

## Biomechanical Indicators of the Corner Kick Skill for the Far Area and Their Relationship with the Accuracy of Performance among Premier League Football Players

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### ABSTRACT

The importance of the research in studying the biomechanical indicators of the skill of executing the corner kick for the player executing the far area and the extent of its relationship to the accuracy of performance to understand the method of performance and reveal the interconnected relationships between the movement of body parts during performance, as well as determining the motor procedures required to accomplish this performance with the highest possible efficiency and with the least possible effort to achieve the accuracy of execution and deliver the ball to the attacking player to achieve goals. The research problem results from the researcher's observation, follow-up, and experience as a former player of the developments in this game the lack of studies that addressed this skill in the mechanical field, and the lack of values for its biomechanical variables. The researcher decided to study this skill mechanically in addition to discovering the appropriate and correct movement infiltration of the executing player as well as discovering the weak points and avoiding them and strengthening the positive side to reach the player to the optimal performance to achieve the required accuracy and ideal performance. The objectives of the research were to identify some biomechanical indicators of the skill of executing the corner kick in football for advanced players and its relationship to accuracy and to identify the nature of the relationship between some biomechanical indicators of the skill of executing the corner kick In football for advanced accuracy, the researcher used the descriptive approach using the correlation study method, which is the optimal method to solve the research problem. The research community was deliberately determined, represented by the Premier League football teams for the 2024-2025 football season, namely Al-Nasiriyah Club - Al-Gharraf Club from Dhi Qar Governorate, Southern Refineries Club and Al-Bahri Club from Basra Governorate. Three players were selected from each team, making the sample (12) players proficient in performing the corner kick with the right foot. The selection of players was based on personal interviews conducted by the researcher with the coaches of those teams to name the players who implemented this method. One of the most important conclusions is that there is a significant correlation between the biomechanical variables and the accuracy of the far-area corner kick skill.

**Keywords:** (*Biomechanical indicators, Corner kick skill in football*)

### 1. INTRODUCTION

#### 1- Definition of the research:

##### 1-1 Introduction and importance of the research:

Football is a modern phenomenon that reflects the progress and sophistication of nations, and their interest in developing new players, demonstrating the brilliance of performance and crafting skills according to scientific biomechanical foundations, to achieve accurate results that provide the most appropriate technical solutions while saving time and effort during the performance of football skills. The corner kick is also considered one of the basic skills that players must possess, and it is executed from a corner of the field. The ball is returned to the field through the execution of the corner kick skill. The corner kick, which is considered one of the main and modern technical methods used by coaches to achieve tactical goals, has become an effective means and attack plan in the world of football, due to the proper use of scientific foundations in the study of movement, relying on the latest devices and methods, such as imaging devices and motion analysis programs, which have achieved accurate, objective results in motor performance, adding to football skills in general and the execution of the corner kick in particular. Hence, the importance of research in studying the biomechanical variables of the skill of executing the corner kick for the player executing the far zone and the extent of its relationship to the accuracy of performance is highlighted to understand how to perform and reveal the interconnected relationships between the movement of body parts

during the performance. The motor procedures required to accomplish this performance with the highest possible efficiency and with the least possible effort are also determined to achieve the accuracy of execution and deliver the ball to the attacking player to achieve the goals

## 2. RESEARCH PROBLEM:

The skill of executing a corner kick in football is not as easy as some people imagine, but rather it has become one of the important and modern skills that coaches use scientific studies and plans to implement in different ways and methods. It has even become an effective offensive tool in the world of modern football. Therefore, any training based on sound scientific foundations achieves positive results and accomplishments. Through the researcher's observation of Premier League matches, as well as observing the training of some clubs and through the player's experience as a former player in the Premier League, the researcher noticed a lack of focus in training the corner kick skill, in addition to the few studies that addressed this skill and thus the lack of numerical data on the values of biomechanical variables. Therefore, the researcher decided to study this skill mechanically, in addition to discovering the appropriate and correct narrative sequence for the executing player, as well as discovering and avoiding weak points and strengthening the positive side to enable the player to achieve optimal performance to achieve the required accuracy and ideal performance

## 3. RESEARCH OBJECTIVES:

- 1- Identifying the values of some biomechanical indicators and accuracy of football players in the corner kick skill.
- 2- Identifying the relationship between the values of some biomechanical indicators and the accuracy of corner kick performance in football.

## 4. RESEARCH HYPOTHESIS:

- 1- There is a significant correlation between some biomechanical indicators of advanced soccer corner kick accuracy.

## 5. RESEARCH AREAS:

**5-1-1 Human Resources:** Al-Nasiriyah and Al-Gharaf football players for the 2024-2025 Iraqi Premier League.

**5-1-2 Time frame:** 2024/12/1 -2025/2/20

**5-1-3 Location:** Al-Amal Sports Club football stadium

## 6. RESEARCH METHODOLOGY AND FIELD PROCEDURES:

The research community was determined intentionally, represented by the Premier League football teams for the football season 2024-2025, which are the clubs of Al-Nasiriyah Club - Al-Gharraf Club from Dhi Qar Governorate, the Southern Refineries Club and Al-Bahri Club from Basra Governorate, and their number is (20) players specialized in performing the corner kick skill. Three players were chosen from each team intentionally, and thus the number of sample members is (12) players.

### 6.1 Homogeneity of the research sample:

The researcher performed homogeneity in the variables (chronological age, mass, height, trunk length, leg length), and used the coefficient of variation to perform homogeneity as shown in Table (1)

**Table (1)**

Homogeneity of the research sample is shown in (chronological age, mass, height, trunk length, leg length) using the coefficient of variation.

| CV     | S    | $\bar{X}$ | Unit of measurement | Measurements | N |
|--------|------|-----------|---------------------|--------------|---|
| % 9.78 | 2.18 | 22.33     | Year                | Age          | 1 |
| % 5.60 | 4.04 | 72.10     | Kg                  | Body Mass    | 2 |
| % 1.76 | 3.10 | 175.25    | cm                  | Height       | 3 |

| CV     | S    | $\bar{X}$ | Unit of measurement | Measurements   | N |
|--------|------|-----------|---------------------|----------------|---|
| % 1.82 | 1.11 | 60.81     | cm                  | Torso Length   | 4 |
| % 1.66 | 1.78 | 106.59    | cm                  | Legging Height | 5 |

## 6.2 Methods of collecting information, devices and tools used in the research:

- Arabic and foreign sources and references - Personal interviews - Questionnaire - Observation - (10) legal footballs - (1) medical scale - (1) linen measuring tape - (1) HP laptop - (1) Sony camera - (4) electronic time clock - Adhesive tape - Whistle - Paper and pen

## 6.3 Field research procedures:

### Tests used in the research

- Performance accuracy of the far-area corner kick (110-1)

### Determining Biomechanical Variables:

After reviewing modern scientific sources and references on sports biomechanics and kinetic analysis, the following biomechanical variables were identified:

- 1- The angle of approach: "It is the angle between the line connecting the point of contact of the foot with the ground to the point of the center of mass of the body with the horizontal line and is measured from the back." (2:89)
- 2- The angle of the body's inclination at the moment of kicking the ball: "It is the angle confined between the body line from the point of the shoulder joint to the point of the hip joint with the vertical or horizontal line". (3:88)
- 3- The relative angle of the knee joint of the kicking leg at the moment of kicking the ball: "It is the angle confined between the thigh and shin bones and is measured from the back". (4:62)
- 4- The angular speed of the kicking leg: "It is the angular displacement that the leg travels from the preparation position until the moment of kicking the ball divided by time, i.e. from the moment the back swing

### Exploratory Experiment:

The researcher conducted the exploratory experiment on Friday, February 14, 2025, at ten o'clock in the morning at the Workers' Sports Stadium, on a sample of (6) Iraqi Premier League football players from the research community and from outside the sample, to implement the test. The purpose of this experiment was as follows:

- To establish the scientific basis for the tests. - To identify the tools and devices used in the test. - To identify the appropriate time and place for conducting the tests. - To identify the difficulties and problems facing the researcher in implementing the test before implementing it in the main experiment.

### Videography

The researcher used a Japanese-made Sony video camera with a frequency of (300) frames per second. He placed the first camera at a distance of (6.90) m from the ball's position, at a perpendicular angle to the ball's range of motion, and with a lens height measured from the ground of (1.33) m. The second camera was placed at a perpendicular angle to the player's range of motion, at a distance of (7.80) m, and with a lens height measured from the ground of (1.30) m. The reason for placing it was to capture the player's approach to the ball, which was at an angle to the ball. A drawing scale measuring (1 meter) was used.

### Video Analysis (Kinematic Analysis of Movement Using Computers)

Kinematic analysis using video imaging is an accurate method for quantitatively studying kinematic variables. It enables the movement researcher to identify the strengths and weaknesses of the variables affecting movement. Risan Khreibet and Najah Mahdi Shalash (1992) state: "The biomechanical analysis of a motor skill involves dividing the movement to be analyzed into its interconnected parts and determining the nature of each part of the movement to apply the appropriate anatomical mechanical foundations and laws for the ideal movement technique" (6:28). To study and analyze the kinematic research variables, the researcher took the following steps:

First:

The raw video footage, which represents the players' performance of the corner kick skill in soccer, was converted from video films to CDs and stored as files. All player attempts and movements were then cut into segments using a program installed on the researcher's laptop called Hero-Soft. These clips were then stored in files, with (3) storage files created for each player, divided according to the corner kick zones. In other words, a file was created for each player, containing three files for each zone, to conduct the kinematic analysis of the movement.

Second: The Kinova program was used to extract research variables related to distances, speeds, angles, and times. Kinova's kinematic analysis program is a video player that displays videos in slow motion and supports specific functions for monitoring, analyzing, and describing athletes' performance. This allows for the study of athletic movements and commentary on technical performance by recording and writing notes. This program also uses an intelligent method to measure distances using a scale depicted in the film by specifying two points on either end of the scale, which in nature reads (1 meter). With this simple step, the program can determine any horizontal or vertical distance, height, or length. The start and end of the distance are marked by the mouse, and the results are displayed directly without the need for further operations. The kinematic variables were extracted directly using the computer. Based on the above, the researcher was able to extract the relevant variables under study and analyze them according to the research objectives.

#### 6.4 Main Experiment:

An experiment is "a careful organization of the conditions and circumstances under which a particular phenomenon can be observed, with the aim of identifying the factors influencing, causing, or causating this phenomenon." (7:58)

After reviewing the data extracted from the exploratory experiment, the researcher conducted the main experiment on Tuesday, February 25, 2025, at the Workers' Sports Stadium in Dhi Qar Governorate, Nasiriyah District. The filming and testing procedures continued from nine in the morning until twelve noon.

After the researcher obtained the measurements and data of the players, including (chronological age, training age, mass, height, torso length, and leg length), he conducted the field experiment by giving each player (6) attempts. The first hour included preparation, installation of cameras and equipment, as well as a warm-up for the players. This was followed by the corner kick test, which lasted approximately (60 minutes). This included (3) attempts (for the far zone), with rest periods between each attempt, ranging from Between (30 - 45) seconds.

## 7. STATISTICAL METHODS:

The researcher used statistical methods that helped process the results and test the research hypotheses through the use of the statistical package (IBM SPSS Statistics 24).

### 7.1 Presentation, analysis, and discussion of the results:

### 7.2 Presentation and analysis of the results of the evaluation of some biomechanical variables for the corner kick skill in different areas of the field:

Table (3) shows the values of some biomechanical variables for the corner kick skill in different areas of the field.

| remote area |           | Unit of measurement | Biomechanical Variables                                |
|-------------|-----------|---------------------|--------------------------------------------------------|
| S           | $\bar{X}$ |                     |                                                        |
| 1.78        | 79.58     | d                   | Approach Angle                                         |
| 1.21        | 15.75     | d                   | Body Inclination Angle at the Time of Kicking the Ball |
| 3.05        | 154.66    | d                   | Relative Angle of the Knee Joint of the Kicking Leg    |
| 11.33       | 341.25    | d/s                 | Angular Velocity of the Kicking Leg                    |

### 7.3 Displaying the accuracy results of the corner kick skill for different areas of the field:

Table (4) shows the results of corner kick skill accuracy for different areas of the field.

| remote area |           | Unit of Measurement | Skill                      | N |
|-------------|-----------|---------------------|----------------------------|---|
| S           | $\bar{X}$ |                     |                            |   |
| 0.834       | 2.166     | Degree              | Corner Kick Skill Accuracy | 1 |

3-Displaying the results of the relationship between some biomechanical variables and the accuracy of the kick from the far zone.

Table (5) shows the results of the relationship between some biomechanical variables and the accuracy of the kick from the far zone.

| Significance | Sig   | value of R | Biomechanical Variables                                | N |
|--------------|-------|------------|--------------------------------------------------------|---|
| Semantic     | 0.001 | 0.666      | Approach Angle                                         | 1 |
| Semantic     | 0.002 | 0.581      | Body Inclination Angle at the Time of Kicking the Ball | 2 |
| Semantic     | 0.002 | 0.583      | Relative Angle of the Knee Joint of the Kicking Leg    | 3 |
| Significance | 0.002 | 0.579      | Angular Velocity of the Kicking Leg                    | 4 |

- The table value of r is (0.576) at a degree of freedom of (10) and a significance level of (0.05).

## 8. DISCUSSION OF THE RESULTS

From Table (5), we see that there is a relationship between the biomechanical indicators and the accuracy of the far-zone corner kick skill. The greater the distance between the foot and the ball, the less force is exerted on the ball, and consequently, the time of contact between the foot and the ball increases (8:789). We note that in the far zone, the distance between the foot and the ball is small, and consequently, the time of contact between the foot and the ball decreases. The player increases the force exerted on the ball, and consequently, the time of contact between the foot and the ball decreases. Mechanically, the relationship between force and time is known to be inverse, meaning that increasing force leads to a decrease in time, and vice versa. When a soccer player strikes the ball with greater force, he reduces the time of contact between his foot and the ball (9:315).

As for the accuracy variable, there was also a significant relationship with the biomechanical variables. The researcher attributes several reasons, including the effect of wind and other weather conditions on the ball. When the distance is closer, the wind reduces its effect on the ball, which leads to improved accuracy. Also, the shorter the distance, the less the effect of gravity on the ball and the less the effect of rebound and reflection on the ball. When the distance is closer, the player increases his control over the ball, which also leads to improved accuracy. Also, the closer the distance, the greater the control over the ball and its movement (10:111). We also see that the rest of the variables had a significant relationship with the far zone, and among these variables are the approach angle variable and the relative knee joint angle. The researcher attributes this relationship to the fact that when the player tries to pass the ball to the far zone, the moment of kicking the ball, he needs to increase the body's inclination angle at the same moment, and the relative knee joint angle is larger, unlike the near and intermediate zones. These two variables have a direct relationship with the variable of the angular speed of the kicking leg, as the length of the radius has a beneficial advantage for the player, causing an increase in the angular speed of the rotation muscles, which is described as the result of the movement of the rotational radii that depends on achieving the required angles in the performance, which achieves a good angular speed. These movements lead to pushing the ball in an arc path

towards a specific area, as Talha Hossam El-Din indicates that “the performance angles are related to factors, to some extent, such as the players’ heights and their skill abilities” (11:312).

## 9. CONCLUSIONS AND RECOMMENDATIONS:

### 9.1 Conclusions:

1- There is a significant correlation between biomechanical variables and the accuracy of the kick skill from the far area of the field.

### Recommendations

1- emphasize passing the ball when performing the corner kick skill from the far corner to achieve high accuracy.

2- Further studies should be conducted at different levels (junior or advanced)

3- Conduct similar studies for other individual and team sports

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