time compared to unsuccessful ones. However, this particular relation was not observed in other studies (Stanhope, 2001).

The home advantage seems to have an impact on some statistical performance indicators of the offensive and the defensive game. Significant differences were observed in the statistical performance indicators of the offensive game in total shots, off-goal shots and ball possession, while in the Greek soccer league the home advantage was found to have a significant impact on ball possession, goals scored, set play, the transitions of the game and the fouls in favor of the opponent (Gómez et al., 2018). However, studies conducted for UEFA Champions League matches did not identify significant impact of the home advantage (Michailidis et al., 2013b).

The teams' ranking position was related to the performance indicators of the offensive game. In particular, significant differences were observed in the number of goals scored, in total shots, in shots on goal, in ball possession, in offsides attributed, in fouls and in corners pro. Researchers who analyzed similar data for the Greek soccer league, also refer to significant differences in the offensive game regarding teams' ranking position (Bekris et al., 2013). Additionally, ball possession was one of the indicators related to the final teams' ranking position in the Greek soccer league (Gómez et al., 2018).

Conclusions

In conclusion, significant differences have been noted in the way goals were scored from set play and open play and in the scoring time period that the goals were scored. Likewise, significant differences have been found in the game-related statistical performance indicators for winning, drawing and losing teams. Most of them scored from open play and the most common actions to score were the cross, the cutback, the combination game or the long shot. Taken into consideration that most goals were scored in the 2nd half during the 75'-90'+ minute, it would be beneficial for the coaches to adjust their training in such way that their teams and players can run longer distances and cope with fatigue. Differences were also found in game-related performance indicators between the winning, the losing and the drawing teams. Significant higher averages were found for the successful – winning teams in the performance indicators of the offensive game in comparison with losing and drawing teams in the variables, ball possession, corners, total shots and total shots on target. Respectively, lower averages were also noted for the winning teams in the defensive game e.g., shots on target received, total shots received and red cards. In addition, home advantage had an impact on game-related statistics, while the first goal was crucial, as in most cases the team which scored first ended up winning the match.

Conflicts of interest

The authors declare that they have no conflict of interest.

References

Almeida, C. H., Ferreira, A. P., & Volossovitch, A. (2014). Effects of match location, match status and quality of opposition on regaining possession in UEFA Champions League. *Journal of human kinetics,41*(1), 203-214.

Armatas, V., & Pollard, R. (2014). Home advantage in Greek football. *European Journal of Sport Science, 14*(2), 116-122.

Armatas, V., & Yiannakos, A. (2010). Analysis and evaluation of goals scored in 2006 World Cup. *Journal of Sport and Health Research, 2*(2), 119-128.

Armatas, V., Yiannakos, A., Papadopoulou, S., & Skoufas, D. (2009b). Evaluation of goals scored in top ranking soccer matches: Greek "Super League" 2006-07. *Serbian Journal of Sports Sciences,3*(1), 39-43.

Armatas, V., Yiannakos, A., Skoufas, D., Zangelidis, G., Papadopoulou, S., & Fragkos, N. (2009a). Goal scoring patterns in Greek top leveled soccer matches. *Journal of Physical Education and Sport, 23*(2), 1-5.

Bamplekis, C., Michailidis, Y., Margonis, K., Kyranoudis, A., Zelenitsas, C., & Metaxas, T. (2021). Goal analysis of the entire Italian National League Serie A. *Human Movement, 23*(2), 104-111.

Beaudouin, F., aus der Fünten, K., Tröß, T., Reinsberger, C., & Meyer, T. (2019). Time trends of head injuries over multiple seasons in professional male football (Soccer). *Sports medicine international open,3*(1), E6-E11.

Bekris, E., Mylonis, E., Sarakinos, A., Gissis, I., & Gioldasis, A. (2013). Offense and defense statistical indicators that determine the Greek Superleague teams placement on the table 2011-12. *Journal of Physical Education and Sport,13*(3), 338-347.

Bransen, L., Van Haaren, J., & van de Velden, M. (2019). Measuring soccer players' contributions to chance creation by valuing their passes. *Journal of Quantitative Analysis in Sports,15*(2), 97-116.

Carpita, M., & Golia, S. (2020). Discovering associations between players' performance indicators and matches' results in the European Soccer Leagues. *Journal of Applied Statistics,48*(9), 1696-1711.

Castañer, M., Barreira, D., Camerino, O., Anguera, M. T., Canton, A., & Hileno, R. (2016). Goal scoring in soccer: a polar coordinate analysis of motor skills used by Lionel Messi. *Frontiers in psychology,7*, 806.

Castellano, J., Casamichana, D., & Lago, C. (2012). The use of match statistics that discriminate between successful and unsuccessful soccer teams. *Journal of human kinetics,31*(1), 137-147.

Cohen, J. (1992). *Statistical power analysis*. Current directions in psychological science,1(3), 98-101.

Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. Academic press.

Della Villa, F., Buckthorpe, M., Grassi, A., Nabiuzzi, A., Tosarelli, F., Zaffagnini, S., & Della Villa, S. (2020). Systematic video analysis of ACL injuries in professional male football (soccer): injury mechanisms, situational patterns and biomechanics study on 134 consecutive cases. *British journal of sports medicine,54*(23), 1423-1432.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior research methods,41*(4), 1149-1160.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods,39*(2), 175-191.

Gómez, M. Á., Mitrotasios, M., Armatas, V., & Lago-Peñas, C. (2018). Analysis of playing styles according to team quality and match location in Greek professional soccer. *International Journal of Performance Analysis in Sport,18*(6), 986-997.

González-Ródenas, J. G., Malavés, R. A., & Malavés, R. A. (2021). The effect of contextual variables on the attacking style of play in professional soccer. *Journal of Human Sport and Exercise, 16*(2), 399-410.

Gonzalez-Rodenas, J., Aranda, R., Tudela-Desantes, A., Calabuig Moreno, F., Sanjurjo, C. A. C., & Aranda, R. (2019). Effect of match location, team ranking, match status and tactical dimenions on the offensive performance in Spanish 'La Liga'soccer matches. *Frontiers in psychology,10*, 2089.

Gonzalez-Rodenas, J., Lopez-Bondia, I., Calabuig, F., Pérez Turpin, J. A., & Aranda, R. (2017). Creation of goal scoring opportunities by means of different types of offensive actions in US major league soccer. *Human Movement Special Issues, 2017*(5), 106-116.

Gonzalez-Rodenas, J., Lopez-Bondia, I., Calabuig, F., Pérez-Turpin, J. A., & Aranda, R. (2015). The effects of playing tactics on creating scoring opportunities in random matches from US Major League Soccer. International *Journal of Performance Analysis in Sport,15*(3), 851-872.

Harrop, K., & Nevill, A. (2014). Performance indicators that predict success in an English professional League One soccer team. *International Journal of Performance Analysis in Sport, 14*(3), 907-920.

Hook, C., & Hughes, M. D. (2001). Patterns of play leading to shots in Euro 2000. *Pass. com,1*, 295-302.

Hughes, M. (2003). *Notational analysis*. In Science and soccer (pp. 253-272). Routledge.

Hughes, M. (2004). Notational analysis–a mathematical perspective. *International Journal of Performance Analysis in Sport, 4*(2), 97-139.

Hughes, M. D., & Bartlett, R. M. (2002). The use of performance indicators in performance analysis. *Journal of sports sciences,20*(10), 739-754.

Hughes, M., & Churchill, S. (2005). Attacking profiles of successful and unsuccessful teams in Copa America 2001. In T. Riley, J. Cabri, & D. Araujo (Eds.), Science and football V. *The proceedings of the fifth world congress on science and football, 23*(2), 222-228).

Hughes, M., & Franks, I. (2005). Analysis of passing sequences, shots and goals in soccer. *Journal of sports sciences, 23*(5), 509-514.

James, N. (2006). Notational analysis in soccer: past, present and future. *International Journal of Performance Analysis in Sport, 6*(2), 67-81.

Lago-Peñas, C., Lago-Ballesteros, J., Dellal, A., & Gómez, M. (2010). Game-related statistics that discriminated winning, drawing and losing teams from the Spanish soccer league. *Journal of sports science & medicine, 9*(2), 288.

Martín-González, J. M., Díaz-Díaz, R., Ramos-Verde, E., Arriaga-Ardales, E., da Silva-Grigoletto, M. E., & García-Manso, J. M. (2017). Topological properties and dynamics of nets game shown by France and Portugal in the final of European soccer cup 2016. *Motricidade, 13*, 101-112.

McGarry, T. (2009). Applied and theoretical perspectives of performance analysis in sport: Scientific issues and challenges. *International Journal of Performance Analysis in Sport, 9*(1), 128-140.

McGarry, T., & Franks, I. M. (2003). *The science of match analysis.* In T. Reilly & A. M. Williams (Eds.), Science and soccer, (pp. 273-283). Routledge.

Michailidis Y. (2014). Analysis of goals scored in the 2014 World Cup soccer tournament held in Brazil. *International Journal of Sport Studies, 4*(9), 1017-1026.

Michailidis, C., Michailidis, Y., Mitrotasios, M., & Papanikolaou Z. (2013a). Analysis of goals scored in the UEFA champions league in the period 2009/2010. *Serbian Journal of Sports Sciences, 7*(2), 51-55.

Michailidis, Y., Mandroukas, A., Vardakis, L., & Metaxas, T. (2018). Evaluation of the goals scoring patterns and the relation between time and goal scoring of four UEFA champions league tournaments. *Facta Universitatis, Series: Physical Education and Sport, 16*(2) 329-336.

Michailidis, Y., Michailidis, C., & Primpa, E. (2013b). Analysis of goals scored in European Championship 2012. *Journal of Human Sport & Exercise, 8*(2), 367-375.

Mitrotasios, M., & Armatas, V. (2014). Analysis of goal scoring patterns in the 2012 European Football Championship. *The Sport Journal, 50*, 1-9.

Mundstock, F. B., da Silva Maia, F. H., & Bicalho, C. C. F. (2021). Goal difference relationship between the national leagues of Brazil, Germany and England from the perspective of the prospect theory. *Journal of Physical Education and Sport, 21*(5), 2569-2575.

Nevill, A. M., & Holder, R. L. (1999). Home advantage in sport. *Sports Medicine, 28*(4), 221-236.

Njororai, W. W. S. (2004). Analysis of the goals scored at the 17th World Cup Soccer tournament in South Korea-Japan 2002. *African Journal for Physical Activity and Health Sciences, 10*(4), 326-332.

Njororai, W. W. S. (2013). Analysis of Goals Scored in the 2010 World Cup Soccer Tournament Held in South Africa. *Journal of Physical Education and Sport, 13*(1), 6-13.

O'Donoghue, P. (2005). Normative profiles of sports performance. *International Journal of Performance Analysis in Sport, 5*(1), 104-119.

Papadopoulos, S., Papadimitriou, K., Konstantinidou, X., Matsouka, O., Pafis, G., & Papadopoulos, D. (2021). Factors Leading to Goal Scoring in the Spanish and Italian Soccer Leagues. *Sport Mont, 19*(1), 13-18.

Pappalardo, L., Cintia, P., Ferragina, P., Massucco, E., Pedreschi, D., & Giannotti, F. (2019). PlayeRank: data-driven performance evaluation and player ranking in soccer via a machine learning approach. *ACM Transactions on Intelligent Systems and Technology (TIST), 10*(5), 1-27.

Sarkar, S., & Chakraborty, S. (2018). Pitch actions that distinguish high scoring teams: Findings from five European football leagues in 2015-16. *Journal of Sports Analytics, 4*(1), 1-14.

Smith, R. A., & Lyons, K. (2017). A strategic analysis of goals scored in open play in four FIFA World Cup football championships between 2002 and 2014. *International Journal of Sports Science & Coaching,12*(3), 398-403.

Smith, S. M., & Bedwell, J. R. (2021). Euro 2020 goal analysis: an ecological dynamics approach for football shooting practice. *Journal of Physical Education and Sport, 21*(6), 3319 – 3325.

SPSS, I. (2018). Corp Ibm SPSS statistics for windows, version 26.0. Armonk, *NY: IBM Corp, released*.

Stanhope, J. (2001). *An investigation into possession with respect to time, in the soccer world cup 1994*. In M. D.Hughes (Ed.), Notational analysis of sport III, 155-162. Cardiff: UWIC.

Taylor, J. B., James, N., & Mellalieu, S. D. (2005). Notational analysis of corner kicks in English premier league soccer. InT. Riley, J. Cabri, & D.Araujo (Eds.), Science and football V. *The proceedings of the fifth world congress on football*, 229-234. Abingdon: Routledge.

Tousios, T., Michailidis, Y., Mandroukas, A., Mikikis, D., & Metaxas, T. (2018). Differences in goal scoring and minutes of scoring between two European Championships, one among 16 teams (Euro 2012) and the other among 24 teams (Euro 2016). *Facta Universitatis, Series: Physical Education and Sport, 16*(2),365-373.

Vergonis, A., Michailidis, Y., Mikikis, D., Semaltianou, E., Mavrommatis, G., Christoulas, K., & Metaxas, T. (2019). Technical and tactical analysis of goal scoring patterns in the 2018 FIFA World Cup in Russia. *Facta Universitatis, Series: Physical Education and Sport, 17*(2), 181-193.

Vogelbein, M., Nopp, S., & Hökelmann, A. (2014). Defensive transition in soccer–are prompt possession regains a measure of success? A quantitative analysis of German Fußball-Bundesliga 2010/2011. *Journal of sports sciences, 32*(11), 1076-1083.

Wang, S. H., & Qin, Y. (2020). Analysis of shooting and goal scoring patterns in the 2019 France Women's World, Cup. *Journal of Physical Education and Sport, 20*(6), 3080-3089.

Yiannakos, A., & Armatas, V. (2006). Evaluation of the goal scoring patterns in European Championship in Portugal 2004. *International Journal of Performance Analysis in Sport, 6*(1), 178-188.

Zhou, C., Zhang, S., Lorenzo Calvo, A., & Cui, Y. (2018). Chinese soccer association super league, 2012–2017: key performance indicators in balance games. *International Journal of Performance Analysis in Sport, 18*(4), 645-656.