apunts EDUCACIÓN FÍSICA Y DEPORTES

ISSUE 154

Published: October 1, 2023
https://doi.org/10.5672/apunts.2014-0983.es.(2023/4).154.09

SPORT TRAINING

OPEN ACCESS

Comparative of the goals scored by set pieces during the Eurocup and Copa America 2021

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Cite this article
Muriarte Solana, D., Gallardo Mármol, F., Grande Rodríguez, I., Barba Ruíz, M., Hernández Lougedo, J. & Martín-Castellanos, A. (2023). Comparative of the goals scored by set pieces during the Eurocup and Copa America 2021. *Apunts Educación Física y Deportes, 154*, 95-107. https://doi.org/10.5672/apunts.2014-0983.es.(2023/4).154.09

Editor:

ISSN: 2014-0983

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Section:
Sport Training

Original language:
English

Received:
February 3, 2023
Accepted:
May 16, 2023
Published:
October 1, 2023

Front cover:
An athlete doing parkour.
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Abstract

This study aimed to establish a comparison between the goals scored from set pieces (corners, direct and indirect free kicks) in the European and South American (EURO 2021 - COPA 2021) competitions, coinciding within the same time frame. For this purpose, all goals (22 and 17, respectively) were analysed and variables related to the following different action phases were collected: beginning (kicker's foot, minute, starting area), development (marking, ball trajectory, number of attackers or defenders) and the end (height of the previous pass, number of passes or contacts before the goal). A Cohen's kappa and the Intra-class Correlation Coefficient were per-formed between two observers, and an analysis using Chi-square and Mann Whitney U was carried out. The results showed no significant differences, except for the height of the pass (with a higher-than-expected number in the medium pass and COPA) and the confederation of the club to which the scoring player belonged (a higher percentage of players scored from UEFA in EURO, and CONCACAF in COPA). These findings could suggest a European influence in set-pieces due to recent success in international competitions and could be useful for coaches and analysts to expand the information about rivals.

Keywords: corners, free kicks, international championship, outcome, performance analysis.

Introduction

Set pieces have clear importance in football development in recent years as one of the trends accounted for in team performance analysts (Sarmento et al., 2018). The technical-tactical behaviours associated with some of the categories belonging to this variable have evolved through differences in the importance of each variable in different editions played, such as the type of offensive organisation, the transcendence, or the number of attackers involved in the play (Maneiro et al., 2021). In the existing literature, studies have focused on analysing different competitions to clarify different questions, such as which type of defence presented more favourable results or whether the effectiveness of the actions increased by getting more players in the team in contact with the ball, or through the trajectory of the ball (Casal et al., 2015; Kubayi & Larkin, 2019).

Set-pieces are a fairly common occurrence on the field, consuming around 38% of the total match time (Siegle & Lames, 2012). Several studies estimate that between 30 and 40% of goals scored by teams come from set pieces (Casal et al., 2015; Kubayi, 2020). González-Rodenas et al. (2020) point out that 24.1% of UEFA Champions League goals in the 2016-2017 season were scored from set pieces, highlighting that the technical-tactical actions that achieve a goal and their spatial characteristics are related to the type of defence used by the opposing team, which is why authors such as Rumpf et al. (2017) extol its relevance. The average number of corners per game is between 10 and 11 (Sainz de Baranda et al., 2011) and, despite their low effectiveness (2.2% following Casal et al. [2015]; 3.6% in Lee & Mills [2021]), this type of action can be decisive for the outcome of the match (Casal et al., 2015; Maneiro Dios et al., 2019).

Regarding free kicks, López-García et al. (2018) found an average of 31.42 free kicks per game. Although free kicks had a similar low effectiveness as corner kicks (3.1%), highlighting these actions, the number of attackers involved, the delivery and the offensive organization could be important indicators to consider improving the scoring ratio. Link et al. (2016) valued density, type of barrier, distance and the number of players as important variables highly dependent on space, while also highlighting centrality and proximity to the goal as factors that increased these variables. About the defensive organisation in these actions, it was found that those teams defending corners using zonal marking conceded more goals compared to a combined model, and that, by placing a defender at each of the posts, no goals were conceded by the defending teams.

Due to its importance, different research has been carried out in both national and international competitions. This type of action has not only been studied in men's football but also in women's football, showing that it is key to winning or drawing matches and that the executions are similar (Maneiro Dios et al., 2019).

Although a widely studied field, it is rare to find comparisons between international competitions in the published literature. The research focused on this comparison finds that the passing networks before scoring a goal are similar in both continents (McLean et al., 2017).

For this reason, and to establish a comparative line of research between these two competitions, we have taken advantage of the simultaneity of tournament development to analyse whether there are different patterns or associations in the goals scored from set pieces between a European international competition (EURO 2021) and a South American competition (COPA 2021), thus proposing a new line of research.

Materials and Methods

Sample

For the analysis of these actions, all goals scored from direct free kicks, indirect free kicks and corner kicks in the final phases of the EURO 2021 and COPA competitions were collected, with a total of 22 and 17 goals scored respectively. A total of 51 EURO 2021 matches, and 39 COPA matches were watched. Both tournaments took place between 11 June and 11 and 10 July 2021, respectively. Penalty kicks, centre kicks and throw-ins were excluded from this study because the structure is similar for direct, indirect and corner kicks; in penalty kicks there is no defence and the percentage of goals from goal kicks and throw-ins is low, although they occur frequently (Siegle & Lames, 2012; Stone et al., 2018).

Procedure

Set pieces were analysed by systematic observation according to Lames (1994) and Singer and Willimczik (2002). Two professionals in sport sciences with more than 10 years of experience in the area oversaw the recording, visualised all the actions, and were trained to provide an accurate and reliable data recording.

Although the analysis of these actions was carried out independently, a total of four meetings were held to define the variables and understand each situation. To achieve this, less than 15% of the sample was used in the meetings.

Variables

To set the variables, several studies were considered (Sainz de Baranda et al., 2005; Di Salvo et al., 2007; Sainz de Baranda et al., 2011; Casal et al., 2015; Link et al., 2016; Fernández-Hermógenes et al., 2017; Beare & Stone, 2019; Kubayi & Larkin, 2019; Wang & Qin, 2020; Lee & Mills, 2021; Maneiro et al., 2021). Those previously used in different studies of set pieces had been taken and adapted, adding other indicators used for patterns of play and scoring research in both international and national competitions. The categorical variables are shown in Table 1.

Table 1.
Description and categorisation of the nominal variables used for the study.

Variable	Description
Type of set piece	Action leading to the goal
	Direct free kicks: free kicks that are taken without the need for contact with the ball by a team-mate before attempting to score a goal.
	Indirect free kicks: free kicks that are taken with the need to have contact with the ball from a teammate before attempting to score a goal.
	Corner kick: kick from the corner of the field after the ball has cleared the end line after being touched by a defender.
Position	Position of the player who scored the goal
(Di Salvo et al., 2007)	Central defender
	External defender
	Central midfielder
	External midfielder
	Forward
Confederation	Confederation of the club to which the player scoring the goal belonged at the end of the season 2020/2021
	UEFA - Union of European Football Associations
	CONMEBOL - Confederación Sudamericana de Fútbol
	CONCACAF - Confederation of North, Central America and Caribbean Association Football
	AFC - Asian Football Confederation
Time	Time frame in which the goal was scored
	1-15
	16-30
	31-45
	46-60
	61-75
	76-90
	Extra-Time
Relevance	Incidence of the goal action on the outcome of the match
	Unimportant: the goal has no bearing on the outcome of the match.
	Tie: the achievement of the goal implies a draw in the match.
	Victory: scoring the goal leads to a victory in the match.

Table 1. (Continuation)
Description and categorisation of the nominal variables used for the study.

Variable	Description
Starting zone, Finishing zone, Goalkeeper position	Area in which the play is initiated, depending on the laterality of the set- piece action
	Space from which finalisation takes place
	Area in which the goalkeeper is at the time of the shot
(Adaptaded from Fernández-Hermógenes et al., 2017; Beare & Stone, 2019; Lee & Mills, 2021; Wang & Qin, 2020; Figure 1)	Short Corner Zone (SCZ)
	Front Zone (FZ)
	Goal Area 1 (GA1)
	Goal Area 2 (GA2)
	Goal Area 3 (GA3)
	Critical Area 1 (CA1)
	Critical Area 2 (CA2)
	Critical Area 3 (CA3)
	Edge (E)
	Back Zone (BZ)
	Opposite Corner Zone (OCZ)
	Medium Lateral Zone (MLZ)
	Central Close Zone (CCZ)
	Central Away Zone (CAZ)
	Opposite Medium Lateral Zone (OMLZ)
	Large Lateral Zone (LLZ)
	Midfield Close Zone (MCZ)
	Midfield Away Zone (MAZ)
	Opposite Large Lateral Zone (OLLZ)
	Own Half (OH)
Kicker's foot	Leg with which the thrower executes the set-piece action
	Right
	Left
Fault trajectory	The direction the ball takes once it has been put into play for direct and indirect free kicks
(Adaptaded from Kubayi & Larkin, 2019; Maneiro et al., 2021)	Open; Ball trajectory away from the goal.
	Closed; The trajectory of the ball approaches the goal.
	Short; The ball is put into play looking for a close teammate.
	Direct; The trajectory of the ball is direct to the goal.
Corner trajectory	The direction the ball takes after it has been put into play at corner kicks.
(Adaptaded from Kubayi & Larkin, 2019; Maneiro et al., 2021)	Open; Ball trajectory away from the goal.
	Closed; The trajectory of the ball approaches the goal.
	Short; The ball is put into play looking for a close teammate.
Defence style	Player positioning to defend the action
(Adaptaded from Casal et al., 2015; Maneiro et al., 2021)	Zone; Each player is responsible for a certain zone of the field or area.
	Man-to-man; Every attacker is marked by a defender.
	Combined; Mix of Zone marking and Man-to-Man marking.
	Mixed; Each player is responsible for a zone, and for the opposing player who stands in that zone.

Table 1. (Continuation)
Description and categorisation of the nominal variables used for the study.

Variable	Description
Opposition	The situation of the player finishing the action about the defenders
(Adaptaded from Casal et al., 2015)	9.15 m
	High; Active defender in front of the player who is going to finish the action and within his range of action is at a distance of interposing a body part to intercept the ball.
	Medium; Active defender in the radius of action, but is laterally or behind the finishing player and allows for some ease of shooting.
	Low; There are no defenders within range of the passer and he performs unopposed.
Type of completion	Technical completion action
(Adaptaded from Casal et al., 2015)	Shooting
	Control and shooting
	Driving
	Dribble
	Own goal
Striking surface	Part of the body with which the player shoots at goal
(Adapted from Sainz de Baranda et al., 2011)	Inside of the foot
	Outside of the foot
	Foot sole
	Instep
	Heel
	Toe
	Head
	Trunk
Height of the previous pass	The altitude of the pass received by the finisher
	High - Parabolic; The player receives a ball that has a flight higher than his neck height.
	Medium; The player receives a ball with a mid-flight (lower neck to knees).
	Low; Player receives a ball low or below knee height.
Finishing leg	Distinguishing between right and left, and whether it is the player's dominant leg or not, as long as the goal is scored with the foot.
(Adaptaded from Casal et al., 2015)	Dominant right
	Non-dominant right
	Dominant left
	Non-dominant left
Goal zone	The sector of the goal through which the ball enters the net
(Sainz de Baranda et al., 2005, Figure 2)	1 – Lower - right
	2 – Lower - centre
	3 – Lower - left
	4 – Middle - left
	5 – Middle-centre
	6 – Middle - right
	7 – Upper - right
	8 – Upper - centre
	9 – Upper - left

Table 2 presents the definition of the numerical variables that have been collected for this study.

Table 2
Description of the numerical variables used in the research.

Variable	Description
Seconds	Time taken for the goal to be scored from the start of the action
Number of attackers (Adapted from Maneiro et al., 2021)	Number of offensive players seeking to participate in the action, not counting the pitcher
Number of defenders (Adapted from Maneiro et al., 2021)	Number of defensive players involved in the action
Numbers of offensive contacts	Number of offensive players touching the ball before a goal is scored
Numbers of defensive contacts	Number of defensive players touching the ball before a goal is scored
Number of passes (Adapted from Maneiro et al., 2021)	Number of passes made in the course of action
Contacts	Number of contacts the player makes to score the goal
Barrier (Link et al., 2016)	Number of players within 9.15 m at set pieces

Figure 1
Observation templates of the starting zone, finishing zone and goalkeeper's position when the free kick or corner kick is taken from the left and right zone. Adapted from Beare & Stone, 2019; Lee & Mills, 2021; Wang & Qin, 2020.

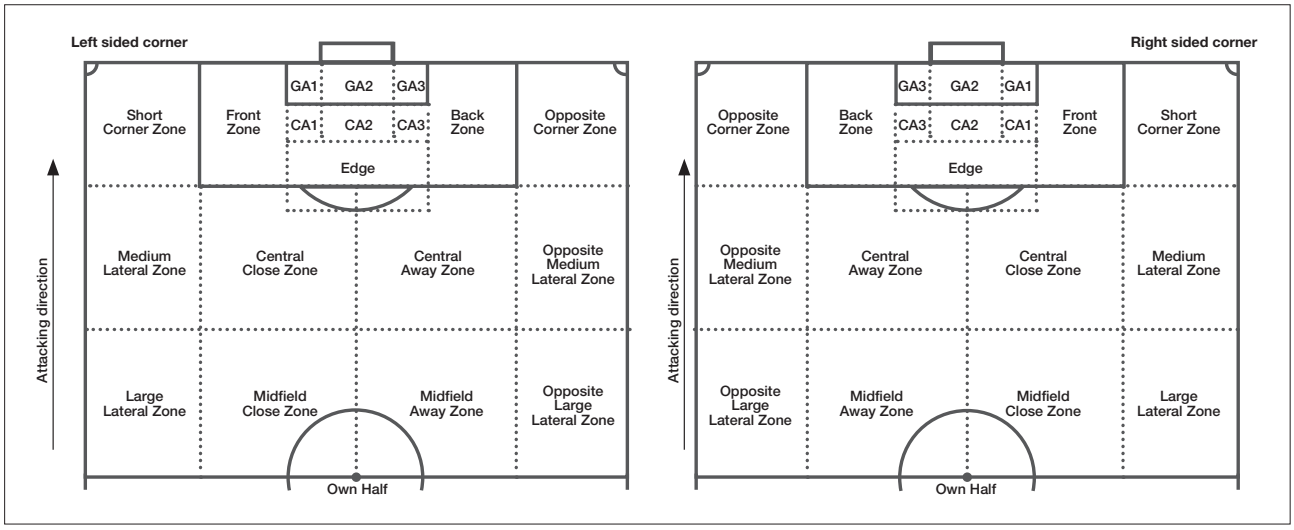
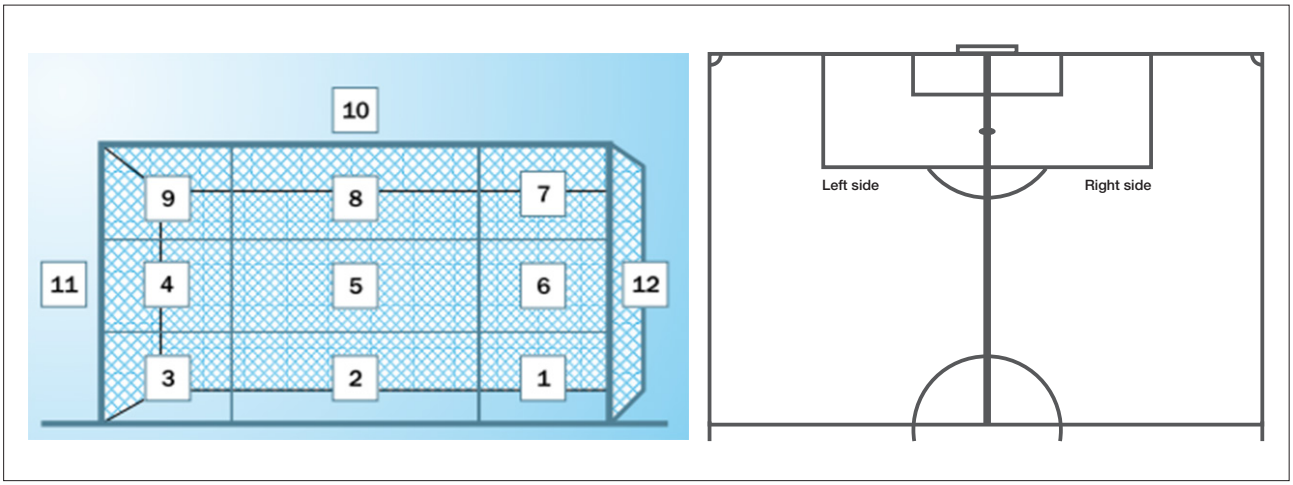


Figure 2 (left) and 3 (right)
Figure 2, taken from Sainz de Baranda et al. (2005), illustrates the different zones for the registration of a shot on goal. Figure 3, based on Fernandez-Hermógenes et al. (2017), corresponds to the criteria for the use of zones according to the laterality of action and goal zones.



To establish common criteria for the zones, a modified categorisation from previous studies was used (Beare & Stone, 2019; Lee & Mills, 2021; Wang & Qin, 2020). The register was used for the right or left zone according to the scenario of the kick around the central zone, and the penalty spot and the central point of the field were used as references (Ardá et al., 2014), as shown in Figure 3.

Statistical analysis

As with the analysis, the methodology applied in this study was similar to González-García et al. (2016). Cohen's kappa coefficient (k) was used to determine the degree of agreement between observers on nominal or categorical variables, and the following criteria was used to determine interpretation: 0 - .2 Poor agreement; .21 - .40 Fair agreement; .41 - .60 Moderate agreement; .61 - .80 Good agreement; .81 - 1 Very good agreement (Altman, 1991). These variables are expressed using the frequency of observation.

For those continuous variables, expressed as mean and standard deviation (M ± SD), the standardised typical error, the intra-class correlation coefficient (ICC), and Pearson's r were calculated using the Hopkins' spreadsheet (2015). To classify ICC, criteria established by Koo and Li (2016) was followed; <.5 Poor reliability; .5 - .75 Moderate reliability; .75 - .9 Good reliability; >.9 Excellent reliability.

Cohen's kappa and ICC values are shown in Table 3.

Table 3
Cohen's kappa and ICC for all variables.

Variable	*k*	CCI		
		Value	*r*	Typical error
Type of set piece	1			
Position	1			
Confederation	1			
Time	1			
Relevance	1			
Starting zone	.951			
Kicker's foot	1			
Fault trajectory	1			
Corner trajectory	.964			
Defence style	.875			
Opposition	.873			
Type of completion	1			
Striking surface	.890			
Finishing zone	.906			
Height of the previous pass	1			
Finishing leg	.924			
Goal zone	.887			
Goalkeeper position	1			
Seconds		.96	.95	.22
Number of attackers		.84	.82	.42
Number of defenders		.91	.70	.31
Numbers of offensive contacts		.98	.99	.13
Numbers of defensive contacts		.92	.92	.32
Number of passes		.98	.98	.16
Contacts		.91	.92	.32
Barrier		.97	.97	.24

The normal distribution of the variables was checked using the Shapiro-Wilk test. The Mann-Whitney U test was used to compare numerical variables, such as seconds, number of players involved, touches, barrier, and number of passes by the tournament. In parallel, the relationship between the different nominal variables and tournament was observed using Pearson's Chi-square test, with Fisher's Exact Test.

To calculate the size effect, Cramer's V was the measure used for Pearson's Chi – square, following Rea and Parker (1992), with the following interpretation: <0.1 = Negligible association; ≥ .1 to < .2 = Weak association; ≥ .2 to < .4 = Moderate association; ≥ .4 to < .6 = Relatively strong association; ≥ .6 to < .8 = Strong association; ≥ .8 to 1 = Very strong association.

The level of significance was set at .05. The collected data were studied using the software Statistical Package for the Social Science (SPSS, IBM Corporation; Armonk, New York, USA), in version 25.0.

Results

In most cases, no significant differences were observed between the qualitative variables. A relatively strong association was found between the height of the previous pass and the tournament, with the number of passes at an average height higher than expected by chance in COPA 2021; in EURO 2021 the same figure was lower than expected (Table 4).

Table 4.
Comparison of nominal variables between EURO 2021 and COPA 2021.

		EURO 2021	COPA 2021	χ^2	*p*	ES
Type of set piece				0.09	.759	
	Corner kick	14	10			
	Direct free kicks	8	7			
Position				3.64	.505	
	Central defender	4	5			
	External defender	2	0			
	Central midfielder	5	2			
	External midfielder	4	6			
	Forward	7	4			
Confederation						
	UEFA	21	10	8.86	.007	.491
	CONMEBOL	0	2			
	CONCACAF	0	4			
	AFC	1	1			
Time				9.71	.108	
	0-15	2	2			
	16-30	3	1			
	31-45	1	6			
	46-60	2	3			
	61-75	9	2			
	76-90	4	3			
	Extra-time	1	0			
Relevance				1.57	.486	
	Victory	3	5			
	Tie	4	3			
	Unimportant	15	9			

Table 4. (Continuation)
Comparison of nominal variables between EURO 2021 and COPA 2021.

		EURO 2021	COPA 2021	χ^2	*p*	ES
Starting zone				5.01	.622	
	Central Close Zone (CCZ)	2	3			
	Edge (E)	0	1			
	Large Lateral Zone (LLZ)	1	0			
	Midfield Close Zone (MCZ)	0	1			
	Medium Lateral Zone (MLZ)	3	1			
	Own Half (OH)	1	0			
	Short Corner Zone (SCZ)	15	11			
Kicker's foot				0.41	.522	
	Right	12	11			
	Left	10	6			
Fault trajectory				3.92	.282	
	Open	5	3			
	Closed	2	0			
	Direct	1	3			
	Short	0	1			
Corner trajectory				0.74	.864	
	Open	7	5			
	Closed	4	4			
	Short	3	1			
Defence style				0.07	1	
	Combined	20	15			
	Zone	2	2			
Opposition				4.87	.176	
	9.15 m	1	3			
	Low	8	4			
	Medium	6	6			
	High	8	8			
Type of completion				1.45	.761	
	Shooting	20	15			
	Control and shooting	2	1			
	Own goal	0	1			
Striking surface				4.85	.392	
	Head	11	5			
	Trunk	0	1			
	Instep	4	4			
	Inside of the foot	5	7			
	Foot sole	1	0			
	Heel	1	0			

Table 4. (Continuation)
Comparison of nominal variables between EURO 2021 and COPA 2021.

		EURO 2021	COPA 2021	χ^2	*p*	ES
Finishing zone				13.04	.070	
	Back Zone (BZ)	1	0			
	Critical Area 1 (CA1)	2	0			
	Critical Area 2 (CA2)	7	1			
	Critical Area 3 (CA3)	0	2			
	Central Away Zone (CAZ)	1	0			
	Central Close Zone (CCZ)	1	2			
	Edge (E)	1	1			
	Goal Area 1 (GA1)	4	1			
	Goal Area 2 (GA2)	4	8			
	Goal Area 3 (GA3)	1	2			
Height of the previous pass				5.21	.044	.412
	High - Parabolic	14	7			
	Medium	3	6			
	Low	4	0			
Finishing leg				4.23	.248	
	Dominant right	6	7			
	Non-dominant right	2	0			
	Dominant left	1	3			
	Non-dominant left	2	0			
Goal zone				10.24	.154	
	1 – Lower - right	2	2			
	2 – Lower - centre	6	1			
	3 – Lower - left	5	2			
	4 – Middle - left	4	3			
	5 – Middle-centre	1	1			
	6 – Middle - right	3	1			
	7 – Upper - right	0	4			
	9 – Upper - left	1	3			
Goalkeeper position				0.925	1	
	Critical Area 3 (CA3)	1	0			
	Goal Area 2 (GA2)	19	15			
	Goal Area 3 (GA3)	2	2			

In addition, a relatively strong relationship was also observed between the confederation of the scoring player and the tournament. The percentage of scoring players belonging to a UEFA club was higher than expected in EURO 2021 when compared to COPA 2021, while COPA 2021 recorded a higher-than-expected number of scoring players belonging to CONCACAF when compared to EURO 2021. No differences were found for players belonging to AFC or CONMEBOL clubs in the tournaments.

Regarding the numerical variables, no significant differences were found depending on the competition analysed ($p > .05$) (Table 5).

Table 5
Comparison of quantitative variables between EURO 2021 and COPA 2021.

	EURO 2021	COPA 2021	*Z*	*p*
Seconds	3.77 ± 1.65	3.11 ± 1.96	1.48	.073
Number of attackers	6.59 ± 1.01	7.06 ± 1.14	1.35	.100
Number of defenders	10.64 ± 0.73	10.70 ± 0.47	0.05	.478
Numbers of offensive contacts	2.45 ± 0.80	2.29 ± 1.05	0.58	.302
Numbers of defensive contacts	.09 ± 0.29	.58 ± 0.87	0.33	.069
Number of passes	1.45 ± 0.86	1.35 ± 1.22	0.44	.246
Contacts	1.14 ± 0.47	1.12 ± 0.33	0.21	.461
Barrier	1.87 ± 1.46	3.28 ± 2.50	0.95	.198

Discussion

After an analysis of the variables collected in this study that accounted for the development of these set pieces, no significant differences were found in the comparison between the Copa America and the European Championship, except for the height of the pass received by the player and the confederation to which the scoring player's club belongs. These findings could align with Wilwock and Furtado (2019), where no substantial differences were found between Euro 2016, Copa America Centenario 2016 and the 2017 Confederation Cup; however, this analysis takes into account all goals scored by teams, not only those scored from set pieces.

It is worth noting that although a higher-than-expected number of players with clubs belonging to the UEFA confederation were randomly registered for EURO 2021, which would be logical given that they belong to the continent, the same was not observed for CONMEBOL players. This could be related to the influence or impact of the European style of play, which has dominated international competitions for much of the last decade. For example, European teams have won the FIFA World Cup uninterruptedly from 2006 to 2018 (FIFA, 2021). Regarding the FIFA Club World Cup, Europe has also been the tournament leader since its inception, and the UEFA confederation has won 13 titles, compared to CONMEBOL's four (FIFA, 2021). This fact could be a determining factor in the teams' execution of similar models or actions of play. However, a more in-depth study should be carried out on the historical development of Latin American and European teams over time to confirm this hypothetical influence, given that research focused on this comparison determines that there are similar styles between the football passing network before scoring goals on the American and European continents (McLean et al., 2017).

Another possible explanation for these results, and one of the limitations of the study, could be the lack of a larger sample. With only successful set-pieces, and in competitions of short durations, the number of actions counted was small. One of the alternatives to alleviate this deficit could be to limit the time frame and acquire a larger sample with a collection of data from different championships.

Regarding the contrast of the data from our research with other studies, it is difficult to establish similarities due to the scarcity of similar scenarios occurring in the same year and period. A comparison could be drawn with the study of Prieto-Lage et al. (2021), which analyses corner kick behaviour in different European leagues. Although there are differences in the conceptualisation of the variables (for example, only attackers or defenders inside the area in the first contact are counted), can also be found in the same study that European teams usually attack with more than four players, and it is frequent in leagues such as the English, Italian and German leagues that attack with more than six players. Further, there are more than six players in the defence area; we found an average of 10.64 players in Europe, accounting for those players located close to the area.

It is also worth noting the contrast between previous studies that indicates that the second half is key to the achievement of these actions in the competitions of both confederations. While the European competition does register these standards, similar to the Spanish and German leagues, in the South American competition could be found a similardistribution between the first and second half (Prieto-Lage et al., 2021), unlike in regular club competitions in this region. This differs from what is reported in the

Spanish and German leagues (Carelli et al., 2016). The distribution of the first and second halves differs from that reported by the authors in the study of other national and international competitions (Casal et al., 2015; Junior, 2015; Njororai, 2014; Prieto-Lage et al., 2021).

Regarding the completion and initiation of these actions, it is difficult to establish comparisons with other studies (Beare & Stone, 2019; Link et al., 2016; Prieto-Lage et al., 2021) by modifying and adapting the observation graph that has been used in this research from Lee and Mills (2021), according to the side on which the stationary ball was located. Finally, emphasising the relevance of these actions, it could be determined that a low number of set-piece goals presented a direct impact on the final result, although this could be due to the conceptualisation of the variable (Ardá et al., 2014; Casal et al., 2014, 2015; Maneiro Dios et al., 2017).

Among the future lines of research that could be added to the study of these types of actions in competitions, it could be analysed whether the time differences suffered by the teams when competing in different locations, within the same competition, could influence these behaviours and their effectiveness.

Another possible line of research could be the study of the influence of playing as a "host" of the competition or as an away team, similar to studies that analyse the relevance of playing as a home team in this type of tournaments.

Conclusions

The goals scored from set pieces (direct kicks and corners) in the European Championship and the Copa America did not show any differences, except for the height of the pass received by the player and the conference of the club to which the player scoring the goal belonged. These findings are in line with the few studies previously conducted on this comparison. The small sample size and the European dominance in international competitions could affect these results, so the line of research must be continued in order to assess potential reasons for these results.

The use of this information for coaches and performance analysts can help explore similarities between teams from different confederations, broadening the information at hand regarding the development of these actions, and establishing key points for operational strategy in matches or championships.

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Conflict of Interests: No conflict of interest was reported by the authors.