

Defensive behavior against crosses: An analysis of leading Spanish, English, and German elite football teams during the 2022 - 2023 season

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Abstract:

The purpose of this study was to investigate the defensive behaviors of the top five teams in the Premier League, La Liga, and Bundesliga during national league matches in the 2022 – 23 season. A total of 60 football matches were analyzed, focusing on defensive responses to 1,428 crosses from open play. The goal was to identify effective strategies for defending crosses that enter the penalty area to minimize goal-scoring opportunities. For this study, the following tools were used: a) the Wyscout platform, b) P.C., and c) a tablet. Statistical analysis was performed using frequency analysis and percentages, with the Crosstabs command and the non-parametric chi-square (χ^2) test applied to examine relationships between the various categories. The tactical defensive behavior and the effectiveness of the defense in dealing with crosses concerned: 1) the body positioning of the defensive line players at the time of crossing, 2) the numerical defender-attacker relationship within the penalty area at the time of the cross, and 3) the cooperation of the defensive line and the midfielder. The analysis of the data showed that: 1) Defenders within the penalty area in all zones of the crosser choose in the highest percentage from 45.5% to 60.7% to have such a body position so that they "see the ball and the opponent". The effectiveness of the defense was statistically significant ($p < 0.05$) in all zones of the crosser recording the highest success rates in the "see ball and opponent" situations. 2) The numerical ratio of defenders - attackers within the penalty area which appeared was mainly a preponderance of defenders over attackers in the range of 68.6% to 83%, secondly an equal number of defenders - attackers emerged in the range of 14% to 30.2% while the cases of minority of defenders the percentages ranged from 2.9% to 9.5% in all the zone of the crosser. In general, higher success rates were recorded in supernumerary versus equal number and minority situations. In terms of defensive effectiveness versus numerical relationship, a statistically significant difference ($p < 0.05$) was found in the defenders' supernumerary situations for zone of the crosser LS: 26-16.5m, LS: 5.5-0 m. 3) Proper cooperation between defenders and midfielder increases success rates and decreases defensive line failure rates in all zone of the crosser. A statistically significant difference ($p < 0.05$) in defensive effectiveness between correct and incorrect collaboration between defenders and halfbacks emerged for zone of the crosser LS: 26-16.5m, LS: 11-5.5m, LS: 5.5-0m, HS: 16.5-11m and HS: 5.5-0m. In conclusion, optimal body positioning, maintaining numerical superiority, and strong cooperation between defenders and midfielders are critical factors in successfully defending crosses in elite-level football.

Key words: Soccer, defensive line, body positioning, penalty area.

Introduction

Despite the tactical importance of defending crosses within the penalty area, there is a paucity of empirical data concerning the specific mechanisms by which elite football teams mitigate such high-risk scenarios. Crosses originating from lateral and half-space zones pose a critical threat, given that approximately 80–90% of goals in top-level competition are scored within the 18-yard box (Çobanoğlu, 2019; Mitrotasios & Armatas, 2014; Olsen, 1988; Yiannakos & Armatas, 2006). Although prior research has elucidated offensive dynamics (Gabriel, 2022; The Football Coach, 2022; Georgievski et al., 2019; Partridge, 1989) and overall transition patterns (Casal et al., 2016; Barreira et al., 2024), investigations focusing explicitly on in-box defensive behavior against crosses remain limited and underrepresented in the literature.

Foundational studies have highlighted the influence of defender body orientation on clearing success (Marziali & Mora, 2011). Similarly, the numerical ratio of defenders to attackers has been shown to affect defensive efficacy in set-piece contexts (Mitrotasios et al., 2022), while inter-line cooperation between defensive and midfield units is thought to enhance spatial coverage and reduce vulnerability (Marziali & Mora, 2011; Yamada & Hayashi, 2015). However, these insights are largely derived from isolated scenarios or set-piece analyses rather than open-play crosses.

Several recent studies have explored performance indicators (Kapsalis et al., 2023), physiological profiling (Aksoy et al., 2024), goal distribution trends (Rance, 2023), and variations in playing style (Plakias et

al., 2023a, 2023b), as well as the impact of injury severity on player performance (Malliou et al., 2025). Additionally, Majewski et al. (2025) demonstrated the utility of econometric models in forecasting match outcomes, integrating factors such as team valuation and travel distance, thereby underscoring the growing importance of data-driven decision-making in tactical preparation. Complementarily, the work of Bács et al. (2025) offers a comparative economic evaluation of league balance between the Premier League and La Liga, emphasizing how financial disparity and player valuation influence match competitiveness. Furthermore, the role of player loans as a form of inter-club cooperation has gained prominence in modern football, as highlighted by Jagielski (2024), who examined the dynamics and strategic implications of temporary transfers in Polish football. Lastly, Hamdan et al. (2022) provided insights into injury perceptions and prevention strategies among elite players, reinforcing how physical readiness and injury mitigation practices can affect match availability and performance stability—critical variables when evaluating defensive consistency during crosses.

Nevertheless, none of these studies have directly examined in-box defensive behavior during open-play crosses, leaving a significant gap in the existing literature.

To address this gap, the present study employs a dataset comprising 1,428 defensive sequences extracted from 60 national-league matches involving the top five teams in the Premier League, LaLiga, and the Bundesliga during the 2022–2023 season. Leveraging video-based coding via the Wyscout platform and non-parametric chi-square analyses, we examine three core tactical variables: (1) defenders' body positioning at the moment of the cross, (2) the numerical defender-to-attacker ratio within the penalty area, and (3) the cooperative alignment of defensive-line players with midfielders. By integrating quantitative frequency analyses with inferential statistics, our aim is to delineate evidence-based defensive principles that can inform coaching interventions and further academic inquiry into elite in-box defending.

Method

Research sample

The sample consisted of the top five teams for the 2022/2023 season in the following leagues: the Premier League (Manchester City, Arsenal FC, Manchester United, Newcastle United, Liverpool FC), LaLiga (FC Barcelona, Real Madrid, Atletico de Madrid, Real Sociedad, Villarreal CF) and Bundesliga (FC Bayern Munich, Borussia Dortmund, RB Leipzig, FC Union Berlin, SC Freiburg). The selection of these teams was based on their status as the most formidable competitors in their respective national leagues, ensuring that both attacking and defensive actions would display a high level of quality and frequency. It is particularly noteworthy that their defensive performance was expected to demonstrate considerable effectiveness.

The study analyzed 60 matches, examining 1,428 defensive sequences to assess the tactical behavior of the defensive line. A defensive sequence was defined as a phase of play in which a team had lost possession and was repositioning in the defensive third. During this phase, the ball was located in either the lateral or half spaces, while the defensive line was strategically positioned between the ball and the goal to prevent scoring attempts by the opponent.

The selection of sequences was based on specific inclusion criteria, requiring that they occurred during full-time or extra-time match play. Video recordings were used to ensure the clear and accurate identification of all evaluated variables.

The criteria for exclusion encompassed defensive actions arising from set-piece situations or their resultant developments. In addition, sequences following a penalty or its result, which included goalkeeper saves, were also excluded. In addition, sequences resulting in goal-scoring opportunities that were contrary to the established rules of the game were not taken into account.

This approach guaranteed that the evaluation focused exclusively on defensive actions performed during the game, thus providing an accurate measure of tactical defensive effectiveness among the top soccer teams competing at the highest levels of competition.

Procedure

Data were collected using the Wyscout platform (Genoa, Italy), focusing on video recordings of offensive actions from elite teams during standard match conditions. Filters were applied to isolate sequences involving opponent attacks from the lateral and half-space zones. Each sequence was analyzed repeatedly, both in real time and with pause/reset tools, to assess the defensive responses with precision.

Three key indicators were used to evaluate tactical defensive behavior. The first was body positioning of defenders in the penalty area during crosses delivered from zones A–D in lateral (LS) and half-space (HS) areas. Defenders were classified based on whether they: (a) had their backs to goal while tracking ball and opponents, (b) saw both ball and opponent with head movement, (c) focused only on the ball, (d) saw both the ball and the goal, or (e) exhibited other positioning (Figure 1).

The second indicator assessed the numerical ratio between defenders and attackers positioned within the penalty area at the moment a cross was delivered. Each situation was categorized as either numerical equality (equal numbers), numerical superiority (more defenders than attackers), or numerical inferiority (fewer defenders than attackers).

The third indicator involved cooperation between the defensive line and midfielders, evaluated through positional groupings within the defensive cone. One arrangement included two central defenders, the weak-side

full-back, and one midfielder (Figure 2A); the other included the same defenders with two midfielders (Figure 2B). These patterns were analyzed to determine their role in successful cross-defense.



Figure 1. Zone of the Crosser and Defenders' body position zone. Zones A–D indicate the distance the crosser from the goal line, with A = 26–16.5 m, B = 16.5–11 m, C = 11–5.5 m, and D = 5.5–0 m. LS = Lateral Space; HS = Half Space. The Body position of the defenders in the zone A-B-B-C inside the defensive cone while dealing crosses from zones A-B-C-D respectively. The **Defensive Cone** represents the critical area inside the penalty box where defenders must position themselves

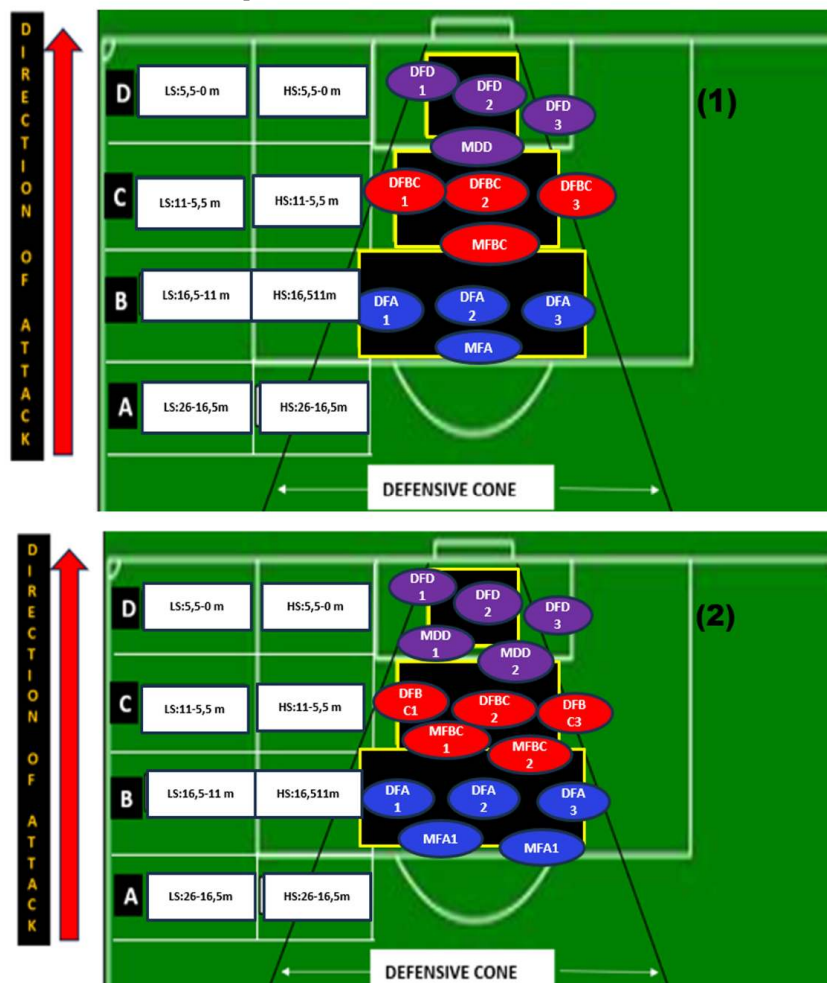


Figure 2. Defensive Cooperation Models During Cross Defense: (1) Three Defenders and One Midfielder, (2) Three Defenders and Two Midfielders. A, B, C, D = Lateral zones of the field based on cross origin distance, LS = Lateral Space; HS = Half Space. DFA1, DFA2, DFA3 =Defender, MFA, MFA1, MFA2 = Midfielder: ball position in space A. DFBC1, DFBC2, DFBC3= Defender, MFBC, MFBC1, MFBC 2 =Midfielder: ball position in space B or C. DFD1, DFD2, DFD3= Defender, MDD, MDD1, MDD2 =Midfielder: ball in space D

Reliability testing

Intra- and inter-observer reliability were assessed using Cohen's kappa (κ) coefficient. For intra-observer reliability, the primary analyst re-evaluated 150 randomly selected crosses on two separate occasions, spaced one week apart. Kappa values exceeding 0.80 were recorded, indicating a strong level of agreement (McHugh, 2012). For inter-observer reliability, a second independent football analyst assessed the same set of crosses under similar conditions. Again, κ values greater than 0.80 were observed across all performance indicators, demonstrating a similarly high level of agreement (Table 1), consistent with the reliability thresholds outlined by McHugh (2012).

Table 1. The Intra- and Inter-Rater Reliability Analysis (K) for Crossing Variables

Variable	Intra-observer Kappa value	Inter-observer Kappa value
Zone of the Crosser and Defenders' Body position zone	0.85	0.82
Zone of the crosser and number of attackers in the 18-yard box	1	1
Zone of the crosser and position of three Defenders and a Midfielder	0.86	0.84
Zone of the crosser and position of three Defenders and two Midfielders	0.82	0.80

Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics (version 29.0.0.0, build 241). Descriptive statistics included frequency distributions and percentage ratios. To examine the independence and associations between categorical variables, the Crosstabs function and the non-parametric chi-square (χ^2) test were applied. The chi-square test is appropriate for evaluating the frequency of cases across categories and assessing relationships between categorical variables. Statistical significance was set at $p < 0.05$.

Results

1. Body position

In order to calculate the frequency and effectiveness of defensive tactical behaviour during the phases in which the crosses were played, a count of all these phases was made in relation to the body position of the players. From the data analysed it was found that the dominant body position across all heights was for players to "see the ball and the opponent" (Table 2).

Table 2. Zone of the crosser and Body position

ZONE OF THE CROSSER	BODY POSITION %				
	THEIR BACKS TURNED TO THEIR GOAL	SEE THE BALL AND THE OPPONENT	SEE ONLY THE BALL	SEE THE BALL AND THE GOAL	ELSE
LS: 26-16,5m	12,9%	60,7%	14,6%	11,9	
LS: 16,5-11m	5,5%	58,2%	22,4%	13,9%	
LS: 11-5,5m	1,7%	59,8%	22%	16,2%	0,4%
LS: 5,5-0m	1,8%	57,3%	31,6%	9,4%	
HS: 26-16,5m	28,6%	46%	19,8%	5,6%	
HS: 16,5-11m	4,1%	54,1%	25,7%	16,2%	
HS: 11-5,5m		45,5%	33,9%	20,7%	
HS: 5,5-0m		54,3%	32,2%	13,6%	
ALL HEIGHTS	6,7%	56%	24,1%	13,2%	0,1%

To analyze differences in defensive effectiveness when dealing with crosses from various crosser zones in relation to different types of body positioning, the non-parametric χ^2 test was used. The results revealed a statistically significant difference ($p < 0.05$) (Table 3).

Table 3. Effectiveness of defence in different zone of the crosser in relation to body positioning (* $p < 0,05$)

Zone of the crosser	χ^2 , p
LS: 26-16,5m	$\chi^2_{(3)} = 14,824$, $p = 0,38^*$
LS: 16,5-11m	$\chi^2_{(3)} = 2,436$, $p = 487$
LS: 11-5,5m	$\chi^2_{(4)} = 12,234$, $p = 0,16^*$
LS: 5,5-0m	$\chi^2_{(3)} = 9,6368$, $p = 0,22^*$

HS: 26-16,5m	$\chi^2_{(3)} = 8,447, p=0,038^*$
HS: 16,5-11m	$\chi^2_{(3)} = 8,0748, p=,044^*$
HS: 11-5,5m	$\chi^2_{(2)} = 11,569, p=0,003^*$
HS: 5,5-0m	$\chi^2_{(2)} = 20,268, p=0,001^*$
ALL HEIGHTS	$\chi^2_{(4)} = 66,555, p=0,001^*$

Regarding the success and failure frequencies in the different body positions it was found that in almost all the zone of the crosser when the players “saw the ball and the opponent”, they had the highest success rates and the lowest failure rates (Table 4)

Table 4. Zone of the crosser and frequencies (%) of success - failure in relation to body position

BODY POSITION FREQUENCIES (%)										
ZONE OF THE CROSSER	THEIR BACKS TURNED TO THEIR GOAL		SEE THE BALL AND THE OPPONENT		SEE ONLY THE BALL		SEE THE BALL AND THE GOAL		ELSE	
	SUCCESS	FAIL	SUCCESS	FAIL	SUCCESS	FAIL	SUCCESS	FAIL	SUCCESS	FAIL
LS: 26-16,5m	94,7%	5,3%	94,4%	5,6%	76,7%	23,3%	85,7%	14,3%		
LS: 16,5-11m	81,8%	18,2%	91,5%	8,5%	84,4%	15,6%	85,7%	14,3%		
LS: 11-5,5m	50%	50%	88,2%	11,8%	81,1%	18,9%	76,9%	23,1%	0%	100%
LS: 5,5-0m	66,7%	33,3%	93,9%	6,1%	81,5%	18,5%	100%	0%		
HS: 26-16,5m	83,3%	16,7%	84,5%	15,5%	60%	40%	57,1%	42,9%		
HS: 16,5-11	100%	0%	92,5%	7,5%	68,4%	31,6%	66,7%	33,3%		
HS: 11-5,5m			89,1%	10,9%	61%	39%	84%	16%		
HS: 5,5-0m			95,4%	4,6%	73,4%	26,6%	70,4%	29,6%		
ALL HEIGHTS	86,3%	13,7%	91,7%	8,3%	75%	25%	80,4%	19,6%	0%	100%

2. Numerical ratio of defenders and attackers

To assess the frequency and effectiveness of defensive tactical behavior during phases involving crosses, all such phases were counted in relation to the numerical ratio of defenders and attackers within the penalty area. Analysis of the data revealed that the predominant numerical relationship in the penalty area was a defensive superiority, with defenders outnumbering attackers (Table 5).

Table 5. Zone of the crosser and numerical ratio (%) defender's vs. attackers

ZONE OF THE CROSSER	PARITY (in %)	MINORITY (in %)	SUPERNUMERARY (in %)
LS: 26-16,5m	17,6%	7,1%	75,3%
LS: 16,5-11m	15,9%	5%	79,1%
LS: 11-5,5m	14,9%	3,3%	81,7%
LS: 5,5-0m	14%	2,9%	83%
HS: 26-16,5m	30,2%	3,2%	66,7%
HS: 16,5-11m	21,6%	9,5%	68,9%
HS: 11-5,5m	23,1%	8,3%	68,6%
HS: 5,5-0m	17,6%	5%	77,4%

To analyze differences in defensive effectiveness when dealing with crosses from various crosser zones in relation to the numerical ratio within the penalty area, the non-parametric χ^2 test was used. The results indicated a statistically significant difference in effectiveness for the crosser's zones: LS (26-16.5m, 5.5-0m) and HS (5.5-0m) (Table 6).

Table 6. Effectiveness of the defence in the various zones of the crosser in relation to the numerical relationship (* $p < 0.05$).

Zone of the crosser	$\chi^2_{(2)}$
LS: 26-16,5m	$\chi^2_{(2)} = 8,119, p = 0,017 *$
LS: 16,5-11m	$\chi^2_{(2)} = 3,622, p = 0,164 *$
LS: 11-5,5m	$\chi^2_{(2)} = 4,212, p = 0,122 *$
LS: 5,5-0m	$\chi^2_{(2)} = 5,941, p = 0,051 *$
HS: 26-16,5m	$2 \chi^2_{(2)} = 1,542, p = 0,463 *$
HS: 16,5-11m	$\chi^2_{(2)} = 0,068, p = 0,967 *$
HS: 11-5,5m	$\chi^2_{(2)} = 0,479, p = 0,787 *$
HS: 5,5-0m	$\chi^2_{(2)} = 9,988, p = 0,007 *$

The frequency analysis of defensive failures in the different player number ratios revealed that more defensive failures were recorded when in a minority while fewer defensive impacts were recorded when in a supernumerary. (Table 7)

Table 7. Zone of the crosser and frequencies (%) of successful - unsuccessful defence in relation to the numerical relationship.

ZONE OF THE CROSSER	PARITY (FREQUENCIES %)		MINORITY (FREQUENCIES %)		SUPERNUMERARY (FREQUENCIES %)	
	SUCCESS	FAILURE	SUCCESS	FAILURE	SUCCESS	FAILURE
LS: 26-16,5m	86,55	13,5%	76,2%	23,8%	93,2%	6,8%
LS: 16,5-11m	90,6%	9,4%	70%	30%	89,3%	10,7%
LS: 11-5,5m	77,8%	22,2%	62,5%	37,5%	85,8%	14,2%
LS: 5,5-0m	95,8%	4,2%	60%	40%	90,1%	9,9%
HS: 26-16,5m	73,7%	26,3%	100%	0%	78,6%	21,4%
HS: 16,5-11m	81,3%	18,8%	85,7%	14,3%	82,4%	17,6%
HS: 11-5,5m	78,6%	21,4%	70%	30%	79,5%	20,5%
HS: 5,5-0m	68,6%	31,4%	100%	0%	87,7%	12,3%

3. Cooperation between the defensive line players and the midfielders

In order to calculate the frequency and effectiveness of the defensive tactical behaviour during the phases in which the crosses took place, a count of all these phases was made in relation to the defensive line and midfielder cooperation as defined by this research. Analysis of the data revealed higher percentages of correct cooperation between the defensive zone and the midfielder when the ball was in the half-space (HS) zone (26-16.5m), while no significant differences were observed across the other zones of the crosser (Table 8).

Table 8. Zone of the crosser and percentages (%) of correct and incorrect cooperation of defensive line and midfielders

ZONE OF THE CROSSER	CORRECT COLLABORATION (%)	INCORRECT COLLABORATION (%)
LS: 26-16,5m	91,9%	8,1%
LS: 16,5-11m	91,5%	8,5%
LS: 11-5,5m	91,3%	8,7%
LS: 5,5-0m	90,1%	9,9%
HS: 26-16,5m	96,8%	3,2%
HS: 16,5-11m	89,2%	10,8%
HS: 11-5,5m	86,8%	13,2%
HS: 5,5-0m	89,9%	10,1%

To examine the differences in defensive effectiveness when dealing with crosses and the cooperation between the defensive zone players and midfielders, the non-parametric χ^2 test was used. The results indicated a statistically significant difference in effectiveness in the crosser's zones: LS (26-16.5m, 11-5.5m, 5.5-0m) and HS (16.5-11m, 5.5-0m) (Table 9).

Table 9. Zone of the crosser and effectiveness of the defence in relation to the cooperation of defensive line players and midfielders (*= $p < 0.05$).

Zone of the crosser	χ^2 , p
LS: 26-16,5m	$\chi^2_{(1)} = 4,287$, $p = 0,038^*$
LS: 16,5-11m	$\chi^2_{(1)} = 0,002$, $p = 0,965$
LS: 11-5,5m	$\chi^2_{(1)} = 8,144$, $p = 0,004^*$
LS: 5,5-0m	$\chi^2_{(1)} = 7,993$, $p = 0,005^*$
HS: 26-16,5m	$\chi^2_{(1)} = 0,018$, $p = 0,892$
HS: 16,5-11m	$\chi^2_{(1)} = 6,515$, $p = 0,011^*$
HS: 11-5,5m	$\chi^2_{(1)} = 2,802$, $p = 0,094$
HS: 5,5-0m	$\chi^2_{(1)} = 15,552$, $p = 0,001^*$

Overall, more defensive failures were recorded when cooperation between the defensive zone players and midfielders was incorrect, whereas fewer defensive failures occurred when cooperation was successful (Table 10).

Table 10. Frequencies (%) of Successful and Failed Defense Based on Correct and Incorrect Cooperation Between Defensive Zone Players and Midfielder

ZONE OF THE CROSSER	CORRECT COLLABORATION (FREQUENCIES %)		INCORRECT COLLABORATION (FREQUENCIES %)	
	SUCCESS	FAILURE	SUCCESS	FAILURE
LS: 26-16,5m	91,9%	8,1%	79,2%	20,8%
LS: 16,5-11m	88,6%	11,4%	88,2%	11,8%
LS: 11-5,5m	85,9%	14,1%	61,9%	38,1%
LS: 5,5-0m	92,2%	7,8%	70,6%	29,4%
HS: 26-16,5m	77,9%	22,1%	75%	25%
HS: 16,5-11m	86,4%	13,6%	50%	50%
HS: 11-5,5m	81%	19%	62,5%	37,5%
HS: 5,5-0m	88,3%	11,7%	55%	45%

Discussion

Body Position

The analysis of body positioning data revealed that, across all crossing zones, defenders from all teams predominantly adopted the stance of "seeing both the ball and the opponent." This was followed—at much lower frequencies—by the body positions of "seeing only the ball," "seeing the ball and the goal," and, least commonly, "having their backs turned to the goal" (Table 2).

Statistically significant differences in defensive effectiveness ($p < 0.05$) were found across all crossing zones in relation to body positioning:

(a) Crosser's Zone LS: 26–16.5 m

In this zone, defenders were most effective when adopting either a "backs turned to the goal" position (5.3% failure rate) or a "see the ball and the opponent" position (5.6% failure rate). The highest failure rate occurred when defenders positioned themselves to "see only the ball" (23.3%) (Table 4). While there are no prior studies specifically analyzing defenders' body positions during crosses from this distance within the penalty area, related literature offers relevant insights. Marziali and Mora (2011, p. 70) suggest that the optimal defensive stance involves having the back turned to the goal, enabling comprehensive visual control of the ball, opponents, and teammates. This recommendation aligns with the findings in the present study, confirming the effectiveness of that positioning under these conditions.

(b) Crosser's Zone LS: 16.5–11 m

In this zone, defensive effectiveness was again statistically significant ($p < 0.05$) in relation to body positioning. Defenders who adopted the "see the ball and the opponent" stance recorded significantly fewer failures (8.5%) than those who positioned themselves with "their backs turned to the goal" (18.2%) (Table 4). Interestingly, although Marziali and Mora (2011, p. 71) continue to advocate for a "back to goal" stance in this area to ensure full visual control, the current findings suggest otherwise. In practice, defenders were more successful when facing both the ball and the opponent directly, possibly due to the shorter distance and faster pace of crosses in this zone, which may demand quicker reaction times and more direct engagement.

(c) Crosser's Zone LS: 11.5 m

In this zone, defensive effectiveness varied significantly depending on body positioning ($p < 0.05$). Defenders who positioned themselves to *see both the ball and the opponent* recorded the highest success rate (88.2%) and the lowest failure rate (11.8%) (Table 4). In contrast, and contrary to the recommendation by Marziali and Mora (2011, p. 74), defenders with *their backs turned to the goal* experienced greater difficulty, with equal success and failure rates (50%). This may be attributed to the inherent challenge of maintaining simultaneous visual control of the ball, opponents, and teammates from such a position, especially in close-range situations.

(d) Crosser's Zone LS: 5.5–0 m

A statistically significant difference ($p < 0.05$) was also observed in this zone in relation to defensive body positioning. The highest success rates were achieved by defenders who adopted the *see the ball and the goal* position (100% success; 0% failure) and the *see the ball and the opponent* position (93.3% success; 6.1% failure) (Table 4). However, these positions were adopted at different frequencies: only 9.4% of cases involved *seeing the ball and the goal*, whereas 57.3% involved *seeing the ball and the opponent* (Table 4). The *backs turned to the goal* posture, as recommended by Marziali and Mora (2011, pp. 75–76), was rarely used (1.8%) and was associated with moderate effectiveness (66.7% success; 33.3% failure), likely due to reduced field awareness in high-pressure scenarios near the goal.

(e) Crosser's Zone HS: 26–16.5 m

In this higher-sided (HS) zone, body positioning was again significantly related to defensive success ($p < 0.05$). The most effective stances were *see the ball and the opponent* (84.5% success; 15.5% failure) and *backs turned to the goal* (83.3% success; 16.7% failure) (Table 2). However, defenders predominantly preferred the former, with 46% of total cases adopting the *see the ball and the opponent* position compared to 28.6% adopting *backs turned to the goal* (Table 4). Given the scarcity of existing research on defensive body positioning in comparable high-level game situations, these findings offer practical guidance for developing effective defensive strategies in training.

(f) Crosser's Zone HS: 16.5–11 m

This zone also showed a statistically significant relationship between defensive success and body position ($p < 0.05$). Defenders with *backs turned to the goal* achieved perfect success (100% success; 0% failure), while those adopting the *see the ball and the opponent* position also performed well (92.5% success; 7.5% failure) (Table 2). Despite this, the back-to-goal stance was employed in only 4.1% of cases, whereas 54.1% of defenders opted to *see the ball and the opponent* (Table 4). In the absence of extensive research on body positioning in such dynamic and competitive match contexts, these empirical findings should inform future tactical training for defenders operating in similar zones.

(f) Crosser's Zone HS: 11–5.5 m

In this zone, a statistically significant difference ($p < 0.05$) was found between defensive effectiveness and body positioning. The highest success rates occurred when defenders adopted the *see the ball and the opponent* position (89.1% success; 10.9% failure) and the *see the ball and the goal* position (84% success; 16% failure) (Table 2). The *see the ball and the opponent* stance was the most commonly adopted (45.5% of cases), compared to 20.7% for *see the ball and the goal* (Table 4). Notably, the body position recommended by Marziali and Mora (2011, pp. 75–76)—*backs turned to the goal*—was not observed in any case. The *see only the ball* position, used in 32.2% of cases, was associated with the poorest performance, with a success rate of just 61% and a failure rate of 39%. In light of the absence of prior studies or literature addressing defender body positioning in this specific context, these findings offer important practical insights for defensive training design.

(g) Crosser's Zone HS: 5.5–0 m

Defensive effectiveness in this final zone also varied significantly with body positioning ($p < 0.05$). The highest success rate (89.1%) and the lowest failure rate (10.9%) were achieved when defenders positioned themselves to *see the ball and the opponent* (Table 4). This positioning was also the most frequently used, accounting for 54.3% of all cases. The next most common stance—*see only the ball*—was adopted in 24.1% of cases and yielded significantly poorer outcomes, with only a 61% success rate and a 39% failure rate. As existing research and literature provide no prior analysis of body positioning in such close-range defensive scenarios, these results present valuable data for refining training practices.

Overall Summary

Across all crosser zones analyzed, the body positioning strategy that consistently led to the highest defensive success was *seeing both the ball and the opponent*. This approach was used in 56% of all observed cases (Table 2) and resulted in a success rate of 95.4% and a failure rate of just 4.6% (Table 4). These findings strongly suggest that this positioning should be emphasized in defensive training, particularly given the lack of previous empirical studies or theoretical frameworks addressing optimal defender body positioning during crosses in match play.

Numerical Relationship Between Defenders and Attackers

The data analysis revealed that, across all crosser zones, the predominant numerical relationship within the penalty area was one of defensive superiority. In 66.7% to 83% of all cases, defenders outnumbered

attackers. Situations of numerical parity accounted for 14% to 30%, while defensive inferiority—where attackers outnumbered defenders—occurred in only 2.9% to 9.5% of the cases (Table 5). This distribution was anticipated, as crossing situations from lateral and half spaces typically unfold against a structured and organized defensive block, where defenders are positioned to outnumber and contain potential attacking threats.

Interestingly, the analysis of defensive outcomes in relation to numerical ratios revealed a counterintuitive trend: the highest success rates were recorded when defenders were actually outnumbered by attackers (Table 7). However, this finding must be interpreted with caution, as it is influenced by data from two specific zones—HS: 26–16.5 m and HS: 5.5–0 m—where defenses were in the minority but achieved 100% success rates. These cases represented only 3.2% and 5% of the total sample, respectively, and are thus statistically negligible.

Statistically significant differences in defensive effectiveness based on numerical superiority ($p < 0.05$) were observed in the following situations:

- Defensive superiority in LS: 26–16.5 m and LS: 5.5–0 m
- Defensive inferiority in HS: 5.5–0 m, although, as noted, this represents only a small fraction of the dataset and should not be overinterpreted.

When compared to existing literature, only Mitrotasios et al. (2022) have examined the numerical dynamics of defenders and attackers in the penalty area. Their categorization into small-group, medium-group, and large-group formations revealed that most crosses were delivered when the penalty area contained a small number of attackers (60.8%) and a medium number of defenders (60.5%). These findings indirectly support the present study by reinforcing the notion that crosses are most often delivered into areas where defenders outnumber attackers, underscoring the importance of analyzing not just spatial but numerical factors in defensive organization.

Cooperation Between Defenders and Midfielders

Based on the data analysis, no statistically significant differences were found in the percentage of good versus poor cooperation between defenders and midfielders across the various zones of the crosser. However, an increased percentage of poor cooperation was observed in the half-spaces (HS: 16.5–11 m, HS: 11–5.5 m, HS: 5.5–0 m), exceeding 10% (Table 8).

Regarding defensive effectiveness in relation to the cooperation between the defensive line and midfielders across different crosser zones, the following findings emerged:

1. Zone of the Crosser (LS: 26–16.5 m):

A statistically significant difference ($p < 0.05$) in defensive effectiveness was observed between correct and incorrect collaboration between the defensive line and midfielders. Failure rates were 8.1% for correct collaboration and 20.8% for incorrect collaboration (Table 10). According to Yamada & Hayashi (2015), 83% of early crosses (originating beyond 16.5 m) end up between the penalty spot and the goal area (5.5 m), typically behind the defenders. As a result, the defensive line is often forced to retreat into the B-C zone to close the gap to the goal. This creates a vulnerable space between the 16.5 m line and the penalty spot, which, according to Kyranoudis et al. (2024), receives 24.8% of crosses from the left and 29.1% from the right. Pollard (1997) notes this area carries a high likelihood of successful goals. Therefore, effective coverage of this zone, especially in cases of crosses from LS: 26–16.5 m, requires solid coordination between defenders and midfielders, as demonstrated by the present study.

2. Zone of the Crosser (LS: 11–5.5 m):

A statistically significant difference ($p < 0.05$) was also observed here, with failure rates of 14.1% for correct collaboration and 38.1% for incorrect collaboration. (Table 10). Marziali & Mora (2011) suggest that in this zone, the defensive line should be aligned with the ball. When this principle is not applied or midfielders do not provide support, defensive control of the 5.5–11 m zone suffers. Kyranoudis et al. (2024) found that approximately 45% of crosses from <16.5 m end up in zone 4 (5.5–11 m). The present study found that 23.8% of crosses from LS: 11–5.5 m also land in this zone. According to Pollard (1997), zone 4 is associated with the highest chance of goal success. Midfielder support in covering this area is thus critical, as clearly demonstrated by the current research.

3. Zone of the Crosser (LS: 5.5–0 m):

Here too, a statistically significant difference ($p < 0.05$) was found between correct and incorrect collaboration. Failure rates were 7.8% and 29.4%, respectively (Table 10). As per Marziali & Mora (2011), in this zone, the defensive line typically positions itself diagonally in line with the ball near the goal area, limiting their ability to control the 5.5–11 m zone. Kyranoudis et al. (2024) report that about 45% of crosses from <16.5 m end up in zone 4, and the current study found that 36.6% of crosses from LS: 11–5.5 m also end up there. Given the high goal probability from zone 4 (Pollard, 1997), it is essential for midfielders to assist in its coverage—an assertion supported by this study's findings.

4. Zone of the Crosser (HS: 16.5–11 m):

A statistically significant difference ($p < 0.05$) was observed, with failure rates of 13.6% for correct collaboration and 50% for incorrect collaboration. (Table 10). In this scenario, the defensive line is often preoccupied with protecting the central space in front of the goal and may not have time to react to passes

into zone Z5 (16.5–11 m). Consequently, midfielder support becomes essential—a necessity clearly supported by the current findings.

5. *Zone of the Crosser (HS: 5.5–0 m):*

This zone also revealed a statistically significant difference ($p < 0.05$), with failure rates of 11.7% under correct collaboration and 45% under incorrect collaboration (Table 10). When the ball is in this area, the defensive line tends to focus on the central goal area, limiting their ability to respond to passes into zone Z4 (5.5–11 m). Midfielder support is thus necessary, a conclusion strongly supported by this study.

Conclusions

The purpose of this research was to analyze defensive behavior in response to different types of crosses within the penalty area, focusing on the top five teams from the Premier League, La Liga, and Bundesliga during the 2022–23 season. A total of 1,428 open-play crosses were recorded and examined. The analysis yielded the following key findings:

1. *Body Positioning of Defenders:*

In all zones of the crosser, defenders within the penalty area consistently adopted a body position that allowed them to “see both the ball and the opponent.” This positioning was found to have a statistically significant effect on defensive effectiveness ($p < 0.05$) across all crosser zones.

2. *Numerical Ratio of Defenders to Attackers:*

The majority of situations within the penalty area featured a numerical superiority for defenders, with defenders outnumbering attackers in 68.6% to 83% of cases. Numerical parity was observed in 14% to 30.2% of cases, while situations where attackers outnumbered defenders were less frequent, ranging from 2.9% to 9.5% across all crosser zones.

Overall, higher defensive success rates were recorded when defenders outnumbered attackers. Statistically significant differences in defensive effectiveness ($p < 0.05$) were found in cases of defensive numerical superiority specifically in the crosser zones LS: 26–16.5 m and LS: 5.5–0 m.

3. *Collaboration Between Defenders and Midfielders:*

Effective cooperation between defenders and midfielders was associated with increased defensive success and reduced failure rates across all crosser zones. Statistically significant differences ($p < 0.05$) in defensive effectiveness were identified between correct and incorrect collaboration in the zones LS: 26–16.5 m, LS: 11–5.5 m, LS: 5.5–0 m, HS: 16.5–11 m, and HS: 5.5–0 m.

References

- Aksoy, Ö., Soyal, M., Caba, U., Başkan, A. N., & Karadağ, A. D. (2024). The correlation between some physiological and motor parameters in elite football players according to playing positions. *Journal of Physical Education and Sport*, 24(4), 864–871. <https://doi.org/10.7752/jpes.2024.04099>
- Bács, B. A., Nagy, K., & Bácsné Bába, É. (2025). Comparative analysis of competitive balance in the English Premier League and Spanish La Liga from the 2014 to 2018 seasons. *Journal of Physical Education and Sport*, 25(2), Article 39. <https://doi.org/10.7752/jpes.2025.02039>
- Barreira, D., Garganta, J., Guimarães, P., Machado, J., & Anguera, T. M. (2024). Ball recovery patterns as a performance indicator in elite soccer. *Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology*, 228(1), 61–72. <https://doi.org/10.1177/1754337113493083>
- Casal, C. A., Miguel Ángel Andujar, M. Á., Losada, J. L., Ardá, T., & Maneiro, R. (2016). Identification of defensive performance factors in the 2010 FIFA World Cup South Africa. *Sports (Basel)*, 4(4), 54. <https://doi.org/10.3390/sports4040054>
- Çobanoğlu, H. O. (2019). Analysis of goals scored in the Russia World Cup 2018. *Journal of Education and Training Studies*, 7(2), 184–191. <https://doi.org/10.11114/jets.v7i2.3998>
- Gabriel, I. (2022). *Fussballtraining mit Prinzip* (1st ed.). Philippka GmbH & Co. KG.
- Georgievski, B., Labadze, L., & Aboelsoud, M. E. (2019). Comparative advantage as a success factor in football clubs: Evidence from the English Premier League (EPL). *Journal of Human Sport & Exercise*, 14, 292–314.
- Hamdān, M., Sharir, R., Yeo, W. K., & Raja Azidin, R. M. F. (2022). Soccer players’ perceptions on injury risk and prevention strategies. *Journal of Physical Education and Sport*, 22(4), 1302–1310. <https://doi.org/10.7752/jpes.2022.10301>
- Jagielski, M. (2024). Coopetition among football clubs in the field of player loans in Poland. *Journal of Physical Education and Sport*, 24(1), 58–67. <https://doi.org/10.7752/jpes.2024.01008>
- Kapsalis, M., Plakias, S., Kyranoudis, A., Zarkadoulas, A., Lathoura, A., & Tsatalas, T. (2023). Exploring the impact of possession-based performance indicators on goal scoring in elite football leagues. *Journal of Physical Education and Sport*, 23(8), 2004–2015. <https://doi.org/10.7752/jpes.2023.08231>
- Kyranoudis, E., Papadimitriou, K., Kyranoudis, A., Giannakopoulos, A., & Kostantinidou, X. (2024). Final pass and its relationship with final action for the creation of goal-scoring opportunities at EURO 2020. *Journal of Human Sport & Exercise*. <https://doi.org/10.14198/jhse.2024.192.06>

- Majewski, S., Majewska, A., & Güngör, A. Y. (2025). Forecasting of football match results using econometric models. *Journal of Physical Education and Sport*, 25(2), Article 38. <https://doi.org/10.7752/jpes.2025.02038>
- Malliou, V. J., Pafis, G., Ispirlides, I., Daskalaki, K., & Katsikas, C. (2025). The impact of injury severity on sleep quality in soccer players. *European Journal of Sport Sciences*, 4(3), 1–8. <https://doi.org/10.24018/ejsport.2025.4.3.230>
- Marziali, F., & Mora, V. (2011). *Difendere su attacchi frontali e laterali*. Edizioni Nuova Primos.
- McHugh, M. L. (2012). Interrater reliability: The kappa statistic. *Biochemia Medica*, 22(3), 276–282. <https://doi.org/10.11613/BM.2012.031>
- Mitrotasios, M., & Armatas, V. (2014). Analysis of goal-scoring patterns in the 2012 European Football Championship. *The Sport Journal*, 1, 1–11.
- Mitrotasios, M., Kubayi, A., Armatas, V., & Larkin, P. (2022). Analysis of crossing opportunities at the 2018 FIFA World Cup. *Montenegrin Journal of Sports Science and Medicine*, 11(1). <https://doi.org/10.26773/mjssm.220305>
- Olsen, E. (1988). An analysis of goal-scoring strategies in the World Championships in Mexico. In T. Reilly, A. Lees, K. Davids, & W. Murphy (Eds.), *Science and Football* (pp. 373–376). E & F Spon.
- Partridge, D., & Franks, I. M. (1989). A detailed analysis of crossing opportunities in the 1986 World Cup. Part II. *Soccer Journal*, June/July, 45–48.
- Plakias, S., Moustakidis, S., Mitrotasios, M., Kokkotis, C., Tsatalas, T., Papalexi, M., Giakas, G., & Tsaopoulos, D. (2023). A multivariate and cluster analysis of diverse playing styles across European football leagues. *Journal of Physical Education and Sport*, 23(200), 1631–1641. <https://doi.org/10.7752/jpes.2023.11336>
- Plakias, S., Moustakidis, S., Mitrotasios, M., Kokkotis, C., Tsatalas, T., Papalexi, M., Giakas, G., & Tsaopoulos, D. (2023). Analysis of playing styles in European football: Insights from a visual mapping approach. *Journal of Physical Education and Sport*, 23(169), 1385–1393. <https://doi.org/10.7752/jpes.2023.07200>
- Pollard, R., & Reep, C. (1977). Measuring the effectiveness of playing strategies at soccer. *The Statistician*, 46(4), 541–550.
- Rance, J. J. (2023). Examination of goals scored in the 2022 World Cup football tournament in Qatar. *Journal of Physical Education and Sport*, 23(336), 2951–2962. <https://doi.org/10.7752/jpes.2023.06169>
- The Football Coach. (2020). *Modern periodisation: Tactical periodisation & microciclo estructurado*. Football Coaching Ltd.
- 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.