

ORIGINAL RESEARCH

Analysis of goals scored in the Premier League of Bosnia and Herzegovina depending in the table ranking positions

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Abstract

Received:

January 14, 2025

Accepted:

February 21, 2025

Published:

February 28, 2025

Keywords:

Body part, open play, set pieces, shooting zone, time interval.

The aim of the research was to analyse the goals scored over three seasons (from 2021/22 to 2023/24) in the top football league competition in Bosnia and Herzegovina. The sample of respondents consists of 1,463 goals scored by teams divided into three sub-samples: teams ranked from first to fourth place, then ones ranked from fifth to eighth place, and teams ranked from ninth to twelfth place. For each goal scored, the following were analysed: time interval, offensive model, zone from which the final shot was taken, and the body part used to score. The chi-square test was used for the evaluation of the differences existence in distributions for each variable within groups of teams, while the difference between sub-samples was determined using the non-parametric Kruskal-Wallis test. The obtained results show that the teams at the top of the table scored the most goals. All sub-samples scored the highest number of goals in the last 15 minutes of the match, inside the penalty area, during organized attacks, and with the right foot. The results indicate similarities across all analysed parameters with studies conducted by other authors. Based on obtained results team coaches should pay special attention to the physical, tactical, and psychological preparation of players in the final stages of the match. They need to improve the organization of the attack to create opportunities for shots inside the penalty area and to enhance the realisation of set pieces. Teams at the bottom of the table have to improve their organization of open play attacks as well as their defence against organized attacks and set pieces compared to other groups of teams.

Introduction

According to the classification of sports, football falls into the category of complex sports (Konstantinidou, according to Yiannakos et al., 2006). It contains a large number of activities that alternate the application of motor skills with functional demands for each individual. Success in football depends on a large number of factors (technique, tactics, and fitness) that interact with each other (Carling et al., 2009; Sporis et al., 2009; Andrzejewski et al., 2022). However, we cannot exclude the social and psychological factors that have a crucial role in achieving positive results at certain moments in the game (Abdulah et al., 2016; Erikstad et al., 2018).

Scoring a goal and winning are the objective of the game, especially at higher levels of competition. Achieving a positive result is often attributed to the

tactical-technical performance of the team, and according to some researchers low level of tactical-technical preparation is the primary reason for poor results on the field (Barthelemy et al., 2024).

Many studies have focused on patterns of goal scoring in various national competitions and international football tournaments. From the research of Reep & Benjamin (1968), which established that, goals are mostly the result of a small number of passes and that one in ten shots on goal results in a score. Many authors have examined patterns of goal scoring in specific competitions. Some authors have studied how the number of passes contributes to scoring goals (Hughes & Franks, 2005; Kubayi, 2020), while others have examined the time periods in which goals are scored (Armatas et al., 2007; Michailidis et al., 2012; Giampierito et al., 2013; Gurkan et al., 2017). Additionally, some studies have highlighted the

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Turk J Kinesiol, 11(1), 45-52. doi: 10.31459/turkjin.1620087

impact of earlier scored goal or the first goal in a match on the final result (Yiannakos et al., 2006; Armatas et al., 2010).

In addition to the timing of goals, the positions on the field from which goals are scored have also been examined (Wright et al., 2011; Yiannakos et al., 2006). Tenga & Sigmundstad (2011) explored how teams score goals by grouping them according to their position in the Norwegian football league table. According to the results, teams at the bottom of the table are characterized by goals scored from counterattacks, a lower number of passes, and attacks that last longer than twelve seconds, as well as attacks that start from the midfield. The only difference between teams at the top and those in the middle of the table is the organization of attacks from the midfield. However, it is important to emphasize those coaches and their coaching staff cannot wait for periodic research from individual authors; they have to continuously analyze and evaluate the performance of individual players and the team in order to improve positive performances and reduce poor ones through the training process. This research will analyze how teams in Bosnia and Herzegovina scored goals over three competitive seasons, depending on their ranking in the table at the end of the season. It is undisputed that such a study excludes a significant number of parameters that contribute to understanding the overall insight of how teams score goals. The results of this study should encourage the academic community, along with coaching staff, to expand this research to other segments of the game, primarily focusing on the technical-tactical characteristics of all phases of play specific to football, examining the contributions of physical performance, and investigating the psychological and sociological factors that contribute to success. This would include increasing the quality of teams' play and their competitiveness with teams from other leagues under the organization of the Union of European Football Associations (UEFA).

Methods

In this longitudinal study, the goals scored by teams competing in the highest football league in Bosnia and Herzegovina were analyzed based on their ranking at the end of the season. The goals scored during three seasons 2021/22, 2022/23 and 2023/24 were examined.

Sample of Participants

The sample consists of goals scored in 551 matches, with a total of 1,463 goals were analyzed. Matches that

ended without any goals (n=43) were excluded from this study. The sample is divided into three sub-samples: the first includes teams ranked from first to fourth (n=644), the second includes teams ranked from fifth to eighth (n=429), and the third includes teams ranked from ninth to twelfth (n=390).

Sample of Variables

The scoresheet records were divided into four main categories.

The first category is the time period (Degrene & Carling, 2024). The study divided the total duration of the game into 15-minute intervals. The playing time was split into six periods: 1st–15th min, 16th–30th min, 31st–45th min, 46th–60th min, 61st–75th min, and 76th–90th min.

The second category is the offense pattern, which refers on the way the goal scoring (Micovic, 2023). The patterns were divided into three groups: open play, set pieces, and own goals.

The third category of variables consists of the positions on the field from which goals were scored (Micovic, 2023). Three zones were defined: goal area, inside the penalty area, and outside the penalty area.

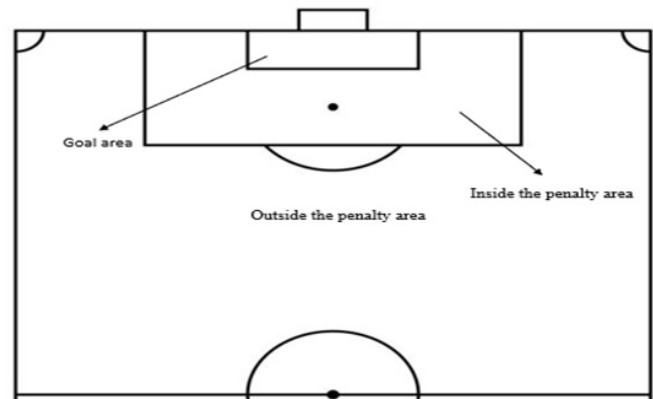


Figure 1. Zones of goal scoring.

The fourth category of variables includes the body parts used to score goals (Micovic, 2023): left foot, right foot, head, and other body parts.

Data sources included highlights available on the official Arena Sport channel, which has broadcasting rights for the top-tier football matches in Bosnia and Herzegovina (<http://www.youtube.com/@TVArenaSport>), and the timing of goals was collected from the website: <https://www.sofascore.com/tournament/football/bosnia-herzegovina/wwin-premier-liga/222#id:63463>.

Data Analyses

Data analysis was done using the SPSS v23 software package. Since this study involves categorical variables

characterized by nominal measurement scale, it has been decided to use non-parametric statistics for this research.

Descriptive statistics were used to analyze frequencies and percentages for each individual variable. The chi-square test was used for the evaluation of the differences existence in distributions for each variable within groups of teams. Statistical significance for accepting the differences was set at $p \leq 0.05$.

The analysis of differences between groups for specific variables was determined using the Kruskal-Wallis test, while differences between individual groups were assessed using the Bonferonni post hoc test. Effect size was calculated as described by Pallant (2011) in the chapter on the Mann-Whitney U test. The effect size was evaluated according to Cohen's coefficient: effect size $r < 0.3$ = small effect, effect size between 0.3 and 0.5 = medium effect and effect size $r > 0.5$ = large effect (Pallant, 2011). In order to avoid a type I errors, the Bonferonni correction was applied for accepting statistically significant differences in the variables between groups, setting the coefficient for accepting statistical significance at $p \leq 0.017$.

Results

Analyzing the frequency of goals scored according to time periods, teams in the first group scored the most goals, while the third group, composed of teams from the lower part of the table, scored the fewest. The results indicate that all groups had the highest number of goals scored in the final interval of the match, from the 75th to the 90+ minute. The highest percentage of goals scored in this last interval belongs to the third group (24.87%).

When examining the time intervals by halftime, all groups scored the most goals in the third segment of each half. A comparison of the goals scored shows that the group with the best ranking had the highest number of goals in all intervals. The results of the chi-square test, which determined the existence of differences between the observed and expected frequencies related to the time intervals in which goals were scored, revealed statistically significant differences in all groups (first group: $n = 644$; $\chi^2 = 20.863$; $p = 0.001$; second: $n = 429$; $\chi^2 = 16.580$; $p = 0.005$; third: $n = 390$; $\chi^2 = 21.200$; $p = 0.005$).

Table 1
Distribution of time intervals of scored goals.

Ranking	Time intervals	f	%	χ^2	p
First group	1-15	91	14.13	20.863	.001
	16-30	86	13.35		
	31-45+	118	18.32		
	46-60	105	16.30		
	61-75	100	15.53		
	76-90+	144	22.36		
Second group	1-15	47	10.96	16.580	.005
	16-30	65	15.15		
	31-45+	77	17.95		
	46-60	72	16.78		
	61-75	74	17.25		
	76-90+	94	21.91		
Third group	1-15	54	13.85	21.200	.001
	16-30	55	14.10		
	31-45+	69	17.69		
	46-60	59	15.13		
	61-75	56	14.36		
	76-90+	97	24.87		

f: Frequency; %: Percent; χ^2 : Chi square; p: Level of significance.

Table 2
Distribution of offensive pattern of scored goals.

Ranking	Offensive pattern	f	%	χ^2	p
First group	Open Play	467	72.52	496.624	.000
	Set Pieces	163	25.31		
	Own Goal	14	2.17		
Second group	Open Play	310	72.26	328.210	.000
	Set Pieces	110	25.64		
	Own Goal	9	2.10		
Third group	Open Play	249	63.85	214.262	.000
	Set Pieces	128	32.82		
	Own Goal	13	3.33		

f: Frequency; %: Percent; χ^2 : Chi square; p: Level of significance.

Table 3
Distribution of zones where goal was scored.

Ranking	Goal scoring zone	f	%	χ^2	p
First Group	Goal Area	182	28.3	182.323	.000
	Inside Penalty Area	368	57.1		
	Outside Penalty Area	94	14.6		
Second Group	Goal Area	105	24.5	141.371	.000
	Inside Penalty Area	257	59.9		
	Outside Penalty Area	67	15.6		
Third Group	Goal Area	101	25.9	130.200	.000
	Inside Penalty Area	233	59.7		
	Outside Penalty Area	56	14.4		

f: Frequency; %: Percent; χ^2 : Chi square; p: Level of significance.

The analysis of the attacks types from which goals were scored revealed that goals were primarily scored from open play, accounting for around 72% in the first two groups, while this percentage was significantly lower in the third group at 63.85%. In the third group, every third goal was scored from set pieces (32.82%). The results of the chi-square test, which assessed the existence of differences between the observed and expected frequencies related to the situations from which goals were scored, indicated statistically significant differences in all groups (first group: $n = 644$; $\chi^2 = 496.624$; $p = 0.000$; second: $n = 429$; $\chi^2 = 328.210$; $p = 0.005$; third: $n = 390$; $\chi^2 = 214.262$; $p = 0.005$; Table 2).

Speaking of the zones from which final goal scoring shots were taken, a similar distribution of goals across the zones was observed for all three groups. Teams scored approximately 85% of their goals from within the penalty area. The results of the chi-square test, which assessed the existence of differences between the observed and expected frequencies related to the zones

from which goals were scored, indicated statistically significant differences in all groups (first group: $n=644$; $\chi^2 = 182.323$; $p = 0.000$; second group: $n = 429$; $\chi^2 = 141.371$; $p = 0.000$; third group: $n = 390$; $\chi^2 = 130.200$; $p = 0.000$; Table 3).

According to the rules of the game, players are allowed to play with all parts of their body but their hands. Analysing the distribution of goals scored, we notice that in all groups, the highest percentage of goals was scored using the right foot. The percentage of goals scored with the right foot increases from the best-performing (45.03%) to the worst group (57.69%). However, for goals scored with the left foot, the percentage increases from the lowest (22.05%) to the group teams ranking at the top of Table 4 (33.85%). The distribution of goals scored with the head within the groups shows a similar percentage representation (17.44% to 19.57%). Goals scored with other parts of the body are mostly noticed while scoring own goals, when the ball deflected off certain body parts and entered the net. The results of the chi-

square test, which assessed the existence of differences between the observed and expected frequencies regarding the body parts used to take the final shot at goal, revealed statistically significant differences in all

groups (first group: $n = 644$; $\chi^2 = 272.770$; $p = 0.000$; second group: $n = 429$; $\chi^2 = 252.576$; $p = 0.000$; third group: $n = 390$; $\chi^2 = 253.754$; $p = 0.000$).

Table 4
Distribution of body part which was used by goal scoring.

Ranking	Part of body	f	%	χ^2	p
First group	Other Part Of Body	10	1.55	272.770	.000
	Right Leg	290	45.03		
	Head	126	19.57		
	Left Leg	218	33.85		
Second group	Other Part Of Body	5	1.17	252.576	.000
	Right Leg	233	54.31		
	Head	79	18.41		
	Left Leg	112	26.11		
Third group	Other Part Of Body	11	2.82	253.754	.000
	Right Leg	225	57.69		
	Head	68	17.44		
	Left Leg	86	22.05		

f: Frequency; %: Percent; χ^2 : Chi square; p: Level of significance.

Table 5
Kruskal-Wallis test differences between groups.

	Mean Ranks			Kruskal Wallis test		Differences between group	
	First group	Second group	Third group	χ^2	p		
Scoring goal zone	719.89	748.96	733.34	1.577	.454		
Time intervale	724.72	740.35	734.83	.388	.823		
Offensive pattern	714.35	716.00	778.74	10.265	.006	I-III*	II-III**
Body part	769.49	709.60	694.73	11.129	.004	I-II***	I-III****

* ES = 0.009; **ES = 0.009; ***ES = 0.009; ****ES = 0.008

Using the Kruskal-Wallis test, we established the existence of statistically significant differences in the variables of offensive patterns ($\chi^2 = 10.265$; $p = 0.006$) and body part ($\chi^2 = 11.129$; $p = 0.004$) used in scoring goals. Using the Bonferroni post hoc test the existence of differences in the offensive pattern variable between the third and first group ($p = 0.003$) was determined as well as between the third and second group ($p = 0.008$). In the body part variable, differences were found between the second and first group ($p=0.013$) and between the third first and group ($p = 0.003$). Checking the effect size, according to Cohen (1988, as cited in Pallant 2011), we determined that in the variables where statistically significant differences were found, the effect size was low (Table 5).

Discussion

By reviewing the goals scored over three seasons in the top football league in Bosnia and Herzegovina, we determined that teams scored a total of 1,463 goals. In an effort to identify the methods of scoring goals based on the quality of the teams ranked at the end of the table, it is evident that teams at the top achieved the highest number of goals, with 644, while the lowest-ranked teams managed 390 completed offensive actions resulting in goals. The top tier of the football competition has undergone various levels of organization, leading the governing body in recent years to reduce the number of teams in order to enhance the quality of play. It is important to emphasize that the quality of the league is not at a high level, knowing that only two clubs managed to reach the group stage of European league competitions in

the last two decades (HSK Zrinjski, 2025; Transfermarkt, 2025).

However, regardless of the quality of the competition, teams continue to strive to score more goals and win against their opponents according to their technical and tactical capabilities. Therefore, it is important to analyze the methods of scoring and compare them with other studies.

Analysis of the time intervals in which goals were scored revealed that teams, regardless of their ranking on the table, score more goals in the second half, a finding confirmed by other studies (Armatas et al., 2007; Michailidis et al., 2012; Giampierito et al., 2013; Gurkan et al., 2017; Leontijevic et al., 2021; Bamplekis et al., 2022; Micovic, 2023; Degrenne et al., 2024). The quality of the teams in the upper part of the table clearly shows that they dominate in all time intervals of the game regarding the number of goals scored. The higher number of goals scored in the second half can be attributed to an increase in both physical and psychological fatigue, which contributes to an increase in errors (Reilly, 1996; Barros et al., 2007; Rampinini et al., 2007). Errors in decision-making can also be noticed among players in the back line, allowing attackers to take advantage and score goals (Reilly, 1996). In addition to the established fatigue, Reilly (1996) emphasizes that an unfavorable outcome for a team often leads to increased risk in an attempt to achieve a positive result, which can put additional pressure on the opposing players, especially those who struggle with psychological stress. However, negative outcomes towards the end of the match often get players moving forward, which allows the opponent to exploit the large space left after regaining possession, resulting in goals (Reilly, 1997).

We cannot overlook the fact that goals scored at the end of matches often occur after the outcome is already known, especially for teams ranked at the bottom of the table, as indicated by the results of this study. The recent rule change allowing teams to substitute five players may alter the percentage of goals conceded as well as the number of goals scored. Researching the physical performances of substituted players, Carling et al. (2008) found that substitute players cover a greater distance at high intensity in the last 15 minutes of the game compared to other players, which can significantly contribute to both a decrease and an increase in the number of goals, particularly when there is a noticeable qualitative difference between the players on the bench and the substitutes.

Analyzing the results of the goals scored in relation to the position from which the final shots were taken,

it was found that teams from all samples scored the majority of their goals from within the penalty area. These findings have also been established in other studies (Yiannakos & Armatas, 2004; Armatas & Yiannakos, 2010; Micovic, 2023). Scoring goals from within the penalty area is expected, the probability of scoring goals increases by the greater proximity to the goal and vice versa (Pratas et al., 2018). The team's aim in organizing an attack is to position a player for a final shot within the penalty area, allowing players to take a shot on goal under easier conditions and from a better angle (Muhammad et al., 2013). The likelihood of scoring from a greater distance is further reduced by the defensive structure of the opposing team, which is generally compactly positioned around the penalty area. In such situations, the proximity of a defender to the shooter decreases the probability of scoring (Pollard et al., 2004). Comparing the number of goals scored from different positions shows that teams at the top of the table create much better scoring opportunities for their attackers.

An examination of the goals scored with different body parts shows that all sub-samples scored the majority of their goals with the right foot. Teams at the top of the table show a percentage difference in the number of goals scored with the left foot compared to other sub-samples. Attackers from the top teams scored more goals with their heads than others. Comparing with other research results we can notice similar findings, with approximately 80% of goals scored by foot (Michalidis et al., 2012; Durluk & Bienek, 2014; Mitrotasios & Armatas, 2014; Micovic, 2023).

Goals scored from open play attack are predominantly represented in all sub-samples. For teams in the top and middle of the table, around 72% of goals are from open play; while for the weakest teams, this percentage is significantly lower (63%). Goals scored from open play arise from situations that involve cooperation among larger or smaller groups of teammates during the attacking phase. The application of technical-tactical elements, both with and without the ball, resulted in poor reactions from opposing teams, leading to goals. Such situations occur after an organized attack initiated by a player's throw-in or winning the ball from an opponent in a certain part of the field, after which the attacking phase begins.

The percentage of goals scored from set pieces shows that the weakest teams (33%) find it harder to score from organized attacks. Considering the percentage of goals scored from set pieces, it is evident that teams dedicate significant training time to

practicing set plays. Set pieces are often the subject of research analysis, which has confirmed that about 30% of goals are scored from set pieces (Armatas & Yiannakos, 2010; Mitrotasios & Armatas, 2014; Gonzalez-Rodenas et al., 2019; Kubayi, 2020; Micovic, 2023), although this percentage is somewhat lower in the strongest club competition in Europe (Leontijevic et al., 2021).

Conclusion

Interpreting the obtained results, we found that in three seasons of the highest rank competition in Bosnia and Herzegovina, teams from the top of the table scored the most goals and stood out numerically in all parameters included in the analysis. Statistically significant differences were found between the observed and expected frequencies in all variables for each subsample, and significant differences between the subsamples were identified in the segments of types of effective attacks and the body parts used for finishing strikes. All subsamples scored more goals in the second half, particularly in the last 15-minute interval, indicating a need for better physical and psychological preparation towards the end of matches.

For teams from the top and middle of the table, effective attacks from open play dominated goal-scoring, while teams from the bottom of the table scored every third goal from set pieces, showing that weaker teams struggled to organize effective attacks through open play. In all subsamples, the right foot was the dominant scoring method, while a significantly lower percentage of goals scored with the left foot was found in teams from the bottom of the table. Goals scored within the penalty area were the most represented across all groups.

Considering that the obtained results do not deviate from the findings of other authors, we can conclude that regardless of the quality of the competition and the country, teams show similarities in their goal-scoring methods in terms of the type of effective attack, the area from which the finishing shot was taken, and the body part used for the finishing shot. Since there is no developed system in Bosnia and Herzegovina for statistical tracking of a larger number of situational motor parameters, a significant contribution to assessing the quality of teams in the attacking segment would be to compare realized attacks against the total number of attempts.

For a more detailed analysis of goal-scoring, it is necessary to analyze additional parameters to get a complete picture of efficiency from both the attacking and defensive perspectives. The results can assist

lower-ranked teams to improve their effectiveness in both attack and defense through their training processes.

Based on obtained results teams should pay special attention to the preparation of players in the final stages of matches in terms of physical, technical-tactical, and psychological fitness to reduce the number of goals conceded. The training process should focus on improving the organization of attacks in front of the opponent's goal to create opportunities for shooting from inside the penalty area, as well as practicing the realization of attacks with both feet and the head. At the same time, in the defense, team has to enhance as well as team and individual actions to reduce the number of entries by opponent players with the ball inside the penalty area. Significant time during training should be dedicated to practicing innovative solutions for set pieces to surprise opponents and create opportunities for scoring. While practicing the attack, teams have to work on defending set pieces in order to improve players' reactions to reduce the opponents' efficiency.

Authors' Contribution

Study Design: SDŽ; Data Collection: SDŽ; Statistical Analysis: SDŽ; Manuscript Preparation: SDŽ; Funds Collection: SDŽ.

Ethical Approval

No ethical approval is required.

Funding

The authors declare that the study received no funding.

Conflict of Interest

The authors hereby declare that there was no conflict of interest in conducting this research.

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