Key Factors and Common Tendency of Heading Technique in Top Football Matches

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Abstract: - First, the research conducts a comprehensive search of the existing literature to understand the current research status and existing research gaps in football heading technique. Then, expert interviews are used to discuss the scientific and rational definition of indicators and related content used in this study and a questionnaire is developed to design an indicator system to evaluate "key factors of heading techniques in the 16th Euro Cup". There are 51 matches in the 16th European Cup. This paper makes a statistical analysis of 41 technical action indexes of 102 teams and the relationship between 41 indexes and the ideal effect of heading. It is concluded that 19 indexes, such as the times of the middle in the backfield and midfield, are significantly correlated with the ideal effect of headings. Then, the original data are statistically analyzed by Multiple Linear Regression Analysis to find out the quantitative relationship between the technical indexes of heading in top football matches and its ideal effect, which provides references for football training, technique analysis, and scientific research.

Key-Words: - football match - heading - technique - key factors - field area - technical ideal effect.

Received: June 24, 2024. Revised: January 25, 2025. Accepted: March 28, 2025. Published: June 6, 2025.

1 Introduction

Football is a globally beloved sport, captivating millions of fans with its dynamic gameplay and intense competition. Football is a highly complex team sport in which performance is the result of players' comprehensive physical quality, technique, and tactical skills, [1]. Among the myriad of techniques that players employ, heading plays a critical role in both offensive and defensive scenarios. Heading, which involves using the head to pass, shoot, or clear the ball, requires not only physical prowess but also precise timing, spatial awareness, and technical skill. Despite its importance, previous research has predominantly focused on the physical aspects of football players, such as their endurance, speed, and strength, but there are relatively few studies on the technology and tactics of top football matches, [2], [3], [4]. Nowadays, video analysis and other technologies are commonly used to monitor football matches, as they assist athletes in improving their performance and training results, which is the research direction of most scholars, [5], [6]. This focus has left a significant gap in our understanding of the intricate technical and tactical skills required, particularly in top-level football matches. The physical attributes of football players have been well-documented and extensively studied. These attributes, while essential, only provide a partial view of what makes a football player effective on the field. Technical skills, especially heading, are crucial for achieving success in matches. Heading is a complex skill that involves coordination, accuracy, and the ability to read the game, yet it has not been explored in depth within the context of elite competitions, [7].

This study aims to bridge this gap by focusing on the key factors influencing heading techniques. Based on relevant studies, in previous research on heading, scholars focused mainly on the number of headings per game, jumping heading techniques, the differences between heading in each league and different positions, and the impact of overall level on heading techniques, [8], [9]. However, the focus of these studies was limited, mainly on the use of heading techniques in football, [10]. There are few studies on the quantitative analysis of related factors, only one of which uses Chi-square to analyze the relationship between the factors of the game situation and the heading technique, [11]. By analyzing data from the 16th European

Championship, one of the most prestigious tournaments in the world, this research seeks to identify the critical variables that impact heading performance. The European Championship offers a unique and rich dataset, given the high caliber of teams and players participating, making it an ideal setting for this investigation. Our approach involves a comprehensive statistical analysis of match data to uncover patterns and relationships that can inform training methods and tactical planning. We employ advanced analytical techniques to develop a predictive model for heading performance, considering various factors such as player positions, frequency of heading attempts, and contextual elements within the game. The novelty of our approach lies in this detailed statistical analysis and the development of a predictive model, which aims to provide actionable insights for coaches and players. In addition to addressing a gap in the existing literature, this research has practical implications for the training and strategic development of football teams. By understanding the key factors that contribute to effective heading, coaches can design targeted training drills to enhance these skills. Furthermore, tactical planning can be refined to better utilize players' heading abilities during matches, potentially giving teams a competitive edge.

In summary, this study contributes to the body of knowledge on football techniques by providing an in-depth examination of heading, a crucial yet often underexplored aspect of the game. By analyzing data from the 16th European Championship, we aim to enhance training methods and tactical planning, ultimately advancing the sport of football. This research not only fills a critical gap in the literature but also offers practical applications that can be directly implemented in professional football training and match preparation, [12].

2 Study Samples and Methods

2.1 Study Samples

The research sample consists of data on heading technique performance from 51 sets of matches in the 16th European Championship held in 2021. The European Championship includes both group-stage and knockout stage matches. This study focuses only on the regular 90-minute matches and does not include extra time in the analysis.

2.1.1 Reliability Verification of Sample Data

Data collection and collation were carried out by the author and 10 graduate students specializing in football at Guangzhou Sports University. The personnel responsible for observing match videos had extensive experience in football technical and tactical statistics. After one person completed the statistics for each match, it was cross-checked and verified by three other individuals. Additionally, a random selection of matches was re-analyzed to repeatedly validate the accuracy of the data. The reliability of the data was assessed through SPSS software for the analysis of data validity, as shown in Table 1. Crombach Alpha=0.919, which was greater than 0.7, and proved its strong reliability.

Table 1. Reliability Statistics

Crombach Alpha	Crombach Alpha Based on Standardized Projects	Number of Items
0.922	0.919	41

2.2 Research Methods

2.2.1 Literature Method

Prior to conducting this study, a comprehensive search of the existing literature was conducted with the aim of understanding the current state of research and research gaps in football heading techniques. China National Knowledge Infrastructure (CNKI) is a widely known and widely used database in Chinese academic circles. CNKI contains a large number of Chinese academic journals, master's and doctoral dissertations, conference papers, and news reports covering a wide range of fields, including social sciences, engineering and technology, natural sciences, medicine and health, economic management, and other fields. 240 results were obtained by searching “heading” on CNKI, including 94 journals, 67 dissertations, and 9 conference papers. The research direction mainly focused on its teaching and training, its use of shooting, and the characteristics of its Biomechanics. Searching through Web of Science and Google Academic with “soccer heading”, it was found that most of the research on soccer heading focused on the purposeful brain injury caused by heading and its prevention, as well as biomechanical analysis of heading technique. There is limited research specifically on heading technique, and most of them are descriptive and statistical. No previous study has investigated the main factors influencing heading technique in matches (this study focuses only on heading technique, not tactical factors). This study attempts to fill this research gap and provide references and suggestions for athletes, coaches, and football professionals.

2.2.2 Expert Interview Method

In preparation for this research, telephone interviews and face-to-face exchanges were conducted among football experts and scholars, including 4 professors, 5 associate professors, 3 A-level coaches, 8 B-level coaches, and 6 C-level coaches (There are five levels of football coaching certificates, from low to high, namely, Level C, Level B, Level A and Professional Level, and the certificate level starts from Level C and progresses to the next level gradually. Holders of Grade C certificates can coach amateur football teams; holders of Grade B certificates can coach teams below the second tier of professional clubs; holders of Grade A certificates can coach professional clubs.).

(1) Research Objective: Explore the science and rationality of the relevant content definitions used in this study.

(2) Expert Selection: The selection of experts was based on the permission of the professors from Guangzhou Sports University and the coaching team from Guangzhou Football Club.

(3) Interview Integrity: The interviews ensured authenticity and reliability, and the consent of each expert was obtained.

(4) Individual Interviews: Individual face-to-face or telephone interviews were conducted with each expert. During the interviews, the researchers provided the experts with the research indicators and definitions and asked for their opinions on the rationality, scientific nature, and practical applicability in real scenarios.

(5) Presentation of Results: The interview results were organized into reports or summaries, including the experts' views, opinions, and suggestions. These results can be used to support the rationality of the research indicators and definitions and provide scientific evidence.

Through the above steps, the expert interview method can provide scientific evidence for the researcher regarding the rationality of the research indicators and definitions. This method allows for obtaining expert opinions, thereby enhancing the credibility and feasibility of the research.

2.2.3 Questionnaire Survey Method

The questionnaire of the paper was designed to evaluate the “key factors of the heading football technique of the 16th European Cup” by designing an indicator system.

2.2.3.1 Validity Test of Questionnaire

The designed index system used the expert validity test method to test its validity according to the five-dimensional scale of the questionnaire, namely: very reasonable, relatively reasonable, general, un-reasonable, and relatively unreasonable (Table 2).

Table 2. Statistical Table of Content Validity Test of Expert Questionnaire (n = 26)

Validity	Very Reasonable	Relatively Reasonable	General	Un-reasonable	Relatively Unreasonable
Frequency	6	17	3	0	0
Percentage	23.1	65.4	11.5	0	0

2.2.3.2 Distribution and Recovery of Questionnaires

According to the information provided, a total of 26 questionnaires were issued in this survey, and 26 questions were successfully recovered, with an effective rate of 100%. This included sending faxes to football experts and academics or distributing questionnaires directly in face-to-face meetings. Regardless of the specific method, the questionnaire distribution ensures the comprehensiveness of the sample and the efficiency of the recovery rate. The full questionnaire is attached as supplementary material.

2.2.4 Observation Method

In this paper, 51 videos from the 16th UEFA Euro Cup were viewed using IQIYI and Migu videos. IQIYI, founded by Baidu, China's largest search engine company, in 2010, provides a streaming platform for a wide range of entertainment content, including live sports events, and is a popular choice for watching domestic and international sports matches. Migu, a subsidiary of China Mobile, one of China's largest telecommunication carriers, is known for its extensive coverage of sports, including football matches, and for providing a wide range of multimedia content related to sports and entertainment. The study counted 41 factors in the technical movement of heading for 102 teams, broadly reflecting the technical situation of heading in football.

2.2.5 Statistical Method

To find the relationship between the two variables, SPSS 22.0 was utilized to calculate 41 indicators reflecting the technical movements of heading through the analysis of 51 videos of Euro 2021, and correlation analysis and multiple linear regression analysis were applied to statistically process the original data. Through the analysis and calculation of these key factors, the mathematical theoretical

model of ideal heading technology and its key factors was obtained.

3 Indicators and Scales of Statistics

To carry out scientific statistical analysis of football matches, it is necessary to divide the tactical area of the football field and determine the corresponding indicators and scales. The regional division of the football field is shown in Figure 1, and the specific index content and scale are listed in Table 3 (Appendix).

3.1 Division of Football Field

To ensure the scientific validity and rationality of this study, the football field was divided into 15 zones. This division was based on the distribution characteristics of player positions and tactical movements in football matches. By identifying different areas, it could more accurately analyze and quantify the execution of technical movements of heading. This provided insight into the application and effectiveness of the heading technique in different tactical situations. In addition, this division also enabled the systematic collection and comparison of header action data within different regions, thus improving the accuracy and detail of data analysis. As in Figure 1, was used to inform the classification of these zones. The division of the football field into "15 zones" was a natural result of the development of modern football, and it has gradually become an important way for players to understand their position and spatial awareness. This included the derived theories such as the "half-space theory" or the "20-zone theory", which have a far-reaching impact on the development of football tactics, [13].

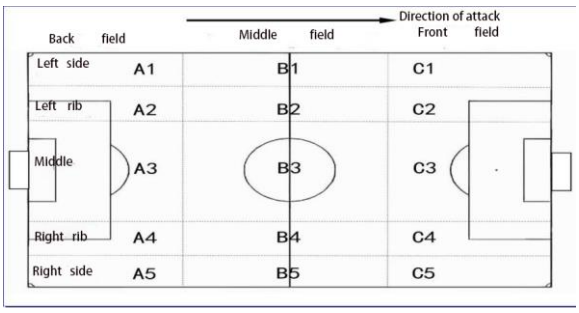

Fig. 1: Football Field, [13]

3.2 Content and Scale of Indexes

The research variables included 9 factors and 41 indexes, including 15 indexes of field area, 3 indexes of head touching position, 4 indexes of body facing direction, 4 indexes of heading direction, 4 indicators of heading purpose, 4 indexes of heading action, 4 indexes of defensive distance and 3 indexes of field position (Table 3, Appendix).

The content and scale of indicators in football matches are mainly introduced in Table 3 (Appendix). First of all, the football field is divided into three zones according to modern mainstream football tactics players move around the area, including front, center field, and back fields, as well as other areas such as wings, ribs, and center, [17]. Secondly, the content and scale are listed, including the head contact area, body direction, heading direction, heading aim, heading movement, defensive distance, field position, and heading effect. The index content includes specific actions, positions, and effects, while the scale describes the evaluation of different degrees or effects of these indicators. Among them, the indexes of the overhead ball include heading shooting, heading passing, heading clearance, and heading tackling.

4 Results and Analysis

4.1 Results of the Correlation between the Ideal Effect of Heading and Various Factors

By using SPSS software, the research findings of the correlation between the ideal effect of heading and 41-factor indexes are as follows (Table 4, Appendix). A total of 19 indexes were significantly correlated with the ideal effect of heading.

4.2 Correlation Analysis between the Ideal Effect of Heading and Various Factors

From the relevant indexes of the field, the number of headings is more concentrated in the middle of the midfield (r=0.560), the middle of the backfield (r=0.436), and the right side of the midfield (r=0.228). The modern football offensive and defensive system emphasizes integrity and aggressiveness. The definition of a defensive form of pressure in the front and middle field is that once the defensive player loses the ball in the front field, they shall immediately organize the defense, [18]. When the loser quickly intercepts the ball controller, other defensive players should press and tackle the attacking players who come to meet them and pay attention to the depth distance of the three lines of forward, midfielder, and full back, to hold down the opponent and make the attacking player pass back by crossing the ball. It is better to grab the ball and take advantage of the situation that the formation of the opponent's offensive and defensive transition is

not good and the psychological state is too late to adjust to launch a sharp attack. Therefore, the midfield and frontfield are the battlegrounds for the two teams to attack and defend. The attacking team mostly uses the pressing attack, while the defensive team mostly uses the pressing defense. According to the relevant analysis of [19] there are two significant reasons for the right side of the midfield: one is the sampling error; the other is that the dominant foot of most athletes is the right foot. Nowadays, most teams have better technical and tactical abilities in attack and defense on the right side than on the left side. In such a fierce struggle, the number of headings will increase. The heading technique in the middle of the midfield and the right side of the midfield needs to be used more reasonably to achieve the desired technical effect.

Among the indexes of touching the ball, the forehead heading is the most accurate and efficient, because of its directness and suppleness. Under the conditions of a large amount of physical consumption and fierce confrontation, if athletes want to achieve the desired effect in a short time, it is the best choice to use the forehead frontal hitting point.

Among the indexes of the direction of the player's face and the direction of the heading, this index is also a direction that has not been studied by predecessors. The position of the ball in a football match determines the orientation of the players in different positions. In the fast rhythm of the game, it is difficult for the players to choose the best orientation to deal with the ball for the first time. Therefore, players often choose the front and back of the direct way to handle the ball, without turning the waist too much to save time. In terms of heading, the simple movements forward and backward are relatively ideal.

In the index of heading action, there is a significant correlation between the technical action of heading in movement and the ideal effect. Football matches can be regarded as a dynamic set of all players' technical and tactical behaviors and body movements [20], so the use of head technical movements can truly reflect the game scene and ideal heading effect.

In the index of defensive distance, the defense within one meter is an ideal distance in a modern football match, even at the expense of a lot of physical energy to interfere with and restrict the offensive players. Among the four indexes of technical purpose, passing and shooting are the main means of attack. Passing is the basis of the whole team's offensive and attacking tactics, as well as an effective means to charge tactics or create shooting opportunities by quickly approaching the opponent's goal. It reflects the overall strength of a team and thus reflects the tactics and style of a team. The only way to win a football match is to score more goals than the other team. Therefore, if a team wants to increase the chances of scoring and winning the game, they must improve the accuracy of shooting, [21]. From the technical analysis of the heading, passing and shooting are the ultimate goals of the heading. Stealing and clearing are the other two indexes of technical purposes and the main means of defense. Stealing reflects the efficiency of the team's defense in the game. It is the most direct manifestation of the team's disruption of the opponent's smooth cooperation and inhibition of the opponent's effective attack. Tackling plays a crucial role in asserting the right to control the ball and initiating attacks in football matches. It serves as the foundation for a team to dictate the game's rhythm. Strong defensive skills are essential for creating successful offensive opportunities, [22]. Clearing is to head the ball away from the goal in a hurry, which is the simplest and most effective form of defense. The ultimate goal of completing the technical action of heading is to influence the result of the game, so the ideal technical effect is naturally related to shooting, passing, stealing, and clearing.

Among the indicators of field position, the number of times of full backs, midfielders, and forwards is significantly related to the technical ideal effect. The primary role of a defender, particularly that of the central defender, is to provide defensive stability, as they frequently encounter aerial passes from opposing attackers, [23]. At this time, the defender must grab the right position to fight for heading the first time. The guard's duty requires that they master the technology of heading skillfully, and in case of using it, they must judge the real situation decisively and not recklessly. These technical requirements form the characteristics of high frequency and high efficiency of heading. In the European Cup, the transition between attacking and defending is rapid. This is characterised by intense competition, limited preparation time for midfielders, frequent physical confrontations, and a high incidence of headers, which often lack efficiency, [24]. Most of the forwards' headings belong to the offensive category, especially the heading shooting action. Although the number of times does not happen much, it plays a vital role every time. For example, in the 85th minute of the match between the Netherlands and Ukraine in Group C, the Netherlands scored a decisive goal through Dumfries' heading and finally won the match 3-2.

The correlation analysis revealed that midfield and backfield headings are crucial for successful heading performance. This suggests that players positioned in these areas need to develop robust heading skills to maintain a competitive advantage. Furthermore, the significant correlation between defensive distance and heading effectiveness underscores the importance of close marking and physical duels in modern football. These findings can inform targeted training programs focusing on positional awareness and heading accuracy. The modern football offensive and defensive system emphasizes integrity and aggressiveness. Therefore, the midfield and frontfield are the battlegrounds for the two teams to attack and defend. The attacking team mostly uses the pressing attack, while the defensive team mostly uses the pressing defense. Among the indexes of touching the ball, the forehead heading is the most accurate and efficient, because of its directness and suppleness. In terms of heading, the simple movements forward and backward are relatively ideal. These insights can be used to develop drills that simulate match conditions and improve players' heading techniques under pressure.

4.3 Discussion on the Relationship between the Relevant Indexes of Heading Technical Action and the Ideal Technical Effect

To grasp and understand the quantitative relationship between the relevant technical actions of heading and the ideal technical effect from a macro perspective, a stepwise NLRA was conducted with the ideal effect of heading technical actions as the dependent variable and 19 heading techniques actions significantly related to the ideal effect as the independent variable.

The data analysis of the study was done using SPSS 22.0 statistical software. The results of NLRA showed that (Table 5, Appendix), there were 7 indexes in the regression equation, including the number of times of heading before moving, times of clearing the ball, the times of the middle of the front court, the times of the middle of the midfield, the numbers of steals, the numbers of times facing the back of the attack direction and the numbers facing the front of the attack direction, and the significance values of these 7 indexes were all less than 0.01. The regression coefficient was not zero, indicating that the regression analysis was meaningful, [25].

The equation between the key factor index of the heading technical action and the ideal effect is Y = 0.999 + 0.24 * the times of moving forward heading + 0.494 * the times of clearances + 0.783 * the times of the middle in the front field +0.58 * the times of the middle in the midfield -0.325 * the numbers of steals +0.309 * back times of facing attack direction -0.521 * frontal times of facing attack direction. The equation contains both fixed and random parts. The ideal effect of heading technical action is positively correlated with the times of moving forward heading, clearance, middle in the front field, middle in the midfield, and the back times of facing the attack direction, and negatively correlated with the times of tackles and frontal times of facing attack direction. This study only aims at the analysis of the technical effect of heading the ball and has no direct relationship with the team's performance.

It has testified to the normal distribution of the 7 groups of data of the equation. From Table 6 (Appendix), there was no statistical difference in the above data, times of the middle in the front field (P=0.2>0.05), times of the middle of the midfield (P=0.2>0.05), back times of facing the attack direction (P=0.05 >0.05), front times of facing the attack direction (P=0.2>0.05), times of moving forward heading (P=0.2>0.05), times of tackles (P=0.2>0.05) and times of clearances (P=0.2>0.05), so it conformed to the normal distribution and had statistical significance.

To test the rationality and objectivity of the equation, it selected the top 8 teams (England, Ukraine, Czech Republic, Denmark, Belgium, Italy, Switzerland, Spain) and the other eight 8 teams not qualified in the group match (Slovakia, Poland, North Macedonia, Hungary, Russia, Scotland, Turkey and Finland) for a comparative study. According to Table 7 (Appendix), the sum of the Y values of the top eight teams = 53.757, and the sum of the Y values of the eight unqualified teams = 24.178. The Y value of the first eight teams was about 2.2 times that of the latter. That is to say, the Y value of the “stronger” team was far greater than that of the “weaker” team. The greater the Y value was, the better the effect of heading the ball was. Therefore, the effect of heading the ball of the top eight teams in the 16th European Cup was far better than that of the teams that have not qualified in the group. On the whole, it conformed to the strength gap between the “stronger” team and the “weaker” team. At the same time, it further proved that the equation was scientifically rational and objective.

The calculated regression model reflects the law of heading techniques indicators and ideal technical effect to a certain extent. It is only a discussion of the digital model, and there are many factors that need to be studied in depth that have not been taken

into account. There are also some limitations to the study, which did not take into account the status and impact of the competition situation, such as the FIFA ranking of the participating teams, the health of the players, the state of the teams, and the environment of the competition venue. In addition, data range and depth may not fully cover all relevant variables. Therefore, future research needs to be further discussed and improved in these aspects to improve the accuracy and applicability of research results.

5 Conclusion and Recommendation

5.1 Conclusion

According to statistics, among the 41 factors of heading, a total of 19 indexes had a significant correlation with the ideal effect of heading, including the number of times of the middle in the backfield, times of the middle in the midfield, times of the right side of the midfield, the front times on the forehead, the back times facing the offensive side, the front times facing the offensive direction, the times of heading forward and heading backward, times of moving forward and backward, times of moving left and right sides, times of the defensive distance within one meter, shooting times, passing times, tackling times, clearance times, full back heading times, midfielder heading times and forward heading times. In addition, the mathematical equation of the effect of ideal heading techniques and 7 indexes was established by NLRA. Specifically, it includes moving forward heading, clearance, the middle of the frontfield, the middle of the midfield, tackling, facing the back of the attack direction, and facing the front of the attack direction.

This study identified key factors that significantly impact the effectiveness of heading techniques in top football matches. Through rigorous statistical analysis, we established a predictive model that correlates specific technical actions with ideal heading outcomes. These findings offer valuable insights for coaches and players to refine their training and in-game strategies. Emphasizing heading techniques in training, particularly in midfield and defensive zones, can enhance a team's competitive edge. Future research should explore the impact of situational variables, such as player fatigue and match intensity, to provide a more comprehensive understanding of heading performance.

5.2 Recommendation

(1) Football coaches, athletes researchers, and other football practitioners should make targeted preparations and adjustments in future training and research according to the rules of the use of head-kicking techniques in matches.

(2) Although this paper calculated the technical action index of heading in top football matches and the mathematical equation of its ideal effect, which provided a new research direction for the technical analysis of football matches, it still needs to be improved and supplemented by football practitioners on this basis.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

The authors wrote, reviewed and edited the content as needed and They have not utilised artificial intelligence (AI) tools. The authors take full responsibility for the content of the publication.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

The authors equally contributed in the present research, at all stages from the formulation of the problem to the final findings and solution.

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

This article is not supported by any project funding.

Conflict of Interest

The authors have no conflicts of interest to declare.

APPENDIX

Table 3. Content and Scale of Indexes

Influencing Factors	Interpretation and Scale
Field Area	Frontfield Zone 1 C1, Frontfield Zone 2 C2, Frontfield Zone 3 C3, Frontfield Zone 4 C4, Frontfield Zone 5 C5 Middlefield Zone 1 B1, Middlefield Zone 2 B2, Middlefield Zone 3 B3, Middlefield Zone 4 B4, Middlefield Zone 5 B5 Backfield Zone 1 A1, Backfield Zone 2 A2, Backfield Zone 3 A3, Backfield Zone 4 A4, Backfield Zone 5 A5 According to the FIFA standard (105 meters long and 68 meters wide), the football field is divided into three areas: the frontfield, the midfield, and the backfield. The arrow is the direction of attack and consists of 15 areas according to the vertical and horizontal directions. (1) Front field and backfield: the parallel line area of the baseline extending inward for 30 meters is the backfield of the side, and the parallel line area of the baseline extending inward for 30 meters is the frontfield of the side. (2) Midfield: The area on either side of the mid-line between the front and backfield, [14]. (3) Side Field: the area parallel to the sidelines on both sides and extending inward for 10 m. (4) Rib: The area extending 20 meters into the field parallel to the sideline on both sides minus the location area of the side field, [15]. (5) Middle: The area between the medial lines of the left and right ribs.
Head Contact Area	Front of forehead, left of forehead, right of forehead.
Body Direction	Facing the back of the attack direction, facing the front of the attack direction, facing the left side of the direction of attack, and facing the right side of the direction of attack
Heading Direction	Heading forward, heading backward, heading left, heading right
Heading Aim	Shooting, passing, tackling and clearing. (1) Heading Shooting: It refers to the use of overhead shooting techniques by players in the game to achieve the purpose of shooting. The ideal effect is to score a goal in the overhead shot, and the basic ideal effects to threaten the opponent's goal in the overhead shot. The effect is not ideal if the overhead shot is not threatening. (2) Heading Passing: This means that the players use the overhead technique to achieve the purpose of passing in the game. The effect is ideal if the passing action is reasonable and the partner gets the ball; the effect is basically ideal if the passing action is reasonable but the partner does not get the ball or the passing action is not reasonable but the partner gets the ball. If the passing action is unreasonable and the partner does not get the ball, the effect is not ideal. (3) Heading Clearance (it is the scope of defensive grabbing the ball): It refers to the reasonable use of heading techniques by players to destroy the opponent's cooperation and change the direction of the opponent's attack. The ideal effect is to destroy the opponent's cooperation and change the opponent's attack direction when counting; The basic ideal is only destroying the opponent's cooperation but not changing the direction of attack or not destroying the opponent's cooperation but changing the direction of attack; Neither destroying the opponent's cooperation nor changing the attack direction is non-effective. (4) Heading Tackling (it is the scope of defensive grabbing the ball): It refers to the technique of heading that a player reasonably grabs, intercepts, or controls the ball. Reasonable use of the technology of heading and achieving the goal of grabbing the ball, breaking the ball, and controlling the ball is the ideal effect. Reasonable use of the technology of heading but not achieving the goal of grabbing the ball, breaking the ball, and controlling the ball by one's own side, or unreasonable use of the technique of heading but achieving the goal of grabbing the ball, breaking the ball and controlling the ball by one's own side, is the basic ideal effect; unreasonable use of heading techniques and failure to break and control the ball is not ideal, [16].
Heading Movement	Standing heading, moving forward heading, moving back heading, left-right side heading
Defensive Distance	Within one meter, one to two meters, fast approach, no defensive confrontation
Field Position	Defenders, midfielders, forwards (goalkeepers are not included in this study)

Table 4. Correlation between the Ideal Effect of Heading and Each Factor Index

Number of Times	Factor Indexes	Average	Standard Deviation	Quantity	Pearson Correlation (r)	Significance of Two-tailed (P)
1	The Left Side of the Frontfield	0.24	0.53	24	0.114	0.252
2	The Left Rib in the Frontfield	0.47	0.767	48	0.141	0.158
3	The Middle of the Frontfield	3.03	2.427	308	0.153	0.125
4	The Right Rib in the Frontfield	0.54	0.852	55	0.089	0.372
5	The Right Side of the Frontfield	0.3	0.755	31	0.049	0.622
6	The Left Side of the Midfield	2.14	2.015	218	-0.118	0.237
7	The Left Rib in the Midfield	2.59	2.213	253	0.029	0.774
8	The Middle of the Midfield	6.01	4.777	619	.560**	0.000
9	The Right Rib in the Midfield	2.33	2.117	241	0.067	0.505
10	The Right Side of the Midfield	2.18	1.977	223	-.228	0.021
11	The Left Side of the Backfield	0.48	0.714	49	-0.115	0.249
12	The Left Rib in the Backfield	1.56	1.668	159	0.029	0.773
13	The Middle of the Backfield	6.33	4.166	647	.436**	0.000
14	The Right Rib in the Backfield	1.29	1.404	132	-0.058	0.563
15	The Right Side of the Backfield	0.38	0.718	39	0.006	0.953
16	Frontal Times of Forehead	23.09	10.213	2355	.394**	0.000
17	The Left Side of Forehead	3.32	2.765	339	-0.024	0.813
18	The Right Side of Forehead	3.14	2.663	320	0.082	0.415
19	Facing the Back in the Attack Direction	5.95	4.593	606	.374**	0.000
20	Facing the Left Side in the Attack Direction	4.61	2.296	476	-.218	0.088
21	Facing the Right Side of the Attack Direction	4.14	2.877	416	-0.164	0.101
22	Frontal Times Facing the Attack Direction	15.02	8.085	1533	.398**	0.000
23	Heading Forward	18.54	9.131	1891	.331**	0.001
24	Left Heading	3.71	2.46	378	0.03	0.764
25	Right Heading	3.71	2.099	378	-0.174	0.080
26	Heading Backward	3.64	2.575	371	.429**	0.000
27	Standing Heading	6.7	4.905	684	0.054	0.587
28	Moving Forward Heading	6	5.113	612	.649**	0.000
29	Moving Back Heading	4.22	4.209	431	.495**	0.000
30	Heading of Left and Right Sides	1.86	1.84	190	.412**	0.000
31	Defense Distance Within 1 Meter	16.43	9.359	1675	.435**	0.000
32	Defense Distance From 1 to 2 Meters	5.92	3.644	604	0.011	0.912
33	Fast Approaching to Defense Distance	3.12	2.929	316	0.004	0.969
34	Non-defensive Confrontations	3.56	3.777	350	-0.128	0.201
35	Shots	2.01	1.766	205	.280**	0.004
36	Passes	9.77	5.306	996	.412**	0.000
37	Tackles	9.68	7.713	1013	-.325**	0.001
38	Clearances	7	5.178	718	.597**	0.000
39	Full Back	15.94	6.927	1613	.306**	0.002
40	Midfielder	7.9	4.402	792	.227*	0.022
41	Forward	5.49	4.002	557	.251*	0.031

*Note: * indicates a significant correlation at the 0.05 level (two-tailed) and * * indicates a very high significant correlation at the 0.01 level (two-tailed).*

Table 5. Stepwise Regression Coefficient Table of Key Factor Indexes of Heading Technical Action and the Ideal Technical Effect

	Non-normalized Coefficient		Normalization Factor	T	Significance *(P)*	Collinearity Statistics	
	B	Standard Error	Beta			Tolerance	VIF
(Constant)	0.999	1.291		0.774	0.441		
Times of Moving Forward Heading	0.24	0.111	0.15	2.153	0.034	0.502	1.99
Times of Clearances	0.494	0.098	0.313	5.034	0.000	0.63	1.587
Times of the Middle in the Frontfield	0.783	0.177	0.232	4.43	0.000	0.883	1.133
Times of the Middle in the Midfield	0.58	0.118	0.339	4.895	0.000	0.508	1.97
Times of Tackles	-0.325	0.064	-0.307	-5.048	0.000	0.658	1.519
Back Times of Facing Attack Direction	0.309	0.102	0.173	3.032	0.003	0.743	1.346
Frontal Times of Facing Attack Direction	-0.521	0.195	-0.146	-2.671	0.009	0.809	1.236

Table 6. Kolmogorov-Smirnov Verification Table

		Times of the Middle in the Frontfield	Times of the Middle in the Frontfield	Back Times of Facing Attack Direction	Frontal Times of Facing Attack Direction	Times of Moving Forward heading	Times of Tackles	Times of Clearances
Normal Parameter a,b	Average	12.83	25.79	25.25	63.88	25.5	42.21	29.92
Differences	Absolute number	0.141	0.112	0.174	0.104	0.109	0.125	0.096
Significance (Two-tailed) (*P*)		.200c,d	.200c,d	.057c	.200c,d	.200c,d	.200c,d	.200c,d

Table 7. Statistical Table of Technical Indexes for Heading of the Top 8 Teams and the 8 Teams Not Qualified in the Group Match in the 16th European Cup

S/N	Country	Times of Moving Forward Heading	Times of Clearances	Times of the Middle in the Frontfield	Times of the Middle in the Midfield	Times of Tackles	Back Times of Facing Attack Direction	Frontal Times of Facing Attack Direction	Y Value
1	Slovakia	9	8	2	7	9	5	21	0.416
2	Poland	16	6	3	16	18	5	28	0.539
3	Ukraine	8	11	3	4	6	2	20	1.27
4	Spain	12	1	5	12	13	3	20	1.53
5	North Macedonia	15	12	1	15	10	5	32	1.633
6	Finland	4	5	2	8	9	5	10	4.045
7	Scotland	12	5	7	12	15	14	30	2.611
8	Hungary	12	8	5	16	17	4	24	4.233
9	Russia	10	3	3	15	14	11	19	4.88
10	Czech Republic	21	7	7	20	20	14	36	5.648
11	Turkey	5	11	2	7	9	9	14	5.821
12	Italy	5	7	4	19	7	6	25	6.363
13	England	3	11	3	1	3	5	7	7.005
14	Switzerland	9	8	7	6	4	7	17	8.645
15	Belgium	9	17	2	8	4	9	18	9.866
16	Denmark	5	9	14	6	0	14	23	13.43