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2024 European Football Championship: An Analysis of Goal-Scoring Patterns

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Abstract

The aim of this study is to analyze the goal-scoring patterns observed in the UEFA 2024 European Football Championship held in Germany. In this study, 117 goals scored across 51 matches played during the tournament were analyzed. Of the goals scored, 56.4% occurred in the second half, while 43,6% were scored in the first half. The highest number of goals was scored between the 16th and 30th minutes (19,7%), while the fewest goals were recorded between the 90th-105th and 106th-120th minutes. When examining the number of touches before the goal, the majority of goals were scored through direct shots (59%). The analysis also revealed that most assists were made from Zone 4 inside the penalty area (22%) and through short ground passes (34%). Additionally, the study found that the most frequent shot type was with the inside of the right foot (29%) and that midfielders were the players who scored the most goals (35%). VAR decisions were used 25 times, with offside and penalty situations being the most frequently reviewed. This study emphasizes the need for reconsideration of offensive and defensive strategies, suggesting that coaches should develop their game plans based on these findings.

Keywords: Soccer, Match Analysis, European Championship, Goal-Scoring Patterns

Introduction

Football, one of the most popular sports globally, played by millions, features several prestigious international tournaments, with the UEFA European Football Championship standing out as one of the most significant. Held every four years by UEFA, this tournament captivates billions of viewers worldwide. For instance, it was reported that the 2024 UEFA European Championship, hosted in Germany, attracted 5 billion television viewers (UEFA, 2024). esides its significance in European football, the European Championship offers coaches and clubs a unique opportunity to evaluate the top national teams and players across Europe. Thus, beyond its status as the pinnacle of European football, it serves as a critical platform for match analysis and data-driven approaches. In recent years, technical and tactical analyses of on-field player performance have gained considerable popularity, complementing physiological, psychological, and anthropometric studies (Clarys et al., 2003). Match analysis has become a widely used tool in football for systematically observing and evaluating the performances of both players and teams (Reilly, 2003). By providing a deep understanding of a match's statistical data, match analysis aids coaches and managers in making informed strategic decisions, enhancing player performance, and refining team tactics.

In football, performance indicators such as high ball possession, creating numerous scoring opportunities, shots on goal, or corner kicks, do not always correlate with success. A team can triumph even when performing below the ideal level, as the ultimate goal in any match is to score at least one more goal than the opposition (Wright et al., 2011). Goals represent the core of football, encompassing a range of in-game developments, tactical decisions, and individual performances. Consequently, goals are central to match analysis. Due to the significance of major tournaments in football, numerous researchers have recently focused on analyzing the goals scored in these events (Ağyol & Tanyeri, 2022; Alberti et al., 2013; Armatas et al., 2009; Başkaya, 2023; Çoban, 2019; Çobanoğlu & Terekli, 2018; Erdal & Apaydın, 2022; Ergin et al., 2023; Ertetik & Müniroğlu, 2021; Gürkan et al., 2017; Gürkan et al., 2018; İmamoğlu et al., 2011; Jones et al., 2004; Kubayi, 2020; Leite, 2013; Marques Junior, 2012; Mitrotasios, 2014; Yavuz & Saygın, 2021; Yiannakos & Armatas, 2006; Yolgörmez & Kayatekin, 2023). Researchers argue that major tournaments like these represent the pinnacle of football development and reflect the current state of the modern game, making them valuable for various research topics (Silva and Campos Júnior, 2006). Consequently, goals remain the most prominent component of performance in football matches. Analyzing how goals are scored can reveal critical insights into the most effective offensive strategies, providing a potential blueprint for success (Mitrotasios, 2014). Furthermore, such analysis can greatly assist coaches in developing training programs and implementing optimal goal-scoring tactics. Hence, this study aims to analyze the goal-scoring patterns observed during the 2024 UEFA European Championship.

Material and Method

The sample for this study consists of the 51 matches played and 117 goals scored during the group and knockout stages of the 2024 UEFA European Football Championship, held in Germany from June 14 to July 14, 2024. All goals scored in the tournament were included in the analysis, which was conducted across 14 different categories (Table 1).

Data Collection

The data for this study was collected through an analysis of the goals scored in the 51 matches played by 32 teams during the group and knockout stages of the 2024 UEFA European Championship. The data was sourced from the publicly accessible website of the Turkish

Radio and Television Corporation (TRTSpor, 2024). One of the authors, who holds a UEFA B coaching license, conducted the analysis of all the goals. To determine the area from which each goal was scored, the football field was divided into 10 sections, and for the area where the assist originated, the field was divided into 5 sections. A standardized analysis form, where these sections were numbered, was used (Figure 1, Figure 2). In the tournament, 10 own goals were identified and categorized accordingly. The collected data was recorded using Microsoft Excel® without the use of any additional analysis software. The players who scored the goals and provided the assists were evaluated based on their positional roles during that specific match.

Data Analysis

Descriptive statistics, such as frequency and percentage, were used to analyze the collected data. All statistical analyses were conducted using the SPSS 26.0 (*IBM, USA*) software package.

Table 1. Parameters Analyzed in The Study

Category	Parameter	Titles
Goal	Time of Goals (Minute)	0-15;16-30;31-45;45+;45-60;61-75;76-90;90+;90-105;105+;106-120;120+
	Goal Area	Defined goal areas (Figure 2)
	Pre-Goal	No touch (Penalty or Own Goal); Direct shot; 1 touch + Direct Shot; 2 touch + Direct Shot; 3 touch + Direct Shot; By dribbling past an opponent; By dribbling past an opponent +2 touch; By dribbling past an opponent +3 touch
	Goal Shot	Inside of Right Foot; Top of Right Foot; Outside of Right Foot; Inside of Left Foot; Top of Left Foot; Outside of Left Foot; Header; Other; Own Goal or Penalty
	The Side Where The Goal Was Scored	Goalkeeper's Right; Aerial Goalkeeper's Right; Ground Goalkeeper's Left;, Aerial Goalkeeper's Left; Ground Over The Goalkeeper; Open Goal
	The Position Of The Goal-Scoring Player	Centre Back; Midfielder; Forward; Left Winger; Right Winger; Own Goal Left Back; Right Back
	Methods of Goal Scoring	Open Play; Corner; Penalty; Rebound From Goalkeeper; Own goal
Assist	Assist Area	Defined Assist Areas (Figure 1)
	Assist Type	No Assist; Ground Cross From The Flank; Aerial Cross From The Flank; Ground Pass; Aerial Pass
	Position of Assist Player	Centre Back; Midfielder; Forward; Left Winger; Right Winger; Left Back; Right Back
	The Impact of The First Goal	Draw; Won; Lose

Penalty Shot in Open Play	Penalty Kicks	Shot Type
	Shot Type	Inside of Right Foot; Top of Right Foot; Inside of Left Foot
	Side of The Penalty Kick	Goalkeeper's Right, Aerial; Goalkeeper's Right Ground; Goalkeeper's Left; Aerial Goalkeeper's Left Ground
	Goalkeeper's corner preferences	The Correct Choice; The Wrong Choice
	Video Assistant Referee (VAR)	Defined parameters (Table 2)

Figure 1. Assist areas

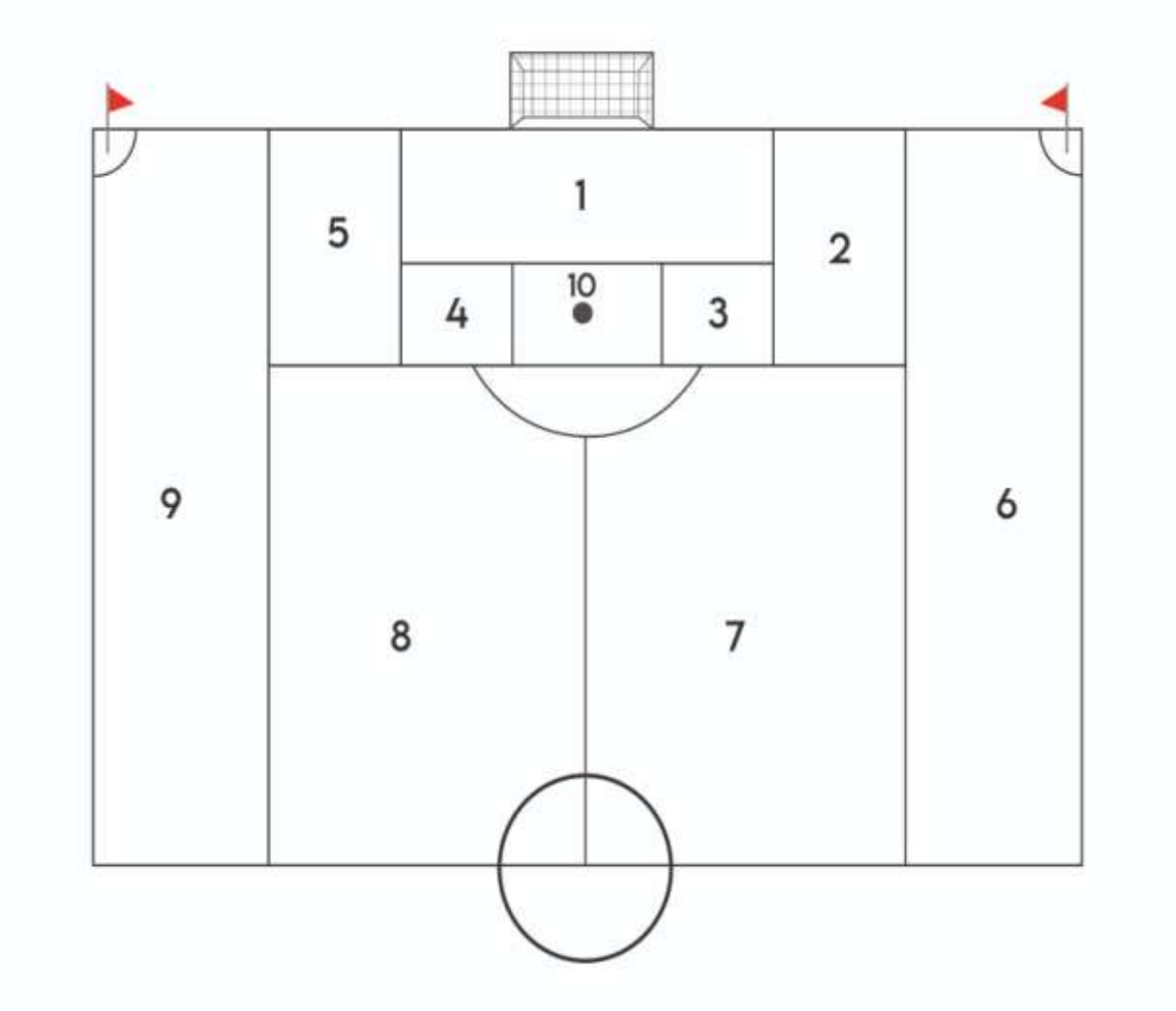

Figure 2. Goal areas

Findings

An examination of Table 2 shows that 51 (43,6%) of the 117 goals scored in the tournament occurred in the first half of the matches, while 66 goals (56,4%) were scored in the second half. The highest number of goals was scored between the 16-30th minutes (23 goals; 19,7%), whereas the fewest goals were scored between the 90-105th minutes (1 goal; 0.9%) and the 106-120th minutes (1 goal; 0.9%) (Table 2).

Table 2. Time Intervals and Number of Goals Scored in The Tournament.

Minute	n	%
0-15 dk	16	13,7
16-30 dk	23	19,7
31-45 dk	8	6,8
45+ dk	4	3,4
45-60 dk	18	15,4
61-75 dk	18	15,4
76-90 dk	15	12,8
90+ dk	13	11,1
90-105 dk	1	0,9
105+ dk	0	0
106-120 dk	1	0,9
120+ dk	0	0
Total	**172**	**100%**

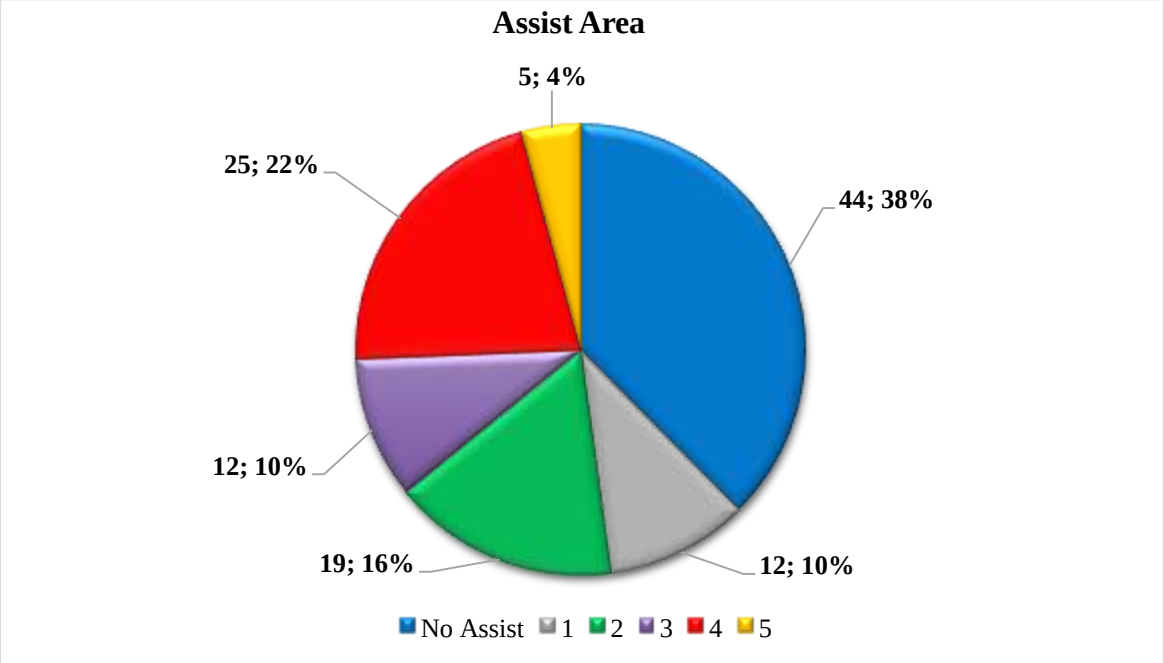

Figure 3. Assist Area

An analysis of Figure 3 reveals that 44 out of the 117 goals scored in the tournament (38%) were without an assist, while 73 goals were assisted. The most assists came from Zone 4 (25 assist; 22%) and Zone 2 (19 assist; 24%), while the fewest assists came from Zone 5 (5 assist; 4%).

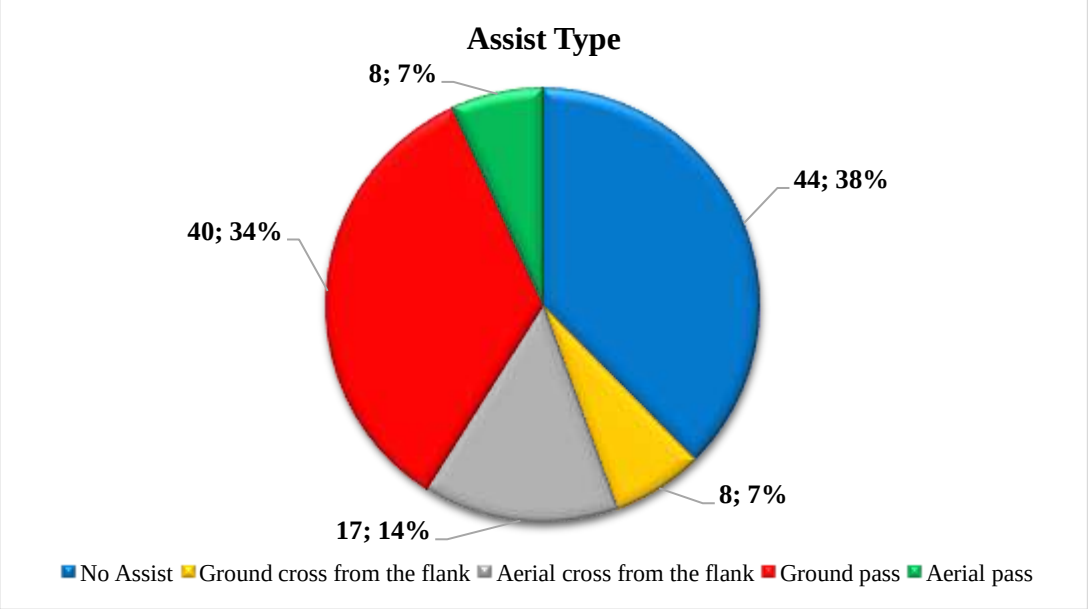

Figure 4. Assist Type

An analysis of the types of assists shows that for the 73 assisted goals, the most frequent assist types were ground passes (40 assist; 34%) and aerial crosses from the flank (17 assist; 14%). The least common assist types were aerial passes (8 assist; 7%) and ground crosses from the flank (8 assists; 7%) (Figure 4).

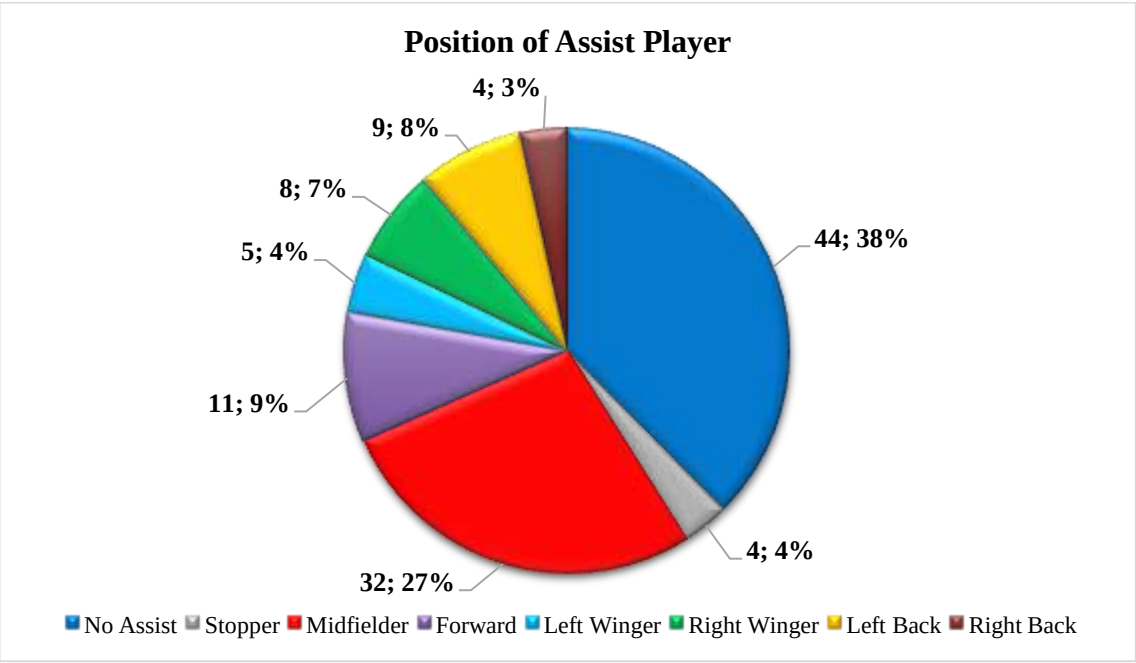

Figure 5. Position of Assist Player

An analysis of Figure 5 shows that in the 73 assisted goals, the most assists were provided by midfielders (32 assists; 27%) and forwards (11 assists; 9%), while the fewest assists came from right-backs (4 assists; 3%).

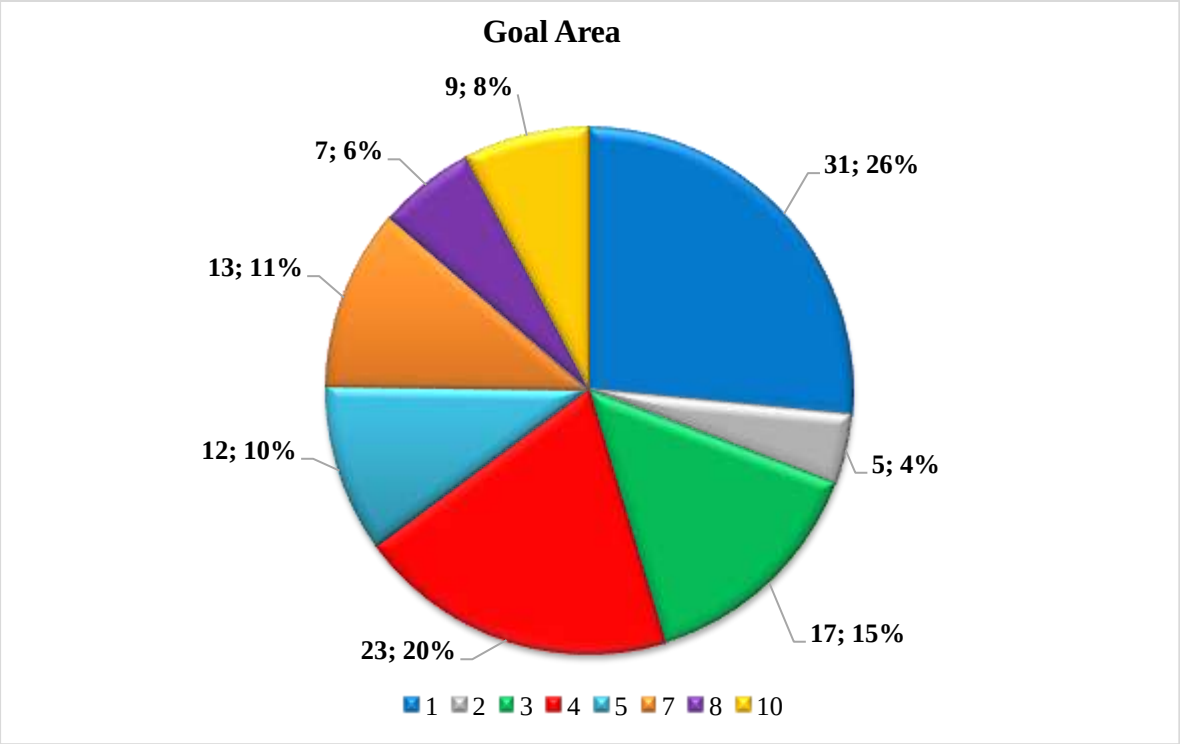

Figure 6. Goal Area

By dividing the half-field into 10 sections and analyzing the defined goal zones (Figure 2), it is observed that the majority of goals were scored from Zone 1 inside the penalty area (31 goals; 26%) and Zone 4 (23 goals; 20%). The fewest goals were scored from Zone 2 (5 goals; 4%), and no goals were scored from Zone 9 (Figure 6).

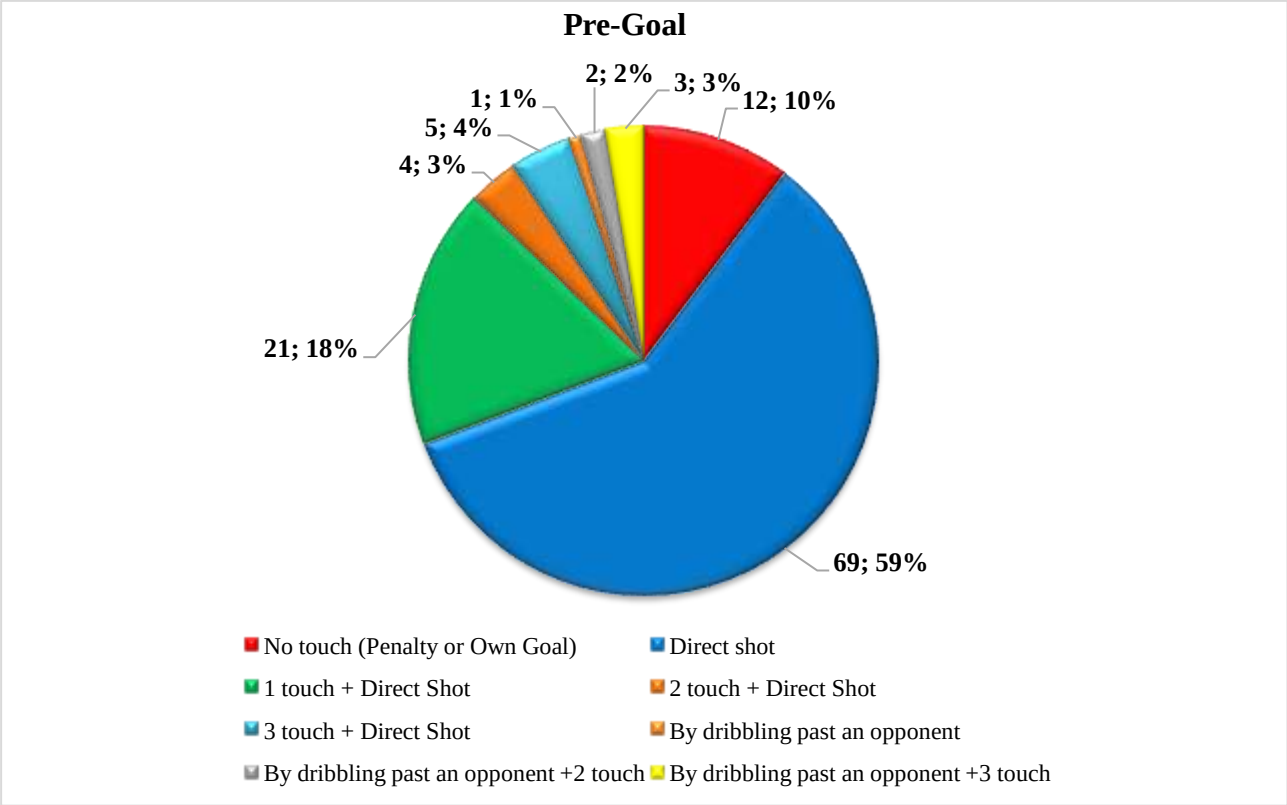

Figure 7. Pre-Goal

An analysis of the number of touches before the goal shows that the majority of goals were scored through direct shots (65 goals; 59%) and 1 touch + direct shots (21 goals; 18%), while the fewest goals were scored by dribbling past an opponent (1 goal; 1%) (Figure 7).

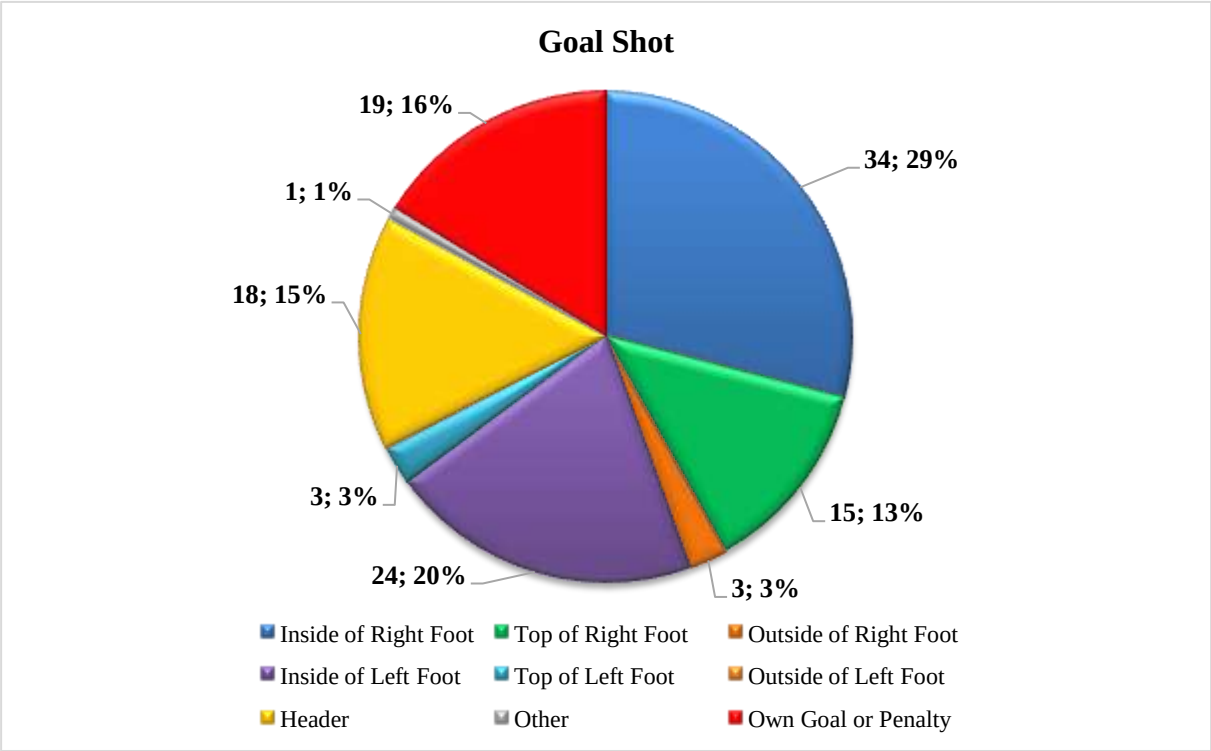

Figure 8. Goal Shot

An analysis of Figure 8 reveals that, excluding penalty and own goals, 79 out of the 98 goals scored in the tournament (68%) were made with the foot, 18 (15%) were headers, and 1 (1%) was scored using other body parts (outside the defined parameters). Among the goals scored with the foot, the most goals were scored with the inside of the right foot (34 goals) and the inside of the left foot (24 goals), while the fewest were scored with the outside of the right foot (3 goals; 1%) and the top of the right foot (3 goals).

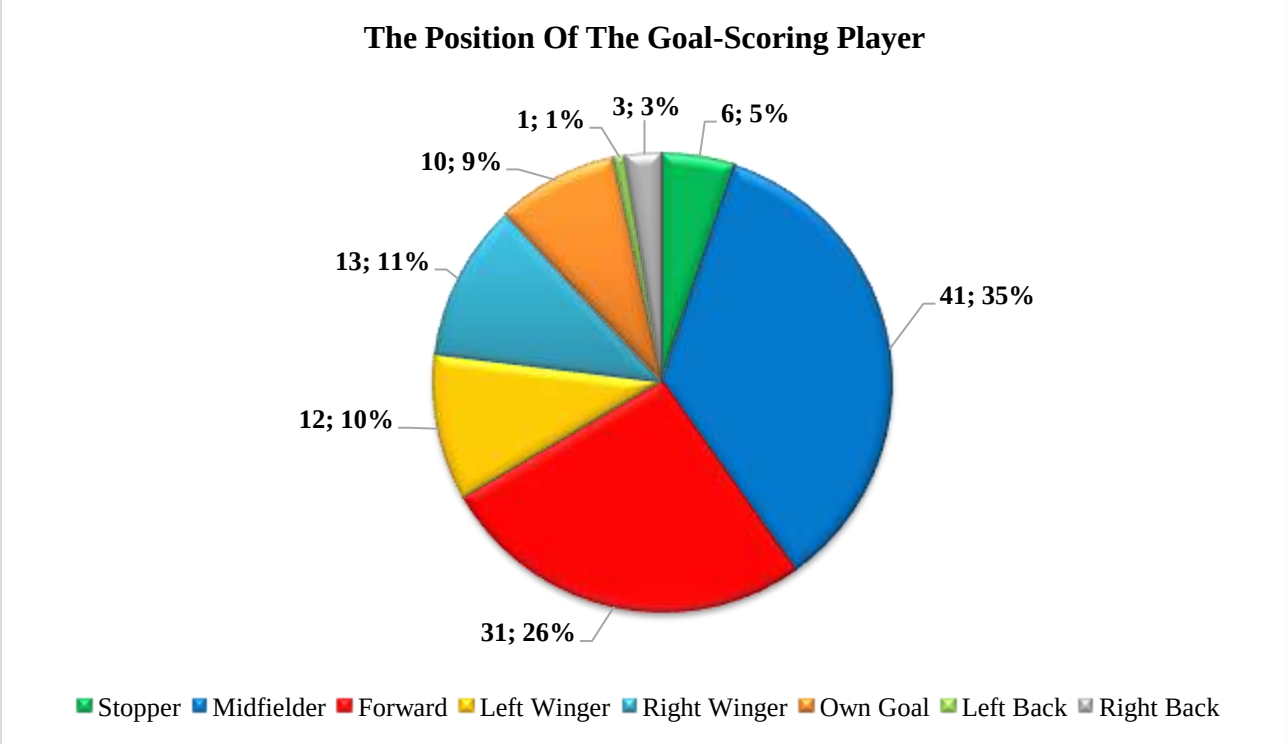

Figure 9. The Position Of The Goal-Scoring Player

An analysis of Figure 9 shows that the majority of goals were scored by midfielders (41 goals; 35%) and forwards (31 goals; 26%), while the fewest goals were scored by left-backs (1 goal; 1%) and right backs (3 goals; 3%).

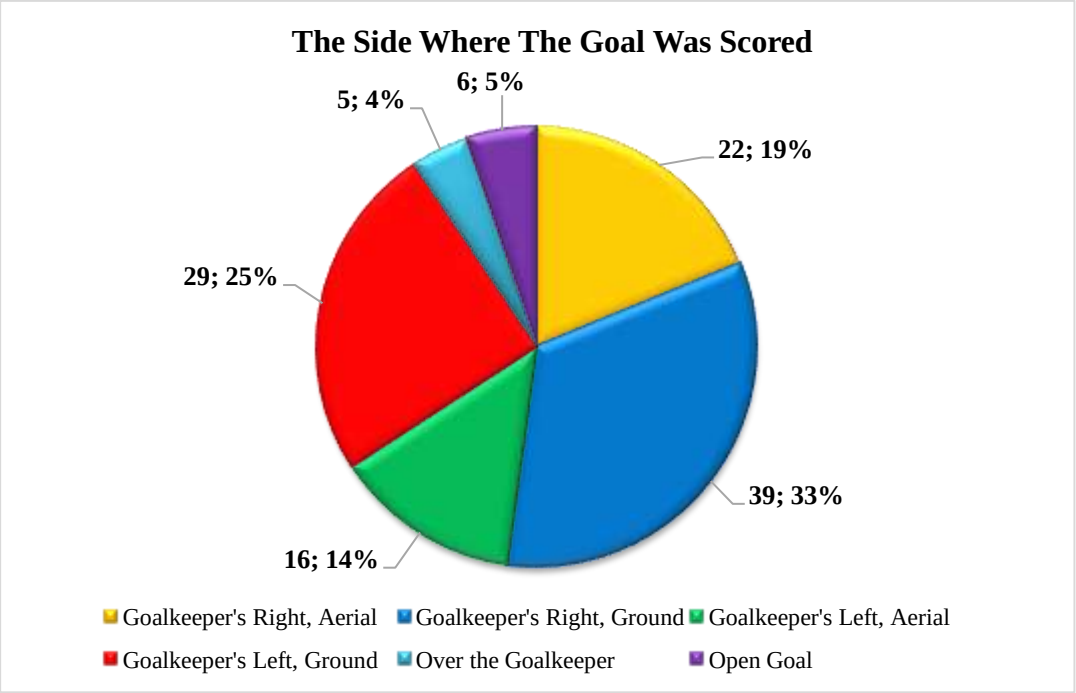

Figure 10. The Side Where The Goal Was Scored

An analysis of the side where the goal was scored shows that the majority of goals were placed to the goalkeeper's right on the ground (39 goals; 33%) and left on the ground (29 goals; 25%), while the fewest goals were scored over the goalkeeper (5 goals; 4%). No goals were scored through the goalkeeper's legs (Figure 10).

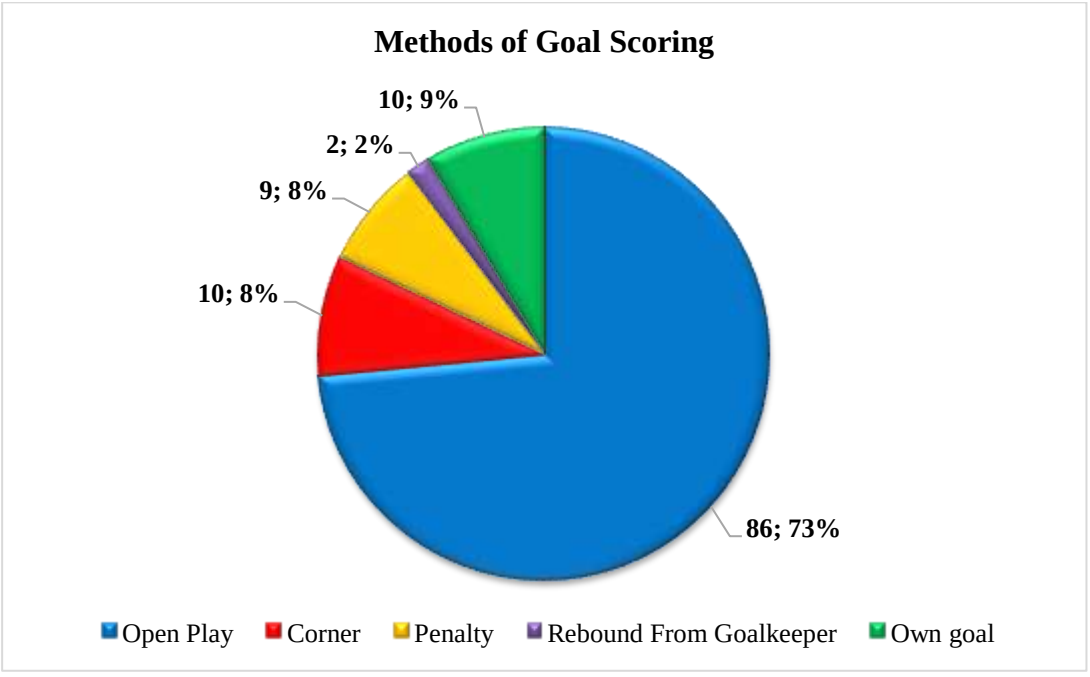

Figure 11. Methods of Goal Scoring

An analysis of the manner in which goals were scored shows that the majority of goals were scored during open play (86 goals; 73%) and from corners (10 goals; 8%), while the fewest goals were scored from rebounds off the goalkeeper (2 goals; 2%).

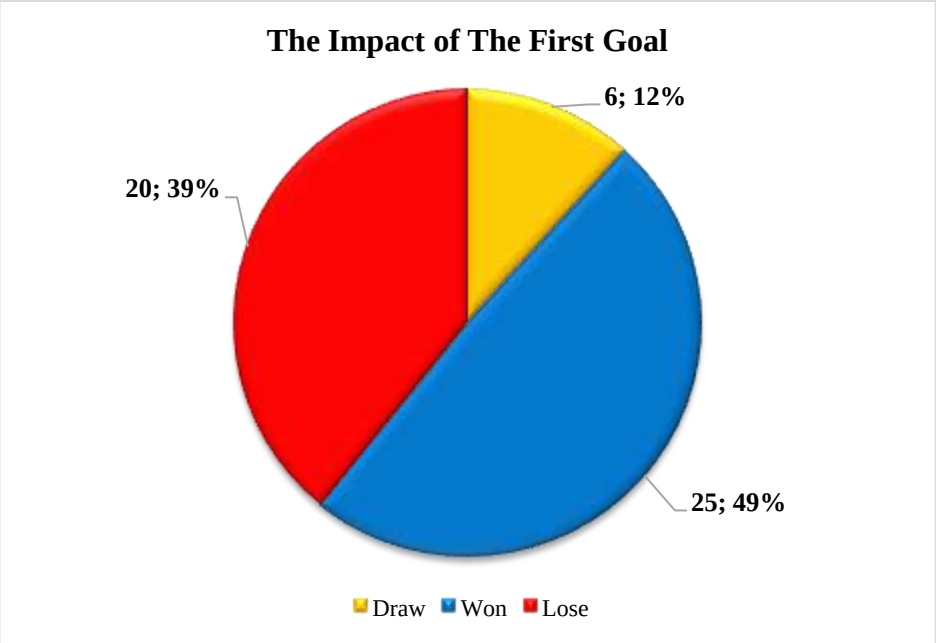

Figure 12. The Impact of The First Goal

When analyzing the impact of the first goal scored in a tournament on the match outcome, it is observed that teams who scored the first goal won 49% of the matches, while 23% of them failed to win despite scoring the first goal. In 6 matches, no goals were scored (Figure 12).

Table 3. Penalty Shot in Open Play

		n	%
Shot Type	Inside of Right Foot	6	66,7
	Top of Right Foot	1	11,1
	Inside of Left Foot	2	22,2
The Side from Which the Shot is Taken	Goalkeeper's Right, Aerial	1	11,1
	Goalkeeper's Right, Ground	3	33,3
	Goalkeeper's Left, Aerial	1	11,1
	Goalkeeper's Left, Ground	4	44,4
Was the Penalty Converted?	Yes	9	%100

	No	0	%0
The Goalkeeper's Corner Preferences	The Correct Choice	4	44,4
	The Wrong Choice	5	55,6

An analysis of penalty shots taken during open play reveals that 9 penalties were taken throughout the tournament. The majority of goals were scored to the goalkeeper's left on the ground (4 goals; 44,4%) using the inside of the right foot (6 goals; 66,7%). During these penalty kicks, goalkeepers made the correct corner choice 4 times and the wrong choice 5 times. All penalties taken during open play resulted in goals (9 goals) (Table 2).

Table 4. Video Assistant Referee (VAR) Decisions

		n	**%**
Reason for VAR	Offside	12	48,0
	Penalty	8	32,0
	Red Card	1	4,0
	Hand Contact With The Ball	3	12,0
	Inside the field of play	1	4,0
	Total	**25**	**100**
Decision	Changed	25	100
	Did Not Change	0	0

VAR was used a total of 25 times throughout the tournament. The most common reasons for VAR interventions were offside and penalty situations, respectively. In all 25 instances where the referees were called to review the VAR footage, their initial decisions were overturned (Table 4).

Discussion and Conclusion

This study examines the goal-scoring patterns observed during the 2024 UEFA European Championship. A total of 117 goals were scored in the tournament, averaging 2.29 goals per match. Of the 117 goals, 51 (43.6%) were scored in the first half, while 66 (56.4%) came in the second half. Previous analyses of goal-scoring patterns in the European Championships, including the 2004, 2012, 2016, and 2020 tournaments, similarly reported that more goals were scored in the second half of matches (Ağyol & Tanyeri, 2022; Çobanoğlu & Terekli, 2018; Leite, 2013; Yiannakos & Armatas, 2006). Likewise, the majority of goals in the 2022 UEFA Women's European Championship were also scored in the second half (Başkaya, 2023). In Kubayi's (2020) analysis of the 2018 FIFA World Cup, the majority of goals were also scored in the second half. The higher number of second-half goals is thought to be a result of the decline in physical performance due to fatigue (Barros, 2007; Rampinini et al.,

2007). Additionally, players entering the second half more motivated and energized, along with tactical and strategic adjustments made by the coaches, could also contribute to the increased number of goals in the second half. When examining the time intervals of the goals, most were scored between the 16th-30th minutes (23 goals), 41st-75th minutes (18 goals), and 76th-90th minutes (18 goals) (Table 2). These results are consistent with those from the 2012 UEFA European Championship (Leite, 2013). This data suggests that teams start the match more cautiously, but as the game progresses, breakdowns occur. Increasing the tempo during these intervals could provide teams with a scoring advantage.

When analyzing assists in the tournament, it was observed that the majority came from Zone 4 (25 assists; inside the penalty area), with ground passes being the most frequent assist type (40 assists), and midfielders contributing the most assists (Figure 3, Figure 4, Figure 5). Similarly, in the 2020 UEFA European Championship, most assists were made by midfielders through ground passes (Ağyol & Tanyeri, 2022). These findings align with our study, highlighting the importance of short passes in assisting goals during the tournament. Short passes provide more security and facilitate quick passing, enabling a fast-paced and fluid style of play, which was a key feature of this tournament. Training focused on developing this playing style could further improve game performance. Moreover, the significant role of midfielders in producing assists was evident, as they play a crucial role in both playmaking and delivering creative passes. Enhancing midfielders' creativity and playmaking abilities could significantly boost the team's offensive effectiveness.

In terms of goal-scoring areas, most goals were scored from Zone 1, Zone 4, and Zone 5 (all inside the penalty area) (Figure 6). Similarly, in the 2016 UEFA European Championship, the majority of goals (90 goals; 83.3%) were also scored from inside the penalty area (Çobanoğlu & Terekli, 2018). Likewise, in the 2010 FIFA World Cup, 82% of goals were scored from within the penalty area (İmamoğlu et al., 2011). The fact that most goals were scored from Zone 1 highlights the high likelihood of scoring when shooting from close range. Shots from this area make it difficult for goalkeepers to react, further increasing the probability of scoring.

When analyzing the number of touches before the goal, the type of shot, the position of the goal-scorer, and the side where the goal was scored, it was found that 69 goals (59%) were scored with a single touch (Figure 7). Similar findings were observed in the 2012 UEFA European Championship, where the majority of goals were also scored with a single touch (Mitrotasios, 2014). These results emphasize the importance of quick decision-making and execution in influencing match outcomes. They also highlight players' technical skills and rapid decision-making during critical moments, offering valuable insights for coaches. In terms of shot types, the most frequent was with the inside of the right foot (34 goals; 29%) (Figure 8). Similar to our study, the 2020 UEFA European Championship also showed that most goals were scored with the right foot (Ağyol & Tanyeri, 2022). Inside-foot shots are known for providing better ball control, which explains why this technique resulted in the most goals. From a defensive perspective, defenders should recognize the inside of the right foot as a threat and adjust their positioning accordingly to enhance defensive performance. Another parameter analyzed was the position of the goal-scorer, with midfielders scoring the most goals (41 goals; 35%) (Figure 9). Similarly, in the 2020 UEFA European Championship, midfielders also scored the most goals (Ağyol & Tanyeri, 2022). The fact that midfielders scored the majority of goals in the tournament may indicate a shift in modern football, where the use of the 4-6-0 formation has increased, and traditional number nines have been replaced by false nines. Thus, it is not surprising that midfielders scored the most goals in the European

Championship. Additionally, this suggests that midfielders making extra runs into the penalty area disrupt the defensive balance, creating situations that are difficult to defend. Coaches could consider these factors when designing offensive training programs. The majority of goals were scored to the goalkeeper's right, on the ground (39 goals; 33%) (Figure 10), and most goals in the tournament were scored during open play (86 goals; 73%) (Figure 11). Similar to our study, the majority of goals in the 2012 UEFA European Championship were also scored during open play (Mitrotasios, 2014). The high percentage of goals (86%) scored during open play demonstrates the effectiveness of players in utilizing the natural flow of the game and capitalizing on opportunities. It also highlights the ability of offensive and midfield players to create and convert chances during the natural progression of play. This further underscores the effectiveness of a fast-paced and dynamic style of play in generating goal-scoring opportunities.

An analysis of the impact of the first goal and parameters during open play indicates that teams scoring the first goal generally won the match (Figure 12). Similarly, teams scoring the first goal also won the match in the 2012 UEFA European Championship (Leite, 2013). Additionally, similar results were observed in the 2024 European Football Championship, as reported by Stafylidis et al. (2024)."

When analyzing penalties during open play, all nine penalties taken in the tournament resulted in goals (Table 3). Most penalties were taken with the inside of the right foot (6 goals; 66.7%), and the shots were placed to the goalkeeper's left, on the ground (4 goals; 44.4%).

Finally, when examining VAR decisions, VAR was used a total of 25 times during the tournament. It was most frequently used for offside (12 instances; 48%) and penalty (8 instances; 32%) situations, with referees overturning their decisions in all 25 cases (Table 4). The frequent use of VAR in offside situations indicates the critical and often contentious nature of these calls. The newly implemented semi-automated offside system helped referees make accurate decisions and reduce potential errors. Additionally, VAR's significant involvement in penalty decisions, which can greatly impact match outcomes, emphasizes its role in ensuring accuracy in critical situations. In conclusion, the 25 instances of VAR intervention during the UEFA 2024 European Championship, where referees changed their decisions each time they consulted the monitor, clearly highlight the critical role of VAR in match management and its effectiveness in ensuring decision accuracy. This demonstrates how VAR has significantly contributed to fair and accurate decisions in football, underscoring the impact of technology on decision-making processes.

Match analysis is one of the most effective ways for coaches to objectively evaluate both their team's and their opponents' performances. The analyses from the 2024 UEFA European Championship have revealed the need to reconsider offensive and defensive strategies. In particular, the goals scored from Zone 1 inside the penalty area and the midfielders' passing connections were among the most notable findings of the tournament. These results suggest that coaches should focus on utilizing Zones 1 and 4 inside the penalty area more effectively in their offensive setups, while improving defensive tactics in these areas. Additionally, the finding that most goals were scored with the inside of the right foot highlights the importance of developing players' technical skills. It is especially important for defenders to be better prepared for such shots, emphasizing the need to strengthen defensive positioning against them. Furthermore, this study shows that in modern football, it is not only the forwards but also the midfielders and wingers who play a crucial role in contributing to the scoreline. In conclusion, planning technical and tactical training based on these insights could improve

both offensive and defensive effectiveness. These findings offer significant contributions to understanding the dynamics of modern football and can serve as a guide for future research.

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