Original Article

Technical, tactical and spatial indicators related to goal scoring in European elite soccer

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ABSTRACT

The aim of this study was to describe the technical, tactical and spatial indicators related to goal scoring in elite European soccer, considering the type of defence and the positioning of the opponent. For the analysis, 8 tactical dimensions related to the final actions in 380 sequences that led to goal during the UEFA Champions League were evaluated by observational methodology. 75.9% of the goals were scored from open play and 24.1% were scored from set pieces. Collective actions produced 51.6% of the total goals while individual actions produced 10.5% of goals. Regarding the penultimate action, crosses were more frequent against organized defences, while passes in behind the defence, or actions as dribbling or running with the ball had a greater percentage of goals against circumstantial defences (χ^2=37.027; p>0.001). Besides, greater utilization of wide invasive spaces (70.2%) was observed to assist against organized defences, while this percentage was 53.1% (χ^2=5.501; p=0.015) against circumstantial defences. For the last action, 70.1% of the goals were scored by using only one contact to the ball in organized defences but 46.6% in circumstantial defences (χ^2=26.521; p>0.001). The technical and tactical actions that achieve goal and their spatial characteristics are related to the type of defence used by the opposing team. **Keywords:** Match analysis; Notational analysis; Scoring opportunities; Association football; Sports performance.

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INTRODUCTION

One of the biggest challenges of performance analysis in soccer is to produce practical information to improve the performance of players and the knowledge of the coaches (Sarmento et al., 2017). One of the key objectives of soccer coaches not only in professional level but also in developmental ages, is to prepare their teams and players to disorder the defensive team in order to score as many goals as possible. In this sense, scoring a goal in soccer is the most determinant action of offensive success, although it only represents the 1% of ball possessions in professional competitions (Pollard and Reep, 1997; Tenga et al., 2010a).

Due to this low frequency, the study of offensive sequences that lead to goal may not truly represent the style of play developed by the teams (James et al., 2002; Caro and Caro-Muñoz, 2016). For that reason, the analysis of other performance indicators such as score-box possessions or scoring opportunities have been used in the scientific literature due to its higher frequency and broader representation of the teams' style of play (Tenga et al., 2010b, Lago-Ballesteros et al., 2012; González-Rodenas et al., 2015a).

Nevertheless, creating more scoring opportunities does not guarantee the achievement of a higher amount of goals. In fact, it has been observed how the ratio shots/goals is a key aspect that differentiate the successful teams from the non-successful teams (Castellano et al., 2010; Delgado-Bordonau et al., 2013; Dufour et al., 2017). Consequently, although the analysis of other performance indicators related to offensive success is very useful to study the effectiveness of the style of play implemented by soccer teams, the specific evaluation of goal scoring situations may be key to identify the tactical factors that contribute to the creation of higher goal effectiveness.

Surprisingly, there is a lack of studies that specifically focus on the analysis of goal scoring in professional soccer (Pratas et al., 2018). The existing literature has identified some tactical indicators related to scoring goals, such as starting the offensive sequences in the opposing half (Wright et al., 2011; Caro and Caro-Muñoz, 2016), assisting the goal scorer from central areas of the field (Silva et al., 2005; Smith and Lions, 2017;), finishing inside the penalty area (Mitrotasios and Armatas, 2014) or using only one touch in the final action (Durlik and Bieniek, 2014). However, despite the tactical complexity of soccer, where the interaction with the opponent is crucial for the understanding of the game, very few studies have considered the positioning or defensive behaviour of the opponent when analysing goal scoring sequences (Mackenzie and Cushion, 2013). For this reason, further research is needed to understand the relationship between offensive and defensive behaviours in the creation of goal scoring situations.

Therefore, the aim of this study was to describe the technical, tactical and spatial indicators that lead to goal scoring in professional soccer, considering the positioning and defensive behaviour of the opposing team.

METHODS

Sample

All possessions that led to goal scoring during the 2016-2017 UEFA Champions League were analysed (n=380). Those goals where the observer could not have a complete and proper visualization of the technical and tactical actions were excluded from the study (n=2).

Tactical and technical variables

The study used the REOFUT theoretical framework (González Rodenas, 2013; González-Rodenas et al., 2015; González-Rodenas et al., 2017) that describes how to analyse multiple tactical and technical

dimensions related to the start, development, penultimate and last action of teams' possessions, as well as their association with achieving offensive performance.

For the analysis of the technical-tactical actions, the analysis of the penultimate and last action has been undertaken in order to evaluate which actions are key not only to finish but also to create goal scoring situations (Table 1).

Table 1. Definition of the dimensions and categories related to the technical-tactical actions

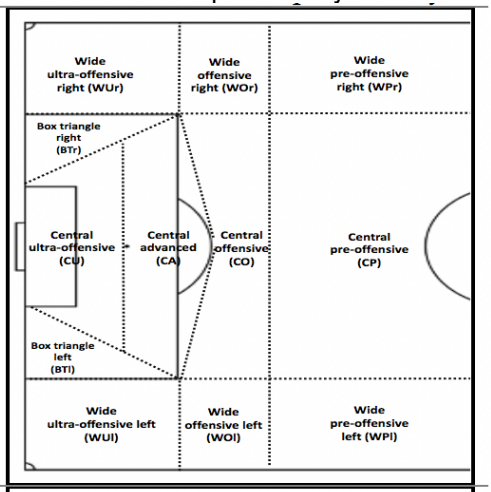
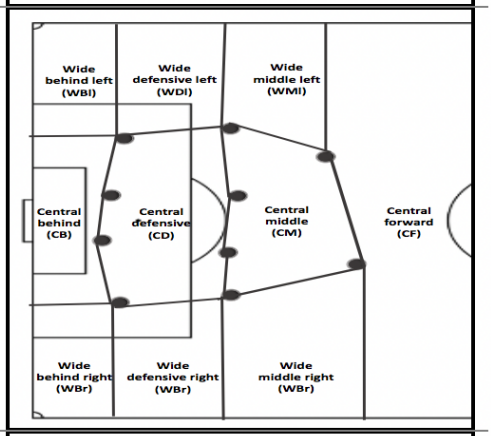
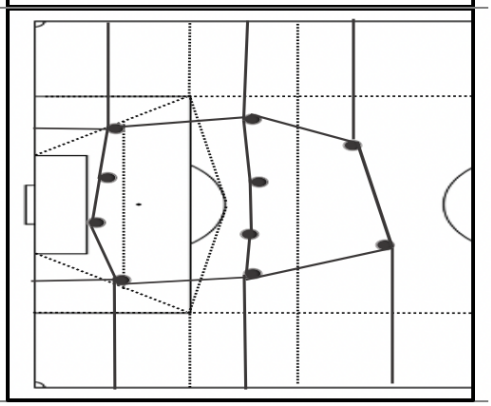
Penultimate action: technical-tactical action performed immediately before the final action that allows the final player to have the opportunity of shooting at goal. This action may be performed by the same player that shoots at goal (individual action) or by a teammate that pass the ball to the final player (collective play):
A) Individual action: the final player receives the ball without having a scoring opportunity but he achieves to create one by means of an individual action. This category has 4 sub-categories:
a.1 Dribbling: the final player dribbles the ball goal past defenders to create a scoring opportunity.
a.2 Running with the ball: the final player carries the ball towards a goal scoring situation.
a.3 Collecting a free ball: the final player collects a free ball that allows him to have an immediate scoring opportunity
a.4 Shot from distance: the final player shoots from outside the score pentagon.
B) Collective play: The penultimate player in the team possession performs a pass that allows the last player to have an immediate scoring opportunity. This category has 3 sub-categories.
b.1 Pass in behind the defence: pass from central channels of the field that breaks the opposing defensive line and allows the receiver to have an immediate scoring opportunity in front of the goalkeeper.
b.2 Cross: pass performed from the wide channels of the field in the opposing half (Figure 1) towards the penalty box (Sarmento et al., 2010) that allows the receiver to have an immediate scoring opportunity.
b.3. Goal pass: the final player receives an assist in form of a pass (different from a pass in behind and cross) from a different player that allows him to have an immediate scoring opportunity.
Last action: technical-tactical action performed by the player that scores the goal at the moment of shooting.
A) Shoot on the ground:
a.1 Shoot (1 contact): the final player shoots at goal while the ball is on the ground by using one contact to the ball.
a.2 Shoot (2 or more contacts): the final player shoots at goal while the ball is on the ground by using 2 or more contacts to the ball.
B) Shoot in the air:
b.1 Volley: the final player shoots at goal while the ball is in the air by using one single contact to the ball.
b.2 Header: the final player shoots at goal while the ball is in the air by heading the ball.
C) Other: Any other type of finishing at goal.

For the spatial analysis (Table 1), two ways of understanding the space of play have been considered and combined to show where the penultimate and last action take place. On one hand, the static zones of the pitch based on width, depth and also on distance and angle in relation to the goal. On the other hand, this study used the "space of defensive occupation" (Grehaigne, 2001; Seabra and Dantas, 2006) to analyse the dynamic and changing subspaces based on the positioning and movement of the defensive team. Lastly, the both types of space have been combined to show the interaction between static and dynamic areas in goal scoring situations.

Also, the analysis of the combination between static and dynamic zones has been studied to detect what are the most frequent spatial interactions between the penultimate and the last subspaces both in collective (Figure 1) and individual actions (Figure 2).

Finally, the dimension "type of defence" (Table 3) have been evaluated in order to check the differences between technical-tactical actions and spatial characteristics depending on the defensive organization of the opponent.

Table 2. Description and graphical representation of the dimensions related to the spatial analysis

Zone of the pitch (static space) The opposing half is subdivided into two transversal sectors (offensive and pre-offensive) and three channels (central, wide right and wide left). In the offensive sector, different zones are created depending on the distance and angle to the goal. A pentagon that selects the space with high shooting angle and a short distance to the goal (20 meters or less) (Pollard and Reep, 1997, Pollard et al., 2004) is considered to analyse the scoring situations (Gonzalez-Rodenas et al., 2017): -The CU and CA zones are the areas inside the "score pentagon" and both present close distance and wide angle in relation to the goal. -The CO zone is located outside the score pentagon and presents wide angle and far distance in relation to the goal. -The BTr and BTl zones are inside the penalty box and present close distance and reduced angle in relation to the goal. - The WU and WO areas are located in the wide channels and present far distance and reduced angle in relation to the goal.	
Invasive space (dynamic space) This spatial organization is defined by Gréhaigne (2001) as the "space that is constituted by the positions of the players located, at a given moment, in the periphery of a team in play, except the goalkeeper". The interrelated positions draw a polygonal surface and it forms the space of defensive occupation (SDO) of the opponent (Seabra and Dantas, 2006). This space is subdivided into 10 different subspaces that define the level of penetration and width in relation to the opponent (adapted from previous studies, Castellano, 2000; Grehaine, 2001; Seabra and Dantas, 2006) These subspaces are dynamic and change every second depending on the positioning on the opposing players: -Subspaces behind the defence (WBl, CB, WBr) -Subspaces between the defenders and midfielders. (WDl, CD, SBr) -Subspaces between the midfielders and forwards (WMl, CM, WBr) -Subspace between the forwards line and the own goal (CF)	
Combination of dynamic and static space. Due to complex nature of soccer actions, where the static space not only interacts but also depends on the positioning of the opponents, the analysis of the combination between dynamic and static space have been undertaken in order to contextualize where the penultimate and last actions in goal scoring situations take place. This complex analysis of the space creates multiple subspaces with different shapes and sizes that are dynamic and constantly changing in relation not only to the player location but also to the opposing team behaviour.	

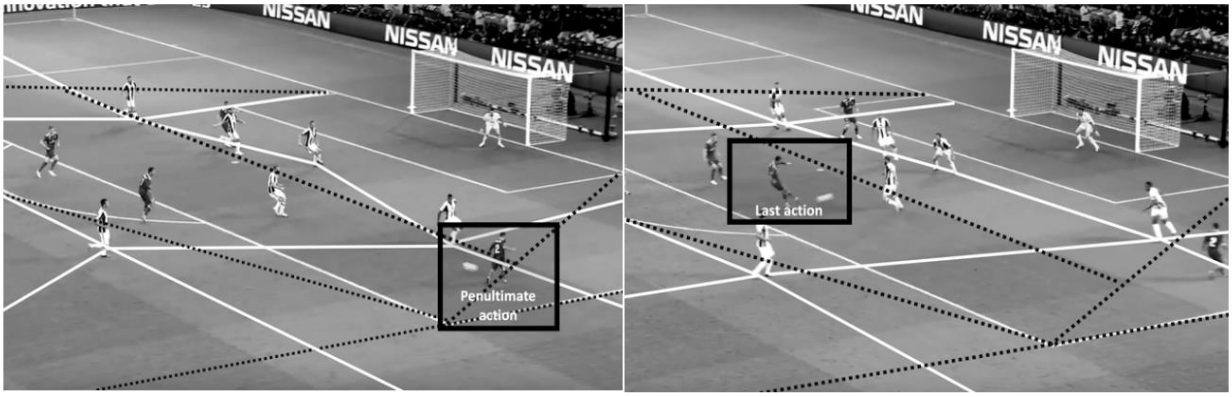


Figure 1. Example of a collective play where there is an interaction between the penultimate action (assist) and the last action.

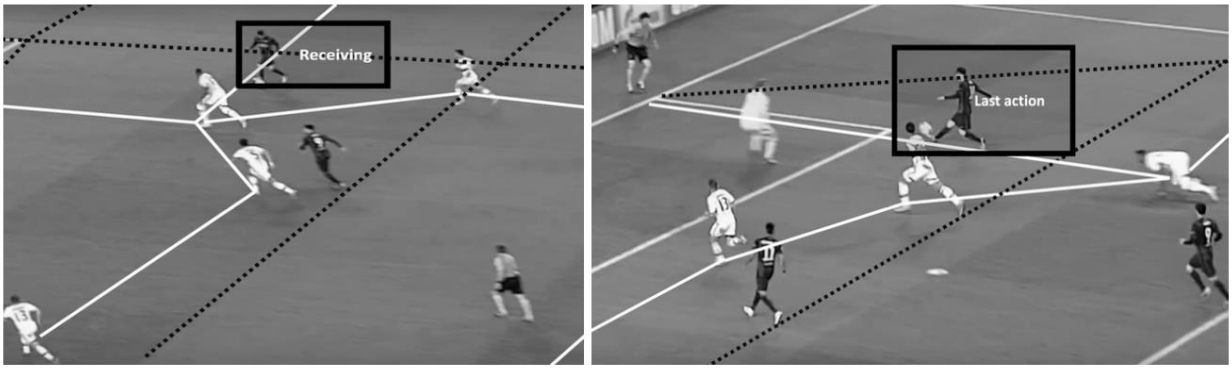


Figure 2. Example of an individual action where the last player receives the ball without having a scoring opportunity and he creates one by dribbling and progressing towards the goal.

Table 3. Definition of the dimension "type of defence" and its categories

Type of defence: structural and spatial organization of players and lines of the defensive team (evaluated qualitatively) during the penultimate and last action of the offensive team. The definition of this variable has been adapted from previous studies (Hernández-Mendo and Anguera, 2001; Casáis, 2008; Casal et al., 2015). Two categories are considered:
A) **Organized defence:** Predicted defensive organization where there is a coordinated and balanced spatial structure in relation to the system of play implemented by the team. In this type of defence, the players are located in their specific positions and have a space of optimal relationship and distance with the teammates. This type of defence may be observed in two tactical scenarios: 1) After a game restart where the defensive team has time to regroup and organize defensively or 2) during a defensive transition in which the offensive team does not progress quickly and the defensive team achieves to regroup and get structured defensively.
B) **Circumstantial defence:** Adaptive and unexpected defensive organization that has the intention of urgently stop the tactical disadvantage in form of numerical or positional inferiority in relation to the opponent. In this type of defence, certain players are not located in their specific positions and do not have an optimal distance with their teammates considering the positioning of the ball. This type of defence may be observed in two tactical scenarios: 1) a counterattack by the opposing team, or 2) a great defensive disruption after performing high pressure on the positional attack implemented by the offensive team.

Match performance analysis

The study is based on observational methodology (Anguera and Hernández Mendo, 2013). For the analysis, a researcher with broad experience in observational methodology (PhD in Sport Sciences, Soccer Coach UEFA-Pro and holding 10 years of experience in professional soccer clubs) analysed each possession as many times as necessary by means of the software Lince (Gabin et al., 2012). Regarding the reliability of the

data, inter-observer and intra-observer analysis were performed by analysing 40 team possessions (10% of the sample). In this sense, this analysis showed good and very good level of reliability according to Altman criteria (1991) (inter-observer kappa coefficient=0.72-1.00; intra-observer kappa coefficient=0.78-1.00).

Statistical analysis

Data registered in Lince was exported to a database created in SPSS 20.0 (SPSS, Chicago, IL). Firstly, analysis of frequencies was carried out to describe the occurrence of each tactical and technical dimension. Secondly, a Chi-square analysis was performed to observe possible differences between tactical and technical dimensions that led to score goal depending on the type of defence, as well as to find the most relevant spatial interactions between the penultimate and last action in goal scoring situations.

RESULTS

Table 4 shows how 75.9% of the goals were scored in open play. Of these, the collective plays that included a goal pass, a pass in behind the defence or a cross comprised the 51.6% of the total goals. In individual actions, goals scored after dribbling produced the 7.6%, while goals after collecting a free ball achieved the 10.3% of goals. As for the set pieces, penalty kicks were the most frequent, followed by free kicks and corner kicks.

Table 4. Descriptive analysis of the penultimate action according to the type of possession and type of sequence (percentage of the total goals)

Type of possession	N (%)	Type of sequence	N (%)	Penultimate action	N (%)
Open play	287 (75.9)	Collective	195 (51.6)	Cross	54 (14.3)
				Pass in behind	62 (16.4)
				Goal pass	79 (20.9)
		Individual	92 (24.3)	Dribbling	29 (7.6)
				Carrying the ball	11 (2.9)
				Collecting a free ball	39 (10.3)
				Shot from distance	13 (3.4)
Set piece	91 (24.1)	Corner kick	26 (6.9)	Cross	16 (4.2)
				Collecting a free ball	10 (2.6)
		Free kick	30 (7.7)	Direct shot	14 (3.7)
				Cross	9 (2.3)
				Goal pass	3 (0.7)
				Collecting a free ball	4 (1.0)
		Penalty kick	35 (9.3)	Direct shot	35 (9.3)

Table 5 shows how shooting on the ground comprised 77.0% of the last actions in open play situations, while headers and volleys were the most frequent actions in corner kicks and also had a great contribution of goals in free kicks. Actions that involved only one contact to the ball achieved the 60.3% of goals in open play, 88.5% in corner kicks and 100% in free kicks.

Regarding the spatial analysis, figure 3 shows where the penultimate action was performed according to the subspaces formed by the combination of the static and dynamic space of play. For collectives plays (Figure 3A), three main areas were identified as the most predominant for assisting the goal scorer. Firstly, the “box triangle” combined with wide subspaces located in behind the defence of the opponent achieved the 20.0% of the goal assists. Secondly, the ultra-offensive wide channels of the field, combined with the wide defensive

subspace of the opponent comprised 15.9% of the goal assists. Thirdly, the central defensive subspace of the opponent, combined with the central offensive zone (10.8%) and the central advanced zone (5.6%) led the assists from central subspaces of the opponent.

Table 5. Descriptive analysis of the last action according to the different type of possession

Dimension	Possession type			
	Open play N (%)	**Corner kick N (%)**	**Free kick N (%)**	**Penalty N (%)**
Last action				
Shot (one contact)	111 (38.7)	1 (3.9)	19 (63.3)	35 (100)
Shot (two or more contacts)	110 (38.3)	3 (11.5)	-	-
Volley	26 (9.1)	7 (26.9)	4 (13.4)	-
Header	36 (12.5)	15 (57.7)	7 (23.3)	-
Others	4 (1.4)	-	-	-

For individual actions, the central defensive subspace of the opponent was the most predominant to initiate the process of creating a goal scoring situation. In that subspace, 22.6% of the actions started in the central offensive zone, whereas the 15.1% started inside the box, specifically in the central advanced zone of the field. Secondly, the wide defensive subspaces of the opponent but located in central channels of the field comprised the initiation of the 28.3% of the goals. Particularly, the 17.0% started in the central offensive zone, whereas the 11.3% started in the central advanced zone.

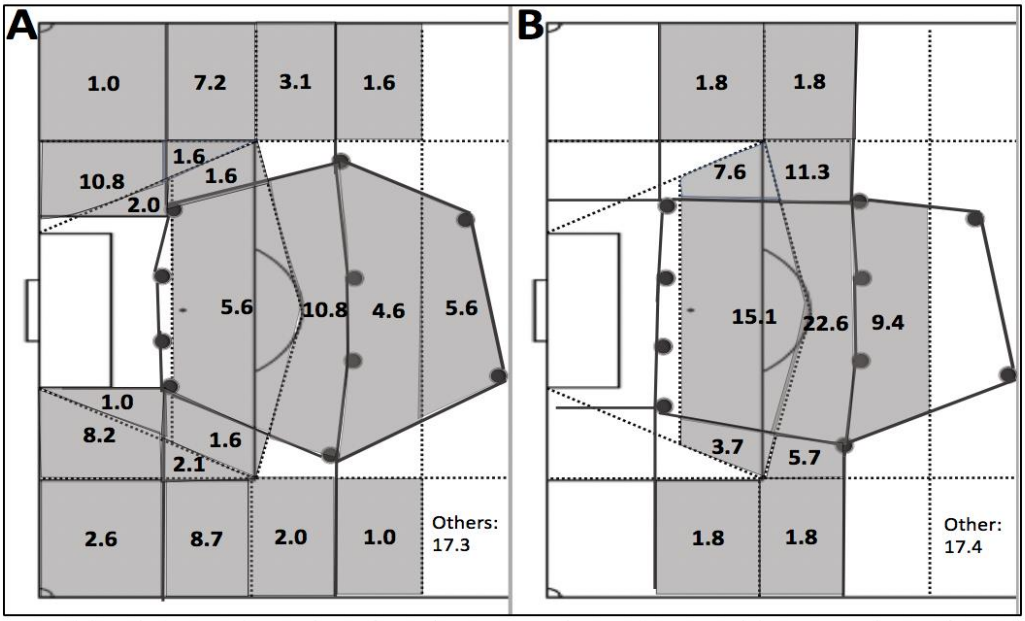


Figure 3. Combined dynamic and static subspaces where the penultimate action takes place in collective plays (A) and individual actions (B). The data show the percentage in relation to the total of goals in collective plays (n=195) and individual actions (n=53).

In regard to the location of the last action, figure 4A shows how the vast majority of the goals scored in collective plays were achieved inside the "score pentagon". Particularly, the combination of the central ultra-offensive zone and the subspace located in behind the defence achieved the 46.7% of the goals. Secondly,

the 30.1% of the goals were scored in front of the defensive line of the opponent, of which the 17.4% and the 13.3% were finished in the central advanced zone and the central ultra-offensive zone, respectively.

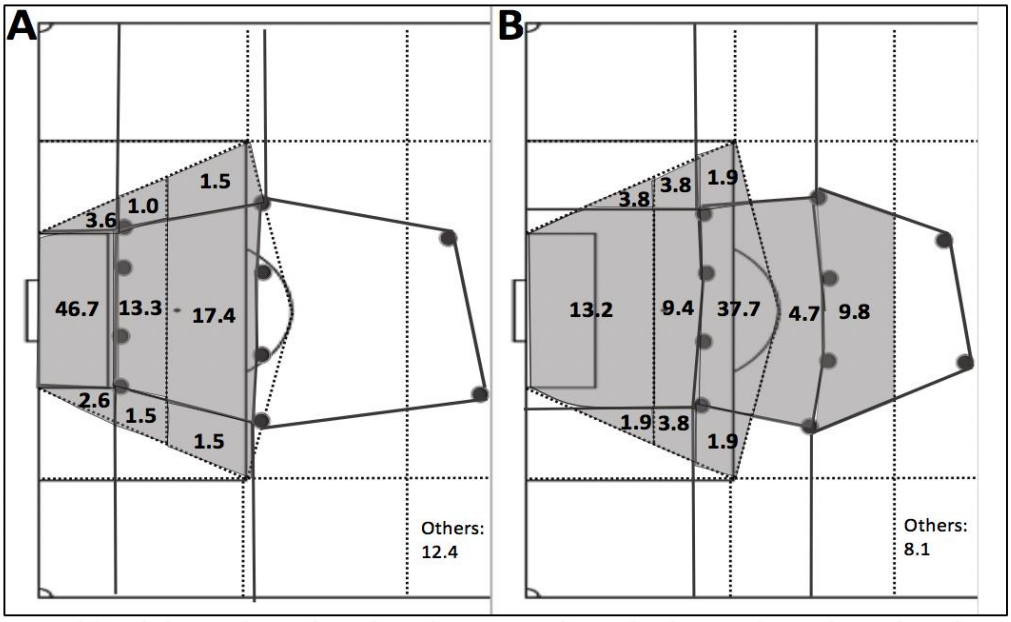


Figure 4. Combined dynamic and static subspaces where the last action takes place in collective plays (A) and individual actions (B). The data show the percentage in relation to the total of goals in collective plays (n=195) and individual actions, excluding "collecting a free ball" (n=53).

For individual actions, the combination of the central advanced zone and the central defensive subspace of the opponent achieved 37.7% of the goals, while the 22.6% were scored from the central subspace located in behind the opposing defence.

Figure 5 shows the most predominant patterns in the utilization of static and dynamic subspaces between the penultimate and the last action in goal scoring situations. Firstly, passing the ball from wide subspaces of the opponent, in behind the defensive line and within the 'box triangle", towards the central ultra-offensive zone, was the most frequent spatial pattern to score goals. Secondly, crossing from the wide ultra-offensive channel and wide defensive subspace of the opponent, towards the central ultra-offensive or advanced zones of the field produced the 13.3% of goals in collective plays. Regarding the action of passing in behind the defence, there was a great variety of spatial interactions, although the central defensive space of the opponent was the most used to perform the pass, specifically from the central offensive zone. Finally, the central defensive subspace was the most frequent area not only to initiate but also to finish the goals created by individual actions.

Table 6 shows how depending on the type of defence presented by the opposing team, the technical-tactical and spatial characteristics of the goals may differ. In relation to the penultimate action, crossing, goal passes and collecting free balls were more predominant against organized defences, while passing in behind the defence and actions such as dribbling and carrying the ball had a greater frequency against circumstantial defences ($p>0.001$). As far as the dynamic space is concerned, a greater utilization of wide subspaces (70.2%) was found against organized defences, in comparison with attacking against circumstantial defences (53.1%) ($p=0.015$). In regard to the last action, a greater proportion of goals scored by means of one contact to the ball (70.1%) was found against organized defences, in comparison with the 44.4% found against

circumstantial defences. Lastly, no differences were found between the level of penetration in the final action depending on the type of defence.

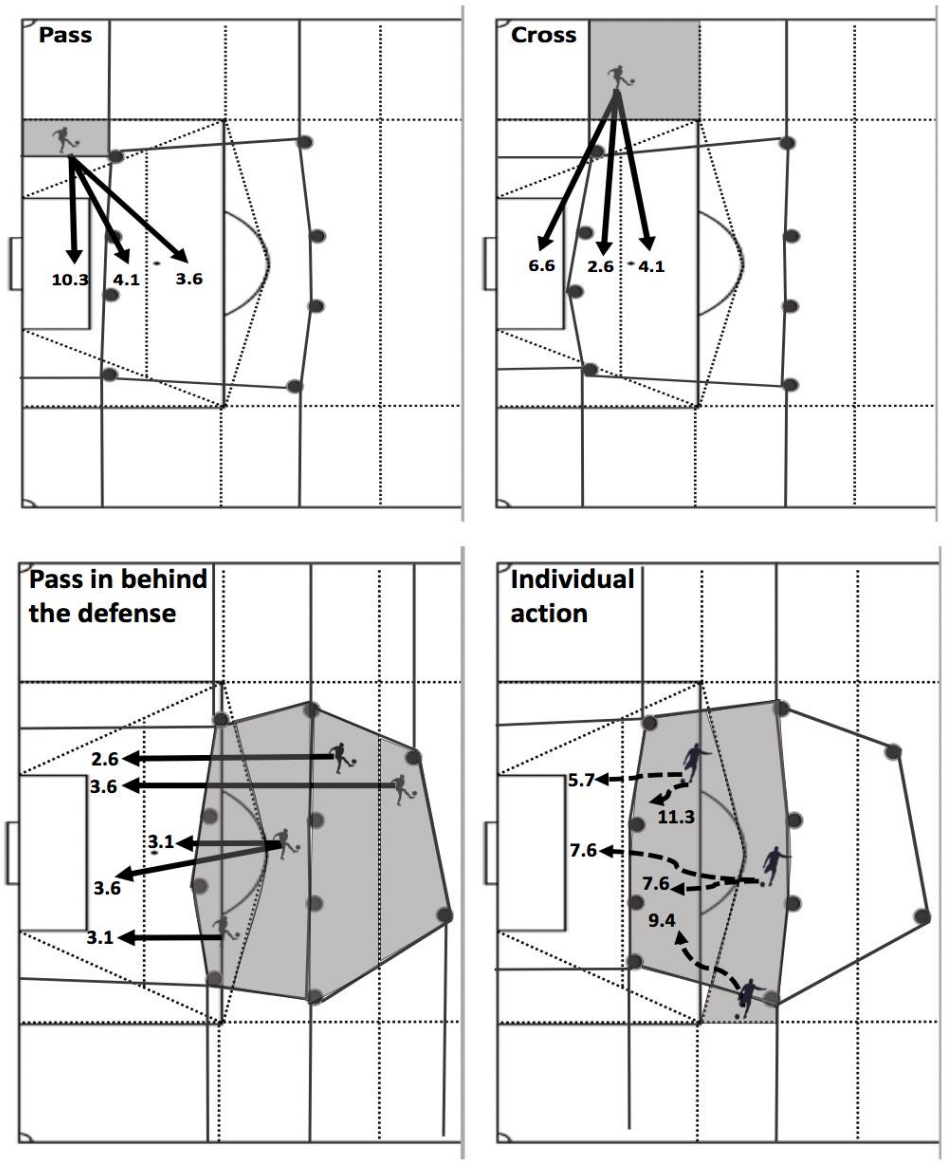


Figure 5. Interaction between the combined dynamic and static subspaces in the penultimate and the last action according to different technical-tactical actions. The data show the percentage in relation to the total of goals in collective plays (n=195) and individual actions (n=53).

Table 6. Descriptive analysis of the technical-tactical and spatial dimensions depending on the type of defence implemented by the opposing team

Dimension	N	Type of defence		Cramer's V	DF	χ^2	P*
		Organized	Circumstantial				
		N (%)	N (%)				
Penultimate action				0.359	6	37.027	0.000
Cross	54	46(25.0)	8(7.8)				
Pass in behind the defence	62	32(17.4)	30(29.1)				
Goal pass	79	53(28.8)	26(25.2)				
Dribbling	29	13(7.1)	16(15.5)				
Carrying the ball	11	1(0.5)	10 (9.7)				
Shot from distance	13	9(4.9)	4(3.9)				
Collecting a free ball	39	30(16.3)	9(8.7)				
Penultimate dynamic subspace in collective plays (width level)				0.168	1	5.501	0.015
Central subspaces	69	39(29.8)	30 (46.9)				
Wide subspaces	126	92(70.2)	34 (53.1)				
Penultimate static subspace in collective plays (width level)				0.213	1	8.763	0.003
Central channels	138	85(64.9)	53(85.5)				
Wide channels	55	46(35.1)	9(14.5)				
Penultimate static subspace (width level)				0.181	1	1.696	0.154
Central channels	31	16(69.6)	15(51.7)				
Wide channels	21	7(30.4)	14(48.3)				
Last dynamic subspace (Penetration level)				0.074	2	1.529	0.466
In behind the defence	158	98(53.8)	60(59.4)				
Defensive subspace	119	79(43.4)	40(39.6)				
Middle subspace	6	1(1.0)	5(2.7)				
Last action				0.304	4	26.521	0.000
Header	37	32(17.7)	5(4.9)				
Volley	26	23(12.7)	3(2.9)				
Shot (1 contact)	111	71(39.2)	40(38.8)				
Shot (2+ contacts)	110	55(30.4)	55(53.4)				
Other	4	0	4(2.2)				

DF=Degres of freedom; X^2=Chi square value; P= significance value of the X^2 test between type of defense

DISCUSSION

The aim of this study was to describe the technical, tactical and spatial indicators related to goal scoring in elite European soccer, considering the type of defence and the positioning of the opponent.

Regarding the type of possession, 75.9% of goals were produced in open play. This data coincides with previous literature that found how set pieces produced between 20 and 30% of goals in multiple international competitions (Yiannakos and Armatas, 2006; Armatas and Yiannakos, 2010; Njororai, 2013; Mitrotasios and Armatas, 2014). As far as the type of set pieces, the penalty kick was the most predominant (9.3%), followed by free kicks (7.7%) and corner kicks (6.9%). Thus, although previous research has demonstrated that only 1.5-3.0% of free kicks or corner kicks achieve to score a goal (Borrás and Sáinz de Baranda, 2005; Casal et al, 2015; Maneiro et al., 2017), our study confirms the great importance of this actions, considering that 1 out of 4 goals analysed were scored by means of set pieces.

For the open play situations, it should be noted that collective plays comprised nearly 50% of the total goals, while the individual actions as dribbling or carrying the ball produced only 1 out of 10 goals scored. In accordance with our results, previous literature that analysed goal patterns in the Eurocup 2004 (Yiannakos and Armatas, 2006), World Cup 2006 (Armatas and Yiannakos, 2010), English Premier League 2008/2009 (Durlik and Bieniek, 2014) and Eurocup 2012 (Mitrotasios and Armatas, 2014) found that less than 20% of goals were scored after individual actions. In this vein, Barreira et al, (2014) observed that goals scored after dribbling in interior spaces of the field have been decreasing over time in international competitions, while the collective plays such as crosses and short passes have been increasing. This fact may be due to the tactical development and greater defensive preparation in the current professional soccer, where disrupting the opponent to achieve shooting possibilities by means of individual actions require excellent skills.

As for the spatial and technical-tactical analysis, this study observed that a high number of assists were performed in central channels of the field but a great proportion of them were located in wide subspaces of the opponent. This fact highlights the importance of invading wide subspaces of the opponent in central and ultra-offensive channels of the field in order to increase the possibility of producing goal scoring situations. For instance, the invasion towards the 'box triangle' in wide and penetrative subspaces of the opponent was the most relevant area to assist to the goal scorer and constituted the most frequent spatial pattern of interaction between the penultimate and last action. From this position, the two most frequent patterns were either to send the ball towards subspaces located in behind the defensive line and within the ultra-offensive central zone or to pass the ball back towards the central defensive subspace. This type of pass has several advantages that may explain its high prevalence in goal scoring situations. On one hand, there is a short distance between the passer and the receiver, what would make easier the connection and understanding between both players. On the other hand, the high level of penetration achieved by the penultimate player would make the defenders to be located really close to their goal and it would allow the passer to have multiple passing options towards players that would be facing the opposing the goal. According to our knowledge, this is the first study that has highlighted and described this type of action and its spatial characteristics in goal scoring situations.

On the other hand, the passes from the central defensive and central middle subspaces of the opponent towards the subspace located in behind the defence achieved nearly 30% of the goals in collective plays. The analysis of patterns between the penultimate and last action showed a great variety in the utilization of dynamic and static subspaces, what indicates the high variability and unpredictability of these situations. In this type of action, the passer needs to interpret the right moment to pass the ball depending on the offensive and defensive movements as well as to send the ball not only with the intention of breaking the defensive line but placing the receiver in an immediate goal scoring situation. Previous studies have also reported the importance of assisting from central zones of the field. Horn et al. (2000) and Horn et al. (2002) found that assists from "zone 14" (Central zone located in the opposing half and just in front of the penalty box) generated the greater proportion of goals in the 1998 World Cup and the English Premier League 2001/2002, respectively. In the same line, Smith and Lions (2017) observed how passing in behind the defence from central channels of the field was the most predominant action for assisting the goal scorer during four World Cup editions (2002-2014). In this sense, our study supports the importance of passing in behind the defence from central channels as one of the key actions to assist the goal scorer. However, our data showed how passing from the 'box triangle' was the most predominant type of assist.

Regarding the action of crossing from wide channels of the field, our results revealed that 14.3% of total goals and 27.7% of goals achieved in collective plays were scored after a cross. Previous literature reported that crossing comprises between 30 and 40% of total goal assists (Durlik and Bieniek, 2014; Mitrotasious and

Armatas, 2014). However, differences between research designs and the definition of "crossing" make it difficult to compare our findings with other studies. Our study found how crossing from the wide ultra-offensive zone and the wide defensive subspace of the opponent towards the central ultra-offensive and back subspace of the opponent was the most predominant type of cross. In the same vein, Yamada and Hayashi (2015) observed that half of the crosses that led to goal in the 2010 and 2012 World Cups were directed towards the back of the defensive line.

In regard to the last action, it should be noted how the majority of goals in collective plays were scored inside the penalty box and particularly, within the "score pentagon". Other studies had reported how between 80-90% of goals are scored inside the penalty box (Yiannakos and Armatas, 2006; Armatas and Yiannakos, 2010; Mitrotasios and Armatas, 2014). As far as the goals scored after individual actions, the vast majority of them were initiated and finished in central zones of the field (offensive and advanced zones) facing directly the defensive line. This finding indicates that connecting with talented players in the subspace located between the defenders and midfielders should be an important tactical objective in professional soccer to increase the possibilities to score goals. Furthermore, goals achieved after individual actions were scored from further subspaces in relation to the goal in comparison with collective plays. These findings indicate that individual plays may present greater difficulty to disrupt the defensive structure of the opponent, so players shoot from areas with more density of defenders and further distance from the goal in comparison with collective plays.

Finally, our study found how the type of defence influenced the technical, tactical and spatial characteristics of the penultimate and last action in goal scoring situations. When the opposing team was organized defensively, the assists from wide dynamic and static areas, as well as crossing, heading, volleying and shooting by one contact to the ball were more frequent than when the opposing team had a circumstantial defence. This may be due to the fact that attacking against a compact and structured defence would make difficult to progress through central subspaces of the opponent. In this context, offensive teams would prefer to advance through wide subspaces and cross the ball towards the penalty box, what would increase the necessity for final players to finish by using one touch-based actions. Contrarily, when teams attacked a circumstantial defence, actions such as passing behind the defence, dribbling and shooting after two or more contacts to the ball had a most important role, probably due to the less protection of central subspaces, what would increase the options of facing the defensive line and progressing by individual actions. In this sense, previous studies (Gonzalez-Rodenas et al., 2015a; Gonzalez-Rodenas et al., 2017) observed how positional attacks used a higher proportion of wide subspaces and crosses in comparison with counterattacks, that progressed more frequently through central subspaces and used a higher proportion of passes in behind the defence.

This study has multiple limitations. In the first place, the fact of using observational methodology may not capture the entire complexity of soccer actions and interactions, as previous studies based on ecological models have claimed (Glazier, 2010; Vilar et al., 2012). In this sense, future research could analyse the combination and interaction between dynamic and static spaces by using other type of research methodology, such as network analysis (Passos et al., 2011), sequential and temporal patterns (Camerino et al., 2012), mixed methods (Anguera et al, 2017) or automatic tracking data (Memmet and Rein, 2018). Secondly, this study only evaluated the final actions of successful team possessions, so it did not consider other dimensions that occur at the beginning or development of team possessions that may be decisive for scoring goal. Lastly, this investigation was focused on a specific and elite competition, so this data cannot be extrapolated to professional soccer in general.

On the other hand, this study has important practical applications. On one hand, this study is graphic, descriptive, didactical and specifically performed for soccer coaches to visualize how goals are scored considering spatial, technical and tactical dimensions. In this way, soccer coaches may use the information and dimensions analysed in this investigation to design training sessions that reproduce specific tactical scenarios and manipulate specific defensive and spatial constraints in order to improve specific offensive actions. On the other hand, this study can help coaches create match strategies in order to maximize the performance of their players depending on the tactical and defensive context of each match and the specific offensive skills of their players.

In conclusion, this study observed how the combined evaluation of dynamic and static spaces contributed to display the specific subspaces where the final actions and interactions took place in goal scoring situations. In addition, the spatial, technical and tactical characteristics of the final actions were associated with the type of defence of the opponent.

REFERENCES

Altman, D.G. Some common problems in medical research. (1991) In: Altman DG (Ed.), Practical statistics for medical research (pp. 403–409). London: Chapman y Hall.

Anguera, M. T., Blanco-Villaseñor, A., Hernández-Mendo, A., & Losada (2011). Diseños observacionales: ajuste y aplicación en psicología del deporte. Cuadernos de Psicología del Deporte, 11(2), 63-76. https://doi.org/10.4321/s1578-84232015000100002

Anguera, M.T. (2004). Hacia la búsqueda de estructuras regulares en la observación del fútbol: detección de patrones temporales. Cultura Ciencia y Deporte, 1(1), 15-20. https://doi.org/10.12800/ccd.v1i1.10

Anguera, M.T., & Hernández-Mendo, A. (2013). La metodología observacional en el ámbito del deporte. E-balonmano.com: Revista de Ciencias del Deporte, 9(3), 135-160. https://doi.org/10.4321/s1578-84232015000100002

Anguera, M.T., Camerino, O., Castañer, M., Sánchez-Algarra, P., & Onwuegbuzie, A.J. (2017). The Specificity of Observational Studies in Physical Activity and Sports Sciences: Moving Forward in Mixed Methods Research and Proposals for Achieving Quantitative and Qualitative Symmetry. Frontiers in Psychology. 8, 2196. https://doi.org/10.3389/fpsyg.2017.02196

Armatas, V., & Yiannakos, A. (2010). Analysis and evaluation of goal scored in 2006 world cup. Journal of Sport and Health Research, 2(2), 119.

Barreria, D., Garganta, J., Castellano, J., Prudente, J., & Anguera, M. T. (2014). Evolución del ataque en fútbol de élite entre 1982 y 2010: Aplicación del análisis secuencial de retardos. Revista de Psicología del Deporte, 23(1), 139-146. https://doi.org/10.12800/ccd.v4i10.130

Borrás, D., & Sainz de Baranda, P. (2013). Análisis del córner en función del momento del partido en el mundial de Corea y Japón 2002. Cultura Ciencia y Deporte, 1(2), 87-93. https://doi.org/10.12800/ccd.v1i2.90

Caro, O., & Caro-Muñoz, A. (2016). Aproximación a los modelos tácticos generales ofensivos mediante el análisis de los goles en fútbol profesional. Journal of Sport and Health Research, 8(1), 1-12.

Casáis, L. (2008). La fase de transición en el fútbol. Editorial Deportiva Fútbol MCSports. Vigo.

Casal, C. A., Maneiro, R., Ardá, T., Losada, J. L., & Rial, A. (2014). Effectiveness of Indirect Free Kicks in Elite Soccer. International Journal of Performance Analysis in Sport, 14, 744-750. https://doi.org/10.1080/24748668.2014.11868755

Casal, C. A., Maneiro, R., Ardá, T., Losada, J. L., & Rial, A. (2015). Analysis of Corner Kick Success in Elite Football. International Journal of Performance Analysis in Sport, 15, 430-451. https://doi.org/10.1080/24748668.2015.11868805

Casal, C., Losada, J. L., & Ardá, T. (2015). Análisis de los factores de rendimiento de las transiciones ofensivas en el fútbol de alto nivel. Revista de Psicología del Deporte, 24(1) 103-110. https://doi.org/10.15366/rimcafd2018.70.004

Castellano, J. (2000). Observación y análisis de la acción de juego en el fútbol [Observation and analysis of game action in football] (PhD thesis). Universidad del País Vasco, Vitoria.

Castellano, J., Casamichana, D., & Lago, C. (2012). The Use of Match Statistics that Discriminate between Successful and Unsuccessful Soccer Teams. Journal of Human Kinetics, 31, 139-147. https://doi.org/10.2478/v10078-012-0015-7

Delgado-Bordonau, J., Domenech-Monforte, C., Guzmán, J., & Méndez-Villanueva, A. (2013). Offensive and defensive team performance: relation to successful and unsuccessful participation in the 2010 Soccer World Cup. Journal of Human Sport and Exercise, 8(4), 894-904. https://doi.org/10.4100/jhse.2013.84.02

Dufour, M., Phillips, J., & Ernwein, V. (2017). What makes the difference? Analysis of the 2014 World Cup. Journal of Human Sport and Exercise, 12(3), 616-629. https://doi.org/10.14198/jhse.2017.123.06

Durlik, K., & Bieniek, P. (2014). Analysis of goals and assists diversity in English Premier League. Journal of Health Sciences, 4(05), 047-056.

Gabin, B., Camerino, O., Anguera, M.T., & Castañer, M. (2012). Lince: multiplatform sport analysis software. Procedia. Social and Behavioral Sciences, 46, 4692–4694. https://doi.org/10.1016/j.sbspro.2012.06.320

Glazier, P. Game, set and match? Substantive issues and future direction in performance analysis. (2010). Sports Medicine, 40(8), 625-34. https://doi.org/10.2165/11534970-000000000-00000

Glazier, P. Game, set and match? Substantive issues and future direction in performance analysis. (2010) Sports Medicine, 40(8), pp.625-34. https://doi.org/10.2165/11534970-000000000-00000

González-Rodenas, J. (2013). Análisis del rendimiento táctico en el juego colectivo ofensivo en fútbol en la copa del mundo 2010 (Tesis doctoral). Universidad de Valencia, España. https://doi.org/10.12800/ccd.v1i2.95

González-Rodenas, J., López-Bondia, I., Calabuig, F., & Aranda, R. (2015a). Tactical Indicators associated with the creation of goal scoring opportunities in professional soccer. Cultura Ciencia y Deporte, 10(30), 215-225. https://doi.org/10.12800/ccd.v10i30.590

González-Rodenas, J., López-Bondia, I., Calabuig, F., Pérez-Turpin, J.A., & Aranda, R. (2017). Creation of goal scoring opportunities by means of different types of offensive actions in US Major League Soccer. Human Movement, 18(5):106–116. https://doi.org/10.5114/hm.2017.73616

González-Rodenas, J., López-Bondia, I., Calabuig, F., Pérez-Turpín, J.A., & Aranda, R. (2015b). The effects of playing tactics on creating scoring opportunities in random matches from US Major League Soccer. International Journal of Performance Analysis in Sport, 15, 851-872. https://doi.org/10.1080/24748668.2015.11868836

Gréhaigne, J. (2001). La organización del juego en el fútbol [Game organization in football] (1st ed.) Barcelona: INDE.

Hernández-Mendo, A., y Anguera, M.T. (2001). Estructura conductual en deportes sociomotores, fútbol. Revista de psicología social,16(1) 71-93. https://doi.org/10.1174/021347401317351215

Horn, R., Williams, R., & Ensum, J. (2002). Attacking in central areas: A preliminary analysis of attacking play in the 2001/2002 premiership season. Insight, 3(5), 28-31.

Horn, R., Williams, R., & Grant, A. (2000). Analysis of France in World Cup 1998 and Euro 2000. Insight, 4(1), 40-43.

James, N. (2006) Notational analysis in soccer: Past, present and future. International Journal of Performance Analysis in Sport, 6(2), 67-81. https://doi.org/10.1080/24748668.2006.11868373

James, N., Mellalieu, S., & Hollely, C. (2002). Analysis of strategies as a function of European and domestic competition. International Journal of Performance Analysis in Sport, 2, 85-103. https://doi.org/10.1080/24748668.2002.11868263

Maneiro, R., Losada, J.L., Casal, C.A. & Ardá, A. (2017). Multivariate analysis of indirect free kick in the FIFA World Cup 2014. Anales de psicología, 33(3), 461-470. https://doi.org/10.6018/analesps.33.3.271031

Mckenzie, R., & Cushion C., (2013). Performance analysis in football: a critical review and implications for future research. Journal or Sport Sciences, 31(6), 639-676.

Memmert, D., & Rein, R. (2018). Match analysis, Big Data and tactics: current trends in elite soccer. Dtsch Z Sportmed, 69: 65-72. https://doi.org/10.5960/dzsm.2018.322

Mitrotasios, M., & Armatas, V. (2014). Analysis of Goal Scoring Patterns in the 2012 European Football Championship. The Sports Journal, 1, 1-11.

Njororai, W. S. (2013). Analysis of goals scored in the 2010 world cup soccer tournament held in South Africa. Journal of Physical Education and Sport, 13(1) 6-13. https://doi.org/10.4314/ajpherd.v10i4.24678

Passos, P., Davids, K., Araújo, D., Paz, N., Minguéns, J., & Mendes, J. (2011). Networks as a novel tool for studying team ball sports as complex social systems. Journal of Science and Medicine in Sport, 14 (2), 170-176. https://doi.org/10.1016/j.jsams.2010.10.459

Pollard, R., & Reep, C. (1997). Measuring the effectiveness of playing strategies at soccer. Journal of the Royal Statistical Society: Series D (The Statistician), 46(4), 541-550. https://doi.org/10.1111/1467-9884.00108

Pollard, R., Ensum, J., & Taylor, S. (2004). Estimating the probability of a shot resulting in a goal: The effects of distance, angle and space. International Journal of Soccer and Science, 2(1), 50-55.

Pratas, J., Volossovitch, A., & Carita, A. (2018). Goal scoring in elite male football: A systematic review. Journal of Human Sport and Exercise, 13(1), 218-230. https://doi.org/10.14198/jhse.2018.131.19

Sarmento, H., Anguera, M. T., Campaniço, J., & Leito, J. (2010). Development and validation of a notational system to study the offensive process in football. Medicina (Kaunas), 46(6), 401-407. https://doi.org/10.3390/medicina46060056

Sarmento, H., Clemente, F. M., Duarte, A., Davids, K., McRobert, A., & Figuereido, A. (2017). What Performance Analyst need to know about research trends in association football (2012-2016). Sports Medicine. https://doi.org/10.1007/s40279-017-0836-6

Seabra, F., & Dantas, L. (2006). Space definition for match analysis in soccer. International Journal of Performance Analysis in Sport, 6(2), 97–113. https://doi.org/10.1080/24748668.2006.11868376

Silva, A., Sánchez Bañuelos, F., Garganta, J., & Anguera, M. T. (2005). Patrones de juego en el fútbol de alto rendimiento: Análisis secuencial del proceso ofensivo en el campeonato del mundo Corea-Japón 2002. Cultura Ciencia y Deporte, 1(2), 65-72. https://doi.org/10.12800/ccd.v1i2.95

Silva, D. (2011). Praxis de las acciones a balón parado en fútbol. Revisión conceptual bajo la teoría de la praxiología motriz. Tesis Doctoral, Facultad de Ciencias de la Educación y Psicología. Universitat Rovira I Virgili. Tarragona. https://doi.org/10.18294/pm.2016.1050

Smith, R.A., & Lyons, K. (2017). A strategic analysis of goals scored in open play in four FIFA World Cup football championships between 2002 and 2014. International Journal of Sports Science and Coaching. 12(3), 398-403. https://doi.org/10.1177/1747954117710516

Tenga, A., Holme, I., Ronglan, L. T., & Bahr, R. (2010b). Effect of playing tactics on achieving score-box possessions in a random series of team possessions from Norwegian professional soccer matches. Journal of Sports Sciences, 28(3), 245-255. https://doi.org/10.1080/02640410903502766

Tenga, A., Kanstad, D., Ronglan, L. T., & Bahr, R. (2009). Developing a new method for team match performance analysis in professional soccer and testing its reliability. International Journal of Performance Analysis in Sport, 9(1), 8-25. https://doi.org/10.1080/24748668.2009.11868461

Tenga, A., Ronglan, LT., & Bahr, R. (2010a). Measuring the effectiveness of offensive match-play in professional soccer. European Journal of Sport Science, 10(4), 269-277. https://doi.org/10.1080/17461390903515170

Vilar, L., Araujo, D., Davids, K., & Button, C. (2012). The role of ecological dynamics in analyzing performance in team sports. Sports Medicine, 42(1), pp.1-10. https://doi.org/10.2165/11596520-000000000-00000

Wright, C., Atkins, S., Polman, R., Jones, B., & Lee, S. (2011). Factors associated with goals and goal scoring opportunities in professional soccer. International Journal of Performance Analysis in Sport, 11(3), 438-449. https://doi.org/10.1080/24748668.2011.11868563

Yamada, H., & Hayashi, Y. (2015). Characteristics of goal scoring crosses in International Soccer tournaments. Football Science, 12, 24-32.

Yiannakos, A., & Armatas, V. (2006). Evaluation of goal scoring patterns in the European Championship in Portugal 2004. International Journal of Performance Analysis in Sport, 6, 178-188. https://doi.org/10.1080/24748668.2006.11868366

