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ORIGINAL ARTICLE

Comparison of goal-scoring patterns between the Euro and Copa América 2024 tournaments through a notational analysis

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ABSTRACT

This study aimed to analyse the goal-scoring patterns in the Euro and Copa America 2024 tournaments through notational methods. A total of 187 goals scored (117 in the Euro and 70 in the Copa America) were analysed. The goal-scoring categories include type of play, type of attack, interval time, starting zone of attack, finishing zone, previous action for scoring, and scoring technique. The results indicated that more goals came from organized attacks and throw-ins in the Euro, while free kicks were more effective in the Copa America. Quick attacks predominated in both tournaments; in Euro, most goals were scored between 16-30 minutes, and in Copa America, between 46-60 and 76-90 minutes. More goals originated from the own half, the right and central zones of the opponent's half in both tournaments, and they were finished in the central zone inside the penalty area, predominantly by shots. Semi-finalist teams in both tournaments scored more goals from deep passes and crosses. In the Copa America, attacks often start from the right zone of the opponent's half. In conclusion, similarities and differences in goal-scoring patterns were observed between the two tournaments. It is necessary to continue exploring associations between the sport performance and goal-scoring patterns.

Keywords: Performance analysis, Football, Sport performance, Match analysis, Observational methodology.

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INTRODUCTION

Football is the most influential and popular sport globally, attracting millions of spectators and generating billions in revenue for clubs, countries, and confederations (Buck & Ifland, 2023). These economic benefits drive the development and expansion of the sport worldwide (Nikolaou et al., 2023). FIFA (Fédération Internationale de Football Association), along with its federations, organizes various high-level competitions, such as the Euro regulated by the Union Européenne de Football Association (UEFA), where European national teams compete and the Copa América, organized by South American Football Confederation (CONMEBOL), where South American countries compete. In 2024, both tournaments were held simultaneously in Germany (Euro) and the United States (Copa América), solidifying their status as key events that keep international footballers active.

The most significant change in contemporary football is integrating science and technology to address its challenges, mainly through increasingly advanced data analysis tools that have revolutionized game interpretation by providing insights into physical, technical, and tactical performance, which are crucial for preparing national teams for international tournaments. Football is a highly complex, dynamic, and interactive sport, with multiple factors influencing performance and determining the game's success (Michailidis et al., 2018). In this regard, notational analysis is a technique that involves creating a detailed and permanent record of game events through the observation of tactical analysts (James, 2006), and it can offer valuable information for coaches and players, contributing to the continuous improvement of the training process. This methodology has been employed to analyse elite clubs such as Real Madrid and FC Barcelona (López Bondia et al., 2017), as well as various top European leagues (Aguado-Méndez et al., 2021; Bamplekis et al., 2021).

Notational analysis has been widely used to study the playing patterns that lead to scoring goals (de Pablo et al., 2019; Gouveia et al., 2023). Goals are the decisive event that determines a team's success (Lago-Peñas et al., 2011). In recent major international competitions, such as the 2022 World Cup, the 2024 European Championship, and the Copa América, the results were decided by a single goal. This highlights the critical importance of goals in football. Furthermore, contextual variables such as match location, opponent quality, and the scoreline influence the creation of goal-scoring opportunities (Gonzalez-Rodenas et al., 2015). Incorporating the analysis of goal-scoring plays into notational studies can provide the scientific community with insights into the advancements and evolution of modern football games and help better understand the differences in tournaments (Li & Zhao, 2021).

Supported by scientific literature, notational analyses have been applied to study goals in different local leagues (Aguado-Méndez et al., 2021; Bamplekis et al., 2021; Li & Zhao, 2021) during the FIFA World Cup (Kubayi & Toriola, 2019; Mićović et al., 2023; Njororai, 2013) and the European Championship (Leite, 2013; Smith & Bedwell, 2021; Tousios et al., 2018; Yiannakos & Armatas, 2006) Specifically, in competitions like the European Championships, a study using data from Euro 2004 reported that long passes were the most frequent actions leading to goals (34.1%), and among set-piece situations, corners and free kicks predominated in the game (Yiannakos & Armatas, 2006). During the 2012 and 2016 Euro editions, it was identified that most goals were scored in the second half, the team that scored first won most matches, and organized attacks were the most common way to score (Leite, 2013; Tousios et al., 2018). Data from Euro 2020 determined that goals were predominantly scored from central areas of the field, with passes coming from both central and wide areas (Smith & Bedwell, 2021).

In competitions on the American continent, few studies have been carried out analysing goal patterns during national team tournaments. In the 2019 Gold Cup (competition official of the Confederation of North, Central American and Caribbean Association Football) it was found an association between the order of scoring and the match result, and 61.5% of goals were achieved through organized attacks (Ugalde Ramírez & Rodríguez Porras, 2021). In the 2021 Copa América, 44.6% of goals were scored in the first half, while 55.4% were scored in the second half. Additionally, 87.7% of goals were scored inside the penalty area, while only 12.3% were outside (Ahmad et al., 2022).

On the other hand, when the goal-scoring patterns between these two competitions have been compared, there was a higher frequency of goals in the first 15-minute interval during the 2016 Copa América compared to the first 15-minutes of the 2016 European Championship (Lastella et al., 2018). Another study compared set-piece plays between these two tournaments without finding significant differences. However, it emphasized that notational analysis in these tournaments can help performance analysts identify similarities between teams from different confederations and establish key points for match and tournament strategy (Muriarte Solana et al., 2023).

Based on the above, and because differences have been found between the various leagues (Li & Zhao, 2021; Mitrotasios et al., 2019) and national teams (Ahmad et al., 2020) in terms of goal patterns and attacking styles, it is interesting to explore the scoring patterns between two of the most important national team competitions in the world. Finally, it is essential to consider the advancement and updating of competition data in the most demanding and competitive settings so that sports science can continue to evolve. Therefore, this study aimed to compare the goal-scoring patterns in the Euro and Copa America 2024 tournaments through notational analysis.

METHODS

Sample

The 187 goals scored in the Euro and Copa América 2024 tournament editions were analysed. The Euro was played in Germany, featuring a competitive calendar of 51 matches, during which 117 goals were scored. A total of 24 national teams participated. The Copa America was held in the United States; 25 matches were played, and 70 goals were scored. 16 national teams participated in the Copa América, five from the Confederation of North, Central America, and Caribbean Association Football (CONCACAF) and eleven from the South American Football Confederation (CONMEBOL).

Procedure

This study used an observational technique (Anguera & Mendo, 2015), and different categories were used to analyse and classify scoring patterns in the 2024 Copa América and Euro. The video analyses were conducted based on viewing match replays through authorized television channels and platforms with broadcasting rights. Therefore, this research did not require ethics committee approval or informed consent, although the provisions of the Declaration of Helsinki were followed.

The scoring patterns were analysed in categories shown in Table 1. Additionally, two sport performance variables were considered: the final match result and the ranking position at the end of the tournament.

Table 1. Variables for analysing scoring patterns in the Euro and Copa América.

Category	Description
Type of play	Goals were classified as coming from open play or set pieces based on how the attacking play that led to each goal originated. A) Open play: situations in which the ball was in play, either in the possession of the attacking team or the opposing team, allowing for an attack without the game being interrupted by an infraction or the ball going out of play. B) Set pieces: all attacks that originated from a corner kick, direct or indirect free kick, penalty, or throw-in were considered.
Type of attack in open play	This category considered the type of attack generated during open play. The attacks were divided into four types: A) Counterattack: possession begins by winning the ball in play, and it is characterized by: - Progression toward the goal attempts to use an element of imbalance from start to finish at a high pace. - Ball circulation occurs more in-depth than width, and the team's intention when attacking is to exploit the space left by the opponent. - The opposing team needs to have the opportunity to minimize the element of surprise, reorganize their system, or be defensively prepared. B) Organized Attack: possession begins by winning the ball in play or restarting the game, and it is characterized by: - Progression toward the goal involves a high number of short and non-penetrative passes. - Ball circulation occurs more in width than depth (Sarmento et al., 2018), and the team intends to disrupt the opponent using a large number of passes and a relatively slow tempo (qualitatively assessed). - The opposing team can minimize the element of surprise, reorganize their system, and be defensively prepared. C) Quick Attack: possession begins by winning the ball in play or restarting the game, and it is characterized by: - The progression toward the goal involves a high number of penetrating and short passes. - Ball circulation occurs both in width and depth (Sarmento et al., 2018), but the team intends to disrupt the opponent with a reduced number of passes and a high tempo (qualitatively assessed). - The opposing team can minimize the element of surprise, reorganize their system, and be defensively prepared. D) Direct Attack: possession begins by winning the ball in play or restarting the game, and it is characterized by: - The progression toward the goal is based on a long pass from defenders to forwards (qualitatively assessed). - Ball circulation occurs more in-depth than width, and the team intends to bring the ball directly near the goal area to create shooting opportunities using a reduced number of passes and a high tempo. - The opposing team can minimize the element of surprise, reorganize their system, and be defensively prepared.
Type of attack in set pieces	This category considered the type of attack generated during a set piece. The attacks were divided into four types: A) Free Kick is taken after the defensive team has been called for a foul. It is taken from outside the opponent's penalty area. It is divided into direct free kicks, in which the player takes the kick and shoots directly at the goal, or indirectly, when there must be at least two touches before the goal is scored. B) Corner is executed from one of the corners of the field after the ball has contacted a player of the opposing team and has completely crossed the goal line on the ground or in the air. It could be restarted with a direct cross into the area or with a pass. C) Throw-in: throw-in restarts play when the ball completely crosses the lines, either on the ground or in the air, after being touched by a player on the opposing team. The team awards the throw-in and performs it from where the ball went out of play. D) Penalty is executed after a player from the defensive team commits a foul inside the area.
Intervals time	Goals were grouped into seven 15-minute intervals. These intervals were: a) 0-15, b) 15-30, c) 30-45, d) 45-60, e) 60-75, f) 75-90, and g) extra time.
Starting zone of attack	Goals were grouped according to the area where the ball was recovered and/or where the attack that led to the goal began: - Own half: Goals where the attack started from the team's own half of the field. - Opponent's half left zone: Goals where the attack began from a ball recovery or play initiation in the left zone of the opponent's half. - Opponent's half central zone: Goals where the attack began from a ball recovery or play initiation in the central zone of the opponent's half. - Opponent's half right zone: Goals where the attack begins from a ball recovery or play initiation in the right zone of the opponent's half. - Inside the penalty area: Goals where the attack started from a ball recovery inside the opponent's penalty area. See Figure 1. A.

Finishing zone	Goals were grouped according to the area from which the goal was scored: - Outside the penalty area: Goals scored from outside the penalty area are classified into the central zone, the left zone, and the right zone. - Inside the penalty area: Goals scored from inside the penalty area are classified into the central zone, left zone, and right zone. See Figure 1. B.
Previous action for scoring	This category considered the previous action before the player shot and ended in a goal. The following actions were analysed: A) Deep pass: This is a low pass directed toward the goal that manages to overcome the last rival defence line and leaves the striker in front of the goal, which generates a clear goal-scoring opportunity. B) Ground pass: A low-lying or grass-based pass performed from one player to another in any direction. Forward, diagonal, horizontal, backward. C) High Long forward pass: A long pass at a high height in a forward direction that manages to overcome rival defensive lines is received by a teammate who shoots at one touch or two. D) Cross: it is a high pass that is sent from the opponent's side of the pitch into the penalty area to create goal-scoring opportunities. E) Dribbling: the player faces one or more opposing defenders and dribbles them after receiving a pass or collecting a free ball, creating a goal-scoring opportunity for himself. F) Foul: when an infringement is committed during the game, and the referee marks a direct free kick or penalty, which results in a goal. G) Defensive Touch of Opponents: After a shot or cross, the goalkeeper or a player from the defending team contacts the ball with the intention to block, deflect, or clear it. The ball is deflected into a free zone, where a player collects it, takes advantage of it, and shoots to score. H) Defensive errors' opponent: when a player from the opposing team makes a clear mistake that gives the opponent a scoring opportunity.
Scoring technique	According to the technical used by the player to score, the following subcategories were established: A) Shoot is when the player shoots at the goal with one, two, or more touches while the ball is on the ground. B) Volley: the shot is made with the foot while the ball is in the air. C) Header: the shot is made with a header. D) Other body part: a different body part (e.g., chest, thigh, hip).

Note: Own goals were analysed by considering whether they were scored during open play or from set pieces, separately.

Figure 1. Representation of the field zones to determine the starting and finishing of attacks.

Once the categories were established, an ad hoc instrument was designed for recording goals in the open-source software LINCE Plus (Soto et al., 2019). The researchers had a familiarization period with the instrument, during which they conducted preliminary tests. After that, the visualization and recording of the

goals were carried out in two moments. To improve the reliability of the data, there should be a difference of more than 24 hours between observations, and to accurately identify, the video could be paused, replayed, and played as many times as needed during the video analysis (Bloomfield et al., 2004).

Statistical analysis

First, Cohen's Kappa coefficients were used to analyse the reliability of the data recorded by intra-observer video analysis, while the inter-observer agreement was determined using the Fleiss coefficient (O'Donoghue, 2010).

Secondly, absolute values (frequencies) and percentages of the goals scored were calculated based on the defined categories. Non-parametric Chi-Square (X^2) goodness-of-fit tests were applied to compare the proportions inside the categories in each competition separately. Chi-Square (X^2) of independence tests were used: 1) to relate scoring patterns between both competitions, 2) to check the association with sport performance categories as match result and place achieved at the final tournament, 3) to determine dependence between the different categories of goal scoring. When statistical significance was identified, a Z-test was applied to compare proportions, adjusting the p-value by Bonferroni correction. The magnitude of the association was evaluated using Cramer's V, classified according to Cohen (1988): V = 0.10 small, V = 0.30 medium, and V = 0.50 large.

All analyses were performed using the software SPSS (IBM Statistics, Version 26). A p-value < .05 was considered the statistical significance threshold for all analyses.

RESULTS

The results of the reliability of data are shown in Table 2. Both the Kappa's Cohen coefficients for intra-observers and the Kappa's Fleiss coefficients for inter-observers were over 0.9, which is classified as excellent (O'Donoghue, 2010).

Table 2. Results of intra-observer and inter-observer through Kappa analysis.

Category	Kappa Cohen		Kappa Fleiss
	Ob1	Ob2	
Type of play	1.00	1.00	1.00
Type of attack	0.95	0.98	0.97
Intervals time	0.98	0.97	0.98
Starting zone of attack	0.98	0.99	0.97
Finishing zone	0.97	0.98	0.94
Previous action for scoring	0.96	0.92	0.98
Scoring technique	1.00	1.00	1.00

Note. Ob1: observer 1: Ob2: observer 2.

Table 3 shows each scoring category's absolute and relative values according to competition. Chi-Square analysis (X^2) of independence found an association between the type of attack, both open play and set pieces. More goals were scored in the Euro through an organized attack than in the Copa America (E = 27.3% vs CA = 6.5%). In set pieces, at the Euros, more goals originated through throw-ins (E = 27.6% vs. CA = 11.1%), and in the Copa America, more goals were scored from free kicks (E = 0% vs. CA = 33.3%).

In addition, the statistical values of the Chi-Square (X^2) goodness-of-fit tests for each tournament with some significant results are observed in Table 3. In both competitions, the type of play through which most goals

were scored was open play. The most goals were scored in both competitions by quick attack (E = 42% and CA = 63%). In the Euro, the interval time during which most goals were scored was between 16 and 30 minutes (19.7%), while in the Copa America, it was between 46-60 and 76-90 minutes (15.7% for each interval). In the Euro, the most frequent area of the field from which the goal play was started was the own half and the right zone of the opponent's field (35.9% and 26.5%, respectively). In the Copa America, the most frequent starting areas were the central zone of the opponent's field (27.1%). The central zone inside the opponent's penalty area was where most goals were scored in both competitions (E = 67.5% and CA = 67.1%). The most prevalent pre-play actions in the Euro were ground passes and crosses (29.9% and 23.1%, respectively); in the Copa America, there were crosses and deep passes (22.9% and 21.4%, respectively). In both competitions, 73% of goals were scored through a shot.

Table 3. Number of absolute and relative goals (percentages) and statistical values for each competition, scoring category, and statistical test performed.

	Euro		Copa America		Euro X Copa America		Euro		Copa America	
	n	%	n	%	χ^2 (*p*)	Cramer V	χ^2 (*p*)	Cramer V	χ^2 (*p*)	Cramer V
Type of play										
Play open	88	75.2	46	65.7	1.946 (.163)	0.102	29.752 (<.001)*	0.504	6.914 (.009)*	0.314
Set pieces	29	24.8	24	34.3						
Type of attack by play open										
Organized Attack	24	27.3	3	6.5	11,455 (.022)*	0.292	38.705 (<.001)*	0.575	36.609 (<.001)*	0.723
Quick Attack	37	42.0	29	63.0						
Counterattack	13	14.8	8	17.4						
Direct Attack	10	11.4	6	13.0						
Own goal	4	4.5	0	0						
Type of attack by set pieces										
Free kick	0	0.0	8	33.3	14,905 (.005)*	0.292	7.828 (.051)	0.258	6.333 (.096)	0.301
Corner	11	37.9	9	37.5						
Throw-in	8	27.6	1	11.1						
Penalty	9	30.1	6	25.1						
Own goal	5	3.4	0	0.0						
Intervals time										
0-15	16	13.7	10	14.3	5.619 (.777)	0.173	47.359 (<.001)*	0.636	13.571 (.094)	0.444
16-30	23	19.7	7	10.0						
31-45	9	7.7	10	14.3						
45+	3	2.6	3	4.3						
46-60	18	15.4	11	15.7						
61-75	17	14.5	10	14.3						
76-90	17	14.5	11	15.7						
90+	12	10.3	7	10.0						
Extra 90-105	1	0.9	0	0						
Extra 105-120	1	0.9	1	1.4						
Starting zone of attack										
Own half	42	35.9	18	25.7	5.075 (.280)	0.165	41.419 (<.001)*	0.594	14.429 (.006)*	0.454
OH central zone	16	13.7	19	27.1						
OH right zone	31	26.5	18	25.7						
OH left zone	20	17.1	13	18.6						
IPA	1	0.9	2	2.9						
Finishing zone										
IPA, central zone	79	67.5	47	67.1	8.745 (.120)	0.216	167.658 (<.001)*	1.197	129.543 (<.001)*	1.360
IPA, right zone	8	6.8	7	10.0						
IPA, left zone	12	10.3	5	7.1						
OPA, central zone	14	12.0	5	7.1						
OPA, right zone	4	3.4	2	2.9						

OPA, left zone	0	0	4	5.7						
Previous action for scoring										
Deep pass	15	12.8	15	21.4						
Ground pass	35	29.9	10	14.3						
High Long forward pass	6	5.1	5	7.1						
Cross	27	23.1	16	22.9	8.489	0.213	57.017	0.698	17.314 (.015)	0.497
Dribbling	13	11.1	6	8.6	(.291)		(<.001)			
Foul	9	7.7	7	10.0						
Defensive clearances Opponents	8	6.8	8	11.4						
Defensive errors' opponent	4	3.4	3	4.3						
Scoring technique										
Shotting	86	73.5	51	73						
Volley	6	5.1	6	9	2.658	0.119	156.538	1.156	50.257	0.847
Header	23	19.7	13	19	(.447)		(<.001)		(<.001)	
Other body part	2	1.7	0	0.0						

*Notes: * = Statistical significance. Abbreviations: Fr = frequency, % = percentage; OH = opponent's half; IPA = inside penalty area; OPA = outside penalty area.*

The statistics from the Chi-Square (X^2) analysis of independence for match result and whether the team reached the semi-finals are shown in Table 4. There is an association between the previous actions and whether the team was a semi-finalist in the Euro. Semi-finalist teams scored the most goals preceded by a dribble, deep pass, and ground pass (24.3% for each action), while non-semi-finalist teams scored more goals preceded by a ground pass and crosses (32.5% and 22.5%, respectively). In the Copa America, there was an association between the previous action and the starting zone of the attack, with the fact of being a semi-finalist or not. Semi-finalist teams scored more goals, preceded by deep passes and crosses (30.6% and 27.8% respectively). In turn, these teams scored more goals that started from the right side of the opponent's half (38.9%). Non-semi-finalist teams scored more goals, preceded by dribbles and crosses (17.6% for each action), most originating from the central field (32.4%).

Table 4. Associations among goal-scoring categories with the match result and the position occupied in the tournament.

	Final match result				**Position occupied in the tournament**			
	Euro		**Copa America**		**Euro**		**Copa America**	
	χ^2 (*p*)	**Cramer V**	**χ^2 (*p*)**	**Cramer V**	**χ^2 (*p*)**	**Cramer V**	**χ^2 (*p*)**	**Cramer V**
Type of play	4.200 (.122)	0.189	1.461 (.482)	0.144	2.132 (.144)	0.135	3.395 (.065)	0.220
Type of attack	17.055 (.204)	0.278	17.044 (.254)	0.349	4.843 (.679)	0.203	7.928 (.339)	0.337
Intervals time	14.472 (.698)	0.249	12.607 (.701)	0.424	8.334 (.501)	0.267	5.930 (.655)	0.291
Starting zone of attack	3.273 (.918)	0.167	9.722 (.285)	0.264	8.858 (.065)	0.275	10.126 (.038)*	0.380
Finishing zone	10.374 (.240)	0.298	4.194 (.938)	0.173	6.749 (.150)	0.240	6.877 (.230)	0.313
Previous action for scoring	22.056 (.077)	0.307	15.048 (.375)	0.328	15.517 (.030)*	0.364	14.464 (.044)*	0.455
Scoring technique	3.157 (.789)	0.164	2.166 (.705)	0.124	1.122 (.772)	0.098	2.044 (.360)	0.171

*Notes: * = Statistical significance.*

The statistical results of the association categories for the Euro can be seen in Table 5. In open play, it was identified that 47.7% of goals started in the own half; more specifically, 54.1% of quick attacks, 84.6% of counterattacks, and 70% of direct attacks originated from the own half. From the opponent's right half, 51.7%

of goals were scored from set pieces. In open play, 33% of goals were preceded by a ground pass and 18.2% by crosses. A cross preceded 37.9% of goals scored from set pieces. Specifically, 72.7% were scored by a cross from a corner. 79.5% of goals scored from open play were scored with shots.

In the 16–30-minute interval time, 34.8% of the goals were scored from inside the opponent's half and from the opponent's centre. Goals whose attacks started inside the opponent's half were preceded by a ground pass in 37.2% of cases and deep passes in 23.3%. A ground pass preceded 33.3% of the goals that originated in the opponent's centre, and from the opponent's right half, the cross was the predominant action before the goal in 30.3%.

Of the goals scored in the centre zone inside the penalty area, 30.4% were preceded by a cross and 29.1% by a ground pass. 50% of the goals scored from the centre zone outside the penalty area were preceded by a ground pass.

Table 5. Matrix of associations among the categories analysed for Euro 2024.

Category	Type of play	Type of attack open play	Type of attack set pieces	Intervals Time	Starting Zone of Attack	Finishing Zone	Previous action for scoring
Intervals Time	$\chi^2 = 8.422$ *p = .492* *C'V = 0.259*	$\chi^2 = 29.403$ *p = .599* *C'V =0.289*	$\chi^2 = 25.011$ *p = .405* *C'V = 0.536*				
Starting zone of attack	$\chi^2 = 27.898$ *p < .001** *C'V = 0.488*	$\chi^2 = 30.460$ *p = .002** *C'V = 0.340*	$\chi^2 = 17.112$ *p = .145* *C'V = 0.443*	$\chi^2 = 60.191$ *p = .007** *C'V = 0.583*			
Finishing zone	$\chi^2 = 5.376$ *p = .251* *C'V = 0.214*	$\chi^2 = 17.848$ *p = .333* *C'V = 0.225*	$\chi^2 = 12.879$ *p = .168* *C'V = 0.385*	$\chi^2 = 27.572$ *p = .842* *C'V = 0.437*	$\chi^2 = 15.364$ *p = .498* *C'V = 0.181*		
Previous action for scoring	$\chi^2 = 49.346$ *p < .001** *C'V = 0.649*	$\chi^2 = 33.971$ *p = .085* *C'V = 0.311*	$\chi^2 = 41.648$ *p < .001** *C'V = 0.692*	$\chi^2 = 72.773$ *p = .187* *C'V = 0.619*	$\chi^2 = 51.748$ *p = .004** *C'V = 0.333*	$\chi^2 = 57.653$ *p = .001** *C'V = 0.351*	
Scoring technique	$\chi^2 = 8.745$ *p = .033** *C'V = 0.273*	$\chi^2 = 58.660$ *p < .001** *C'V=0.471*	$\chi^2 = 18.964$ *p = .004** *C'V= 0.572*	$\chi^2 = 34.538$ *p = .151* *C'V = 0.477*	$\chi^2 = 15.924$ *p = .195* *C'V = 0.369*	$\chi^2 = 13.782$ *p = .315* *C'V = 0.198*	$\chi^2 = 89.121$ *p < .001** *C'V = 0.504*

*Notes: * = Statistical significance. C'V = Cramer's V.*

Table 6. Matrix of associations among the categories analysed for the Copa America 2024.

Category	Type of play	Type of attack open play	Type of attack set pieces	Intervals Time	Starting Zone of Attack	Finishing Zone	Previous action for scoring
Intervals time	$\chi^2 = 14.651$ *p = .066* *C'V = 0.457*	$\chi^2 = 15.607$ *p = .902* *C'V = 0.336*	$\chi^2 = 12.597$ *p = .922* *C'V = 0.418*				
Starting zone of attack	$\chi^2 = 18.466$ *p < .001** *C'V = 0.514*	$\chi^2 = 25.576$ *p = .002** *C'V = 0.431*	$\chi^2 = 17.013$ *p = .149* *C'V = 0.486*	$\chi^2 = 34.025$ *p = .370* *C'V = 0.349*			
Finishing zone	$\chi^2 = 11.182$ *p = .048** *C'V = 0.401*	$\chi^2 = 28.490$ *p = .019** *C'V = 0.454*	$\chi^2 = 3.742$ *p = .711* *C'V = 0.279*	$\chi^2 = 43.255$ *p = .334* *C'V = 0.352*	$\chi^2 = 26.303$ *p = .156* *C'V = 0.306*		
Previous action for scoring	$\chi^2 = 20.277$ *p = .005** *C'V = 0.538*	$\chi^2 = 25.459$ *p = .228* *C'V = 0.430*	$\chi^2 = 53.574$ *p < .001** *C'V = 0.863*	$\chi^2 = 54.917$ *p = .516* *C'V = 0.335*	$\chi^2 = 51.793$ *p = .004** *C'V = 0.430*	$\chi^2 = 55.946$ *p = .014** *C'V = 0.400*	
Scoring technique	$\chi^2 = 5.650$ *p = .059* *C'V = 0.284*	$\chi^2 = 3.861$ *p = .695* *C'V = 0.205*	$\chi^2 = 7.244$ *p = .299* *C'V = 0.388*	$\chi^2 = 16.588$ *p = .413* *C'V = 0.344*	$\chi^2 = 12.811$ *p = .119* *C'V = 0.303*	$\chi^2 = 13.702$ *p = .187* *C'V = 0.313*	$\chi^2 = 46.464$ *p < .001** *C'V = 0.576*

*Notes: * = Statistical significance. C'V= Cramer's V.*

Table 6 shows the statistical results of the association between categories for the Copa America. It was found that, of the total goals scored from open play, 37% and 32.6% were initiated in the opponent's half and the central zone of the opponent's half, respectively. Of all goals, 54.3% were finished in the central zone of the area. More specifically, 37.9% of the goals scored through quick attacks began in the central zone of the opponent's half, and 62.1% of the quick attacks ended in the central zone of the area.

Meanwhile, 45.8% of the goals scored through set pieces originated from the right side of the opponent's half, and 91.7% of all goals were scored in the central zone of the opponent's half. The deep ball was the previous action that prevailed for goals that originated in the opponent's half (33.3%) and the opponent's right half (31.6%). 27.7% and 21.3% of goals inside the opponent's box were preceded by a cross and a deep pass, respectively. 62.5% of headed goals were preceded by a cross.

DISCUSSION

The aim of this study was to analyse the goal-scoring patterns in the 2024 Euro and Copa America tournaments through notational analysis. The ability to score goals is considered one of the key factors that may determine the outcome of a game and allows for establishing similarities and differences between teams (Lago-Peñas et al., 2011) and competitions (Mitrotasios et al., 2019). Therefore, its analysis and understanding are relevant.

The main results show a relationship between both competitions only in the type of attack in both open play and set pieces. In the Euro, 27% of goals were scored through an organized attack, while in the Copa America, only 6% were scored this way. The fast attack was through which most goals were scored in both competitions. The studies found that established comparisons between both competitions did not include analyses related to the type of attack. In Euro 2004 and 2012, it was found that more than 44% of goals scored were achieved through organized attacks (Leite, 2013; Yiannakos & Armatas, 2006). In the Copa America, no studies have examined these variables. However, analysing another competition, such as the Gold Cup in 2019, it was also found that a greater number of goals (67%) were scored through organized attacks (Ugalde Ramírez & Rodríguez Porras, 2021).

In other international tournaments, such as the World Cups from 1966 to 2018, it was observed that most goals were scored through open play and collective attack (Mićović et al., 2023). In top European leagues such as La Liga (Spain), Premier League (England), Bundesliga (Germany), and Serie A (Italy), the type of attack most frequent to create scoring opportunities were counter-attacks (33.5 ± 32.3%), and the least frequent was the quick attacks (16.1 ± 20.3%) (Mitrotasios et al., 2019). The latter differs somewhat from what was found at Euro and Copa America 2024, tournaments in which fast attacking scored more goals. The difference may be due to the competitive context, as the type of attack and defence used during long tournaments, such as local leagues, may differ from the demands in shorter tournaments.

The type of attack that each team uses will depend on its game model, match status, score, and player characteristics. In addition, the type of defence the opponent used is key when determining the effectiveness of the attacks. In Major League Soccer (USA), counterattacks were more effective in creating scoring opportunities when the opponent was defensively unbalanced, while long possessions were more effective in balanced defences (Gonzalez-Rodenas et al., 2015). The type of attack is a key element in matches, and the game's dynamics currently reflect that speed of execution and decision-making prevail. Based on the data, the chances of scoring are quite high when attack sequences are carried out with four passes or less

(ratio = 1:10.5) (Wright et al., 2011). The increase of one second in the offensive sequence and one extra pass reduced the probability of success by 2% and 7% (Sarmento et al., 2018).

Scientific literature has identified that goals scored from set pieces and collective actions have been gaining prominence (Mićović et al., 2023; Pratas et al., 2018). Set Pieces have become more important when a team is looking for goals because they are an excellent option when they cannot be achieved in open play due to the opponent's defensive strategies (Njororai, 2013). In this study, corners were the set-piece action that allowed the most goals to be scored in the Euro and Copa America 2024. In a comparative study of previous editions of these competitions, no significant differences were found in the categories analysed; the only difference was in the height of the pass at the time of sending the ball, although it does not distinguish whether it was in free kicks or Corners (Muriarte Solana et al., 2023). In other competitions, such as the UEFA Champions League, it is highlighted that corners, penalties, and indirect free kicks are how most goals are scored (Michailidis et al., 2018). Corners are actions in which teams plan offensively what they will do in advance based on the defensive behaviour of the rival, which provides a high chance of scoring.

In the Euro, the starting zone of the attack was mainly in their own half. In the Copa America, similar percentages are shown between goals scored, originating from the own half and the central and right zones of the opponent's half. Statistics from European leagues show that attacks that ended in goals began in the middle third of the field after the ball was recovered (Gouveia et al., 2023). In addition, the starting zone was a category associated with the position occupied by the team in the Copa America. The semi-finalist teams scored more goals that started in the opponent's right half. Research shows that around 62% of goals start in the opponent's half (Wright et al., 2011), even the chances of an attack being successful (ending in a goal) increase by 1.5% when they start in the 2nd or third quarter of the field (Sarmento et al., 2018). Furthermore, complementing this, there is a significant relationship between ball recovery in the opponent's field and goals scored (Aguado-Méndez et al., 2021).

In previous editions of Euro 2012, more than 70% of goals were scored from inside the penalty area (Michailidis et al., 2013), consistent with what was found in both competitions for 2024. In Euro 2020, goals were scored from central areas of the pitch following assist passes delivered from both central and wide zones (Smith & Bedwell, 2021). This factor must be taken into account, as the closer to the goal a shot is taken, the more likely it is to score (Park et al., 2016). In contrast, shots from outside the area and external zones require a moderate-to-high technical level from the players, so their effectiveness is not high (Sarmento et al., 2018).

The most prevalent pre-scoring actions were through balls, low passes, and crosses in both competitions. In the 2012 and 2016 European Championships, it was identified that key moments leading to a goal were more frequent following a cross or a deep pass in open play (Tousios et al., 2018). In European leagues, it was reported that around 64% of goal opportunities are predicted by a pass (Mitrotasios et al., 2019). In Uruguayan football, it was found that the two most prevalent sequences were pass-shot-goal and shot-rebound-shot-goal (de Pablo et al., 2019). In the Champions League, goals were mainly scored after combinations and crosses in open play, while corners and penalties dominated set plays (Michailidis et al., 2018). These actions are closely associated with each team's playing style and the players' physical, anthropometric, and technical characteristics, mainly the forwards (López Bondia et al., 2017).

Finally, in this 2024 edition, no differences were found between the 15-minute intervals for both competitions. In previous editions of both competitions, in 2016, the Goal-scoring frequency was higher in the first 15 minutes of the Copa America (24%) compared to the same period in the European Championship (Lastella

et al., 2018). Conversely, and only analysing the 2021 Copa America, there was no significant difference in goals scored between the first and second halves (Ahmad et al., 2022). In the World Cups from 1998 to 2014, no differences were found in the number of goals scored in the 15-minute periods (Kubayi & Toriola, 2019). Some studies indicate that most goals are scored in the last 15 minutes of the match (Bamplekis et al., 2021; Li & Zhao, 2021). Scoring more goals at the end of the match can be justified by reasons such as physical and mental fatigue, tactical lapses in concentration, offensive, risky decision-making that leaves the defensive zone vulnerable and allows the opponent to take advantage while scoring more goals in the first few minutes can be due to inattention on the part of the players and previously planned opponent tactics that take advantage of defensive lapses and manage to overcome them.

CONCLUSIONS

This study provides information regarding the scoring patterns of two of the main national team competitions in the world, identifying some similarities and differences between the two tournaments.
In the Euro, a higher percentage of goals came from organized attacks compared to the Copa America (27.3% vs. 6.5%), while in the Euro, more goals were scored via throw-ins (27.6% vs. 11.1%) and Copa America there were more goals from free kicks (33.3% vs. 0%).

The interval time during which most goals were scored differed between competitions. The areas from which the attacks that resulted in goals originated also varied between tournaments. In the Euro Cup, they mainly originated from their own half and the right zone of the opponent's half, while in the Copa América, most goals started from the central zone of the opponent's half.

No associations were observed between the categories and the match result or reaching the semi-finals. This makes it necessary to continue exploring these factors to determine how the scoring method and context can influence the teams' performance in matches or throughout tournaments.

AUTHOR CONTRIBUTIONS

The study was conceptualized by J.A. U-R and A. B-V. Both authors designed the methodology, performed data collection, and curated the dataset. Data analysis was performed by J.A. U-R and reviewed by A. B-V. Both authors wrote the original draft of the manuscript and have read and approved the final version.

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