International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 05, 2020
ISSN: 1475-7192

Study the characteristics of the force-time curve and some biomechanical variables for head-scoring skill

[1]Mohammed Majeed Salall

Abstract

Introduction and the importance of research, and through it the importance of biomechanics in improving the level of skillful performance of many activities and sports, including the game of football, was discussed in the study of one of the most important skills in the game of football, which is head scoring, which is the end and natural end of investing A method used by the team to win the match, so the researcher decided to study and analyze this skill and find relationships to some of its variables through kinematic and kinematic analysis to bring it to the level of ideal technical performance in order to complete part of the requirements for reaching the mathematical form.

This section also included the research problem, which came through the researcher's observation of the lack of studies in the biomechanical field of football in general and in the skill of scoring the head in particular, so there was a need to conduct such a study to know and analyze the kinematic and kinematic variables of the skill of scoring the head under conditions similar to the cases of play As the researcher never knows this skill has been studied in football at the level of the country in biomechanical terms, which necessitated the researcher to delve into this skill to clarify its importance and study it from various mechanical aspects.

As for the research objectives, they are as follows:

1. Identify the nature of the (strength_ time) curve for the skill of scoring the head from jumping in the research sample.

2. Identify the values and nature of the relationship for some biomechanical variables (Kinetic and Kinematic), some with others, due to the skill of scoring the head from jumping in the research sample.

3. Identify the nature of the relationship between the values of some kinematic variables with each other and the nature of the relationship between the values of some kinematic variables with each other as well for the skill of scoring the head from the jumping of the research sample.

As for the research hypotheses, they were: -

[1] *Iraqi University College of Education for Girls.*

1. Some of the Kinetic variants of head-scoring skill are related to each other in a significant relationship.

2. Some of the kinematics variants of head-scoring skill are related to each other in a significant relationship.

3. Some Kinetic variables are related to some kinematic variants of the head scoring skill of jumping with a significant relationship.

Keywords: *biomechanical variables, kinematics variants, football*

I. Introduction and importance of research

The developed countries began the process of advancement at all levels, relying on scientific research and the many and varied studies, so the sciences developed in their various specialties and types, and one of these sciences had a great and influential role in that development and advancement is the science of biomechanics in which all knowledge, information and research methods related to the structural and functional formation of the movement apparatus are applied in Human" " .

The harnessing of biomechanics has had a great impact on improving the level of skillful performance of many events and sports, including the game of football, which those responsible have become very eagerly looking for this science because it takes in their hands to develop their players and raise their levels, because most football skills are characterized by speed of movement, so judging them Through the naked eye and the field experience of the trainer in order to comprehend the skill and determine its errors, it is not characterized by validity and objectivity, after it has been proven that the human eye cannot analyze the incidents that appear in less than (0.25 seconds) approximately.

Therefore, the importance of biomechanical analysis of kinetic skills in football lies in the fragmentation of the movement or the skill to be analyzed and studied in order to identify its movement path and then clarify the mechanical reasons for success and failure in its performance, and despite the multiplicity of skills in football and the different mechanisms of technical performance in it, not The common goal that players seek to achieve in the types of skills is to score a goal against the opposing team's goal with high speed and accuracy.

Hence, the importance of research was evident in the study of one of the most important skills in the game of football, which is head scoring, which is the natural goal and end of investing every method used by the team to win the match, so the researcher decided to study and analyze this skill and find relationships to some of its variables through kinematic and kinematic analysis. To bring it to the level of ideal technical performance in order to complete part of the requirements to reach the sports form.

Therefore, this study tries and seeks to expand the knowledge base to study the skill performance of football players, and to give a new vision to improve the level of skill performance through biomechanical analysis and seek to improve performance in the skill of scoring the head, which is the backbone of football attack operations, so the researcher tries to study technical performance This skill in terms of quantity and quality, trying to

reach the basis of movement and its rules to help clarify these foundations for players, coaches and those interested in the field of football.

Research problem.

Due to the lack of studies in the field of biomechanics in football in general and in the skill of scoring the head in particular, so there was a need to conduct such a study to find and analyze the kinematic and kinematic variables of the skill of scoring the head under conditions similar to the cases of play, as it has never been known to the researcher and if these studies The skill of football at the level of the country in terms of biomechanics, which necessitated the researcher to delve into this skill to clarify its importance and study it from various mechanical aspects, by identifying several biomechanical variables and finding the characteristics of the force-time curve because of its great importance in this skill, in the event of equal competitors In all skill aspects, the player who is faster to jump is the one who hits the ball first and this speed requires strength to achieve it, so by knowing these biomechanical variables and finding the characteristics of the force-time curve, the strengths and weaknesses in the performance of this skill can be diagnosed as an attempt to address the apparent decline in the level of Scoring this skill for the Iraqi national football team.

Research aims.

1. Identify the nature of the (strength_ time) curve in the skill of scoring the head from jumping in the research sample.

2. Identify the values and nature of the relationship of some biomechanical variables (Kinetic and Kinematic), some with others, due to the skill of scoring the head from jumping in the research sample.

3. Identify the nature of the relationship between the values of some kinematic variables with each other and the nature of the relationship between the values of some kinematic variables with each other as well for the skill of scoring the head from the jumping of the research sample.

Research hypotheses.

1. Some of the Kinetic variants of head-scoring skill are related to each other in a significant relationship.

2. Some of the kinematics variants of head-scoring skill are related to each other in a significant relationship.

3. Some kinematic variables are related to some kinematic variants of guiding skill .

II. Research methodology

The approach differs in the research according to the nature and quality of the study, so the researcher used the descriptive approach in the manner of interrelationships (correlational studies). This method not only seeks to collect information in the current situation and obtain accurate descriptions of superficial phenomena only, but to

track the relationships between facts obtained by the researcher in order to Getting a deeper dimension to the phenomena.

The research samples.

The process of selecting a sample is one of the main steps in collecting information and data, and the researcher often resorts to determining a sample community based on the phenomenon or problem he chooses. That is, the researcher chooses a sample in which he deems it faithfully representative of the original community he studies.

Therefore, the research sample was deliberately chosen from the attackers of the Iraqi national team participating in the West Asian qualifiers for the year 2004, and they numbered three attackers who were given several attempts and three successful attempts were analyzed, all of which were analyzed so that the number of cases became (9).

In order to know the correctness of selecting the sample and the extent of its normal distribution, the researcher used the Skewness coefficient for the results of the field survey for body measurements and some physical tests that were conducted on the research sample.

As the statistical treatments resulted in good selection and homogeneity of the sample, because the values of the torsion modulus were confined to ± 1, where the more the values of the torsion modulus were confined to ± 1, the more it indicated that the grades were naturally distributed and there was no deficiency in choosing the sample.

Force measuring platform and accessories.

The researcher made exceptional efforts in order to develop the work of the force measurement platform. After several meetings with some professors and specialists in the fields of mechanics and electron at the University of Technology in Baghdad, as well as through correspondence with the global information network (the Internet) The theoretical program was developed to develop the work of the force measurement platform and that By connecting the switching device to an advanced computer (PIIII), and through it, results are given up-to-date, with high speed and accuracy that surpasses the device's work with an automatic computer (Warka).

After that, the theoretical program was put into application through the researcher's contact with the engineer in charge, so the new switching device (interpreter) was manufactured, which has the ability to receive the signal during performance from the platform, interpret it and transfer it to the computer device, and after collecting the electrical and electronic materials necessary for this, the consistency and compatibility of the device's speed (Al-Interpreter) With the speed of the computer, due to the lack of some materials necessary for the success of the device's work, which forced the researcher to return to the old switching device, which works on the automatic computer "Warka".

The researcher made sure of the operation of the strength measurement platform through the specialist engineer and with the help of Prof. Dr. Sareeh Abdul Karim, and found that it contained some holidays and shortages.

The specifications of the force measuring platform are: -

The length (100 cm), width (125 cm) and thickness (5 cm) were made in Diyala Engineering Office / Baghdad, and it has already been used by many researchers.

The platform was linked to a computer of any type and partner NEC-PC 6001 MKII, and it was connected to the computer with a monitor display of NEC-JC 1460 DE with a disk drive recorder NEC-PC 60 m31B with Printer-Plotter type NEC-PC-PR 105 BE.

Also attached to the platform is a home-made Power Supply-DC power supply with a Japanese-made Digital Avometer Pm VA 2522.

A German-made High Storage Osilloscope, PM 3234-10-10 MHz, with which ADC-Ports electronic circuits are connected to deal with the automatic computer, transmit motion and feed it to the computer. These circuits are divided into: -

Self-zeroing circuits for high-precision Zero Balance Adjustment values

Electronic control circuits

Soft Ware Controlling Programming Control Circuits

As for the platform's work, it is represented by projecting the force through the driving foot of the player on the platform and transmitting this force through the Strain Gauges and its reliable circuits known for their accuracy called (Winston Bridge), which transforms the mechanical work into an electrical signal that goes to the computer via the switching device to obtain accurate numbers In addition, a program has been developed through which we can obtain the graph of the curve and schedule its required properties to be stored in order to be able to study and analyze the force paths and their values for each player from the research sample.

The graphs of the (force-time) curves were obtained from the computer for the force measurement platform, which was programmed with a program prepared for this purpose, where the path of the curve represents the amounts of force recorded during the technical performance of the head-scoring skill from the jump, while the time determines the beginning and end of each push stage and for each attempt From the attempts of the research sample

Through the force-time quantities recorded and for each attempt of the individuals of the research sample, the strength variables were extracted, including the force rate, the maximum force and the time of its effect at the first and final thrust phases, the minimum strength and the time of its influence at the absorption stage, as well as the RMS and an area under the curve, and this was done through a special program after it An abbreviation of each player's name, weight, and attempt number has been included for the purpose of knowing the players and trying when analyzing.

Videography.

In his second and main reconnaissance experiments, the researcher used a (2) National Panasonic M 3500 video camera made in Japan with a frequency of 25 images, and the researcher also used (SAMSUNG – VHS) video films with a Tripod tripod.

The camera number (1) is placed at a distance of 8.5 meters from the field of hitting the ball so that the imaginary line coming from its focus is perpendicular to the point where the ball is hit and on the right side of the player, with a height of 1.60 m, and the camera number (2) is placed at a distance 8.5m from the ball hitting field so that the imaginary line coming from its focus is perpendicular to the point where the ball is hit and behind the player .

The main experience.

The researcher conducted his main experiment on Tuesday, May 18, 2004 and on the Al-Zawraa Sports Club stadium with the same procedures for the second exploratory experiment by preparing the workplace well, noting the arrangement of the sites of the devices and tools used in sequence with the course of the required work.

The researcher explained the method of conducting the test with an indication of its importance, which includes running with weighted steps from the person towards the ball launched from the ball throwing cannon (its path from the inside to the outside) and directed parallel to the force measurement platform so that the player's movement is timed with the launch of the ball and then jumping with one foot over the platform And hit the ball on the forehead and direct it towards the set square on the right side of the lower area of the goal.

These steps, as a whole, represent a single test for each player, noting that when each player performs, the auxiliary staff, each according to his responsibility, follow the cameras, the ball-throwing cannon, the computer work, the method of recording and storing data and curves.

Measured biomechanical variables

A special form in which the biomechanical variables were recorded in Appendix No. (6) was presented to a group of Iraqi and foreign specialists in the subject of biomechanics.

1. Maximum force of the first impulse: It is the largest value recorded on the curve in the stage of the first impulse.

2. The time of arrival for the effect of the maximum force of the first impulse: the time elapsed for the nearest fraction of a second from the moment of contact with the platform until the maximum force was recorded in the stage of the first thrust.

3. The lowest absorption force: It is the smallest value recorded on the curve in the absorption stage.

4. Time of arrival for the effect of the lowest absorption force: The time elapsed for the nearest fraction of a second from the moment of contact with the platform until the lowest force in the absorption stage was recorded.

5. Maximum final thrust force: It is the largest value recorded on the curve in the final push stage.

6. The lead time for the effect of the maximum final thrust force: The time taken for the nearest fraction of a second from the moment of contact with the platform until the maximum force was recorded in the final thrust stage.

7. Area under the curve: It is the amount of the effect of the force between two moments (t0, t1), which represents the amount of influence of the temporal force or momentum that equals the change in the amount of movement expressed.

Analysis of the nature of the power-time curves in the skill of scoring the head from jumping to the research sample.

Through the program prepared by the computer and through the results obtained by the researcher from the force measuring platform device (Force Plate Form), graphs of (force_ time) curves were obtained for the individuals of the research sample in the skill of scoring the head from jumping, and as a result of the novelty of the curves extracted in the field Football game requires clarification of the nature of its components and characteristics.

Most of the curves showed a similarity in their shape by containing two peaks, the first peak appeared after touching the force measuring platform, which represents the landing area on the platform and is the beginning of the movement and is related to the preparatory part for it, while the second peak appeared after extending the knees and it is related to the main part of the movement and it is the largest area In the curve, which starts from the moment of starting to push and takes place in one time and consistent mechanics, where the driving foot is fixed on the ground after good anchoring to move to the thrust stage as a result of the length of the acceleration distance over the total moment of anchor, and separating those two peaks from the lowest point of the curve path after the first peak which is the limit The separator that divides the curve into two regions is called the absorption stage.

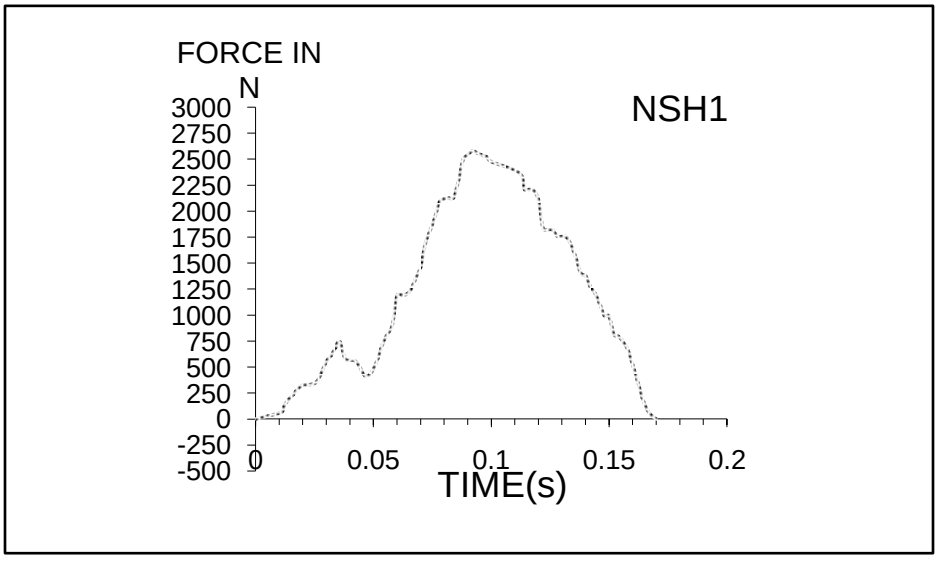

Figure No. (1) shows the first and final payment summits

It also became clear that there is a discrepancy in the amount of the first push among the players, and it is evident in the strength curves, as the first push starts with a relatively small peak as an indicator of strength as an expression of the push by a part of the foot (the heel of the foot), while the force begins with a larger peak as an expression of a relatively large indicator of strength and this It means that the movement started with the whole foot.

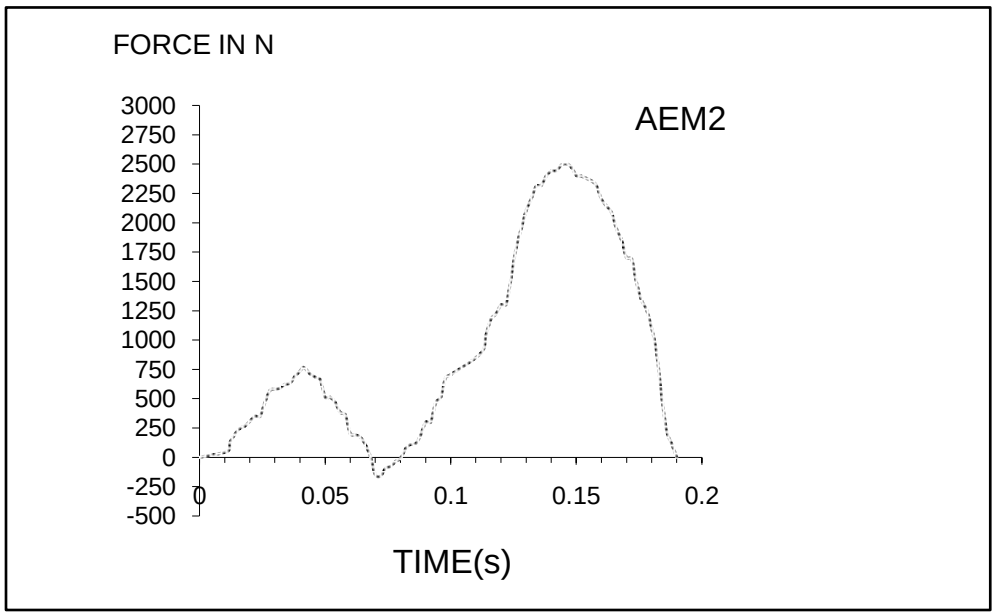

Figure No. (2)

It shows the amount of variance at the stage of the first batch of the research sample .

It also showed from the nature of the curve characteristics that the head-scoring skill from jumping is generally starting from scratch as an indicator of strength, as well as that some force curves in which the absorption stage is not negative but its value is positive, which indicates that the drop stage for the player is very short.

The characteristics of the curve showed a difference between them in terms of the distribution of the force recorded on the curve and the time of its effect on the length of the performance stages of the skill of scoring the head from jumping on the strength measuring platform device, and this indicates the difference in the technical performance of each player, and also shows a difference in the tops of the curves and the time of their impact.

The force of the first thrust on the platform is much less than the final thrust in all performances of this skill, where in the final thrust period, which is achieved directly from the support by the standing foot and the kinematic weight of the free leg and arms, this stage is characterized by common mechanical properties. Vertical by using the maximum possible strength components on the ground that qualify it to prepare for advancement and achieve the maximum possible values of appropriate vertical strength.

III. Conclusions.

1. There is a similarity to the nature of the curve in the skill of scoring header from jumping because it contains two peaks represented by the first push and the second by the final push separated by the lowest point of the curve path after the first peak, called the absorption phase.

2. There is a variation in the amount of the first push of the head-scoring skill from jumping, and it is evident through the beginning of the strength index with a relatively small peak when the push is by a part of the foot (heel), while the force begins with a larger peak, expressing a relatively large indicator of strength when the push is with a full foot.

3. In some attempts to perform the skill of scoring the head from the jump, the values of the absorption stage are positive, and this is an indication that the rise stage of the player is very short, while other attempts were negative to increase the stage of absorption.

4. That the first thrust on the podium is much less than the final thrust in all performances for the head-scoring skill of jumping.

5. There is a difference in the distribution of the force recorded on the curve and the time of its influence on the length of performance stages of the skill of scoring the head from jumping on the measuring platform.

6. The research sample recorded the best ball velocity in the skill of scoring the head from jumping a value of (30.62 m / s), and the circumferential velocity of the trunk and head was a value of (1.51 and 2.16 m / s), respectively.

7. The research sample's achievement of the required values for the height of the hip joint point and the required time is the reason for that to be suitable for the angles of rise and flight that were achieved in terms of extension in the joints of the foot, knee and torso where there was clear progress in the values of these angles to serve the skillful performance of scoring the head from the jump.

8. When optimizing the use of the trunk in movement, this movement adds speed and force to the movement of the head under the principle of kinetic transmission, thus achieving the required resultant speed in line with the motor duty.

IV. Recommendations.

1. The necessity for trainers to adopt mechanical foundations and laws in training, as it is necessary to focus on increasing the values of the circumferential velocity of the head and the trunk, depending on the principle of increasing the angular velocity for them as a mechanical principle that can be applied through the mechanical tracking of the peripheral velocity equation.

2. The need to pay attention to the requirements of performing the skill of scoring the head from jumping, depending on the biomechanical analysis of its performance stages, which the researcher has divided into its four stages.

3. Emphasis on the dynamic relationship between the head and the ball. The greater the amount of movement of the head, the more the player can achieve a large movement momentum to hit the ball.

4. Dividing the power-time curve into regions gives a clearer understanding of the characteristics and requirements of the beginning of the stage from its end and the relationship of each with the other in the level of technical performance.

5. The study of the values of the recorded force and the time of its influence on the properties of the curve without its relationship to the apparent biomechanical variables accompanying them leads us to an objective evaluation of the level of performance and the potentials of its errors, as the descriptive and causal aspects must be combined in the performance evaluation.

6. The necessity to adopt the important mechanical foundations and factors for the ejected objects, which were represented in the variables of speed, angle of flight of the body and the height of the point of the hip joint in order to achieve an ideal flight path commensurate with the requirements of technical performance in line with the required motor duty.

7. Work to develop the explosive power of the muscles of the legs in order to obtain a rapid jump, depending on the principle of action and reaction.

8. Avoid increasing bending in the joints of the body at the end of the absorption section, as this negatively affects the overall propulsion time.

References :

1. Hussein Mardan. Analytical study of some dynamic variables from initiation to passing the first obstacle. PhD thesis, College of Physical Education, University of Basra, 1996.
2. Hussein Mardan Omar and Ahmad Tawfiq Al-Janabi. Calibration of power platforms using linear regression as a correction factor. University of Babylon Journal: Physical Education Sciences, Mag 2, No. 2, 2003.
3. Hanafi Mahmoud Mukhtar. Scientific foundations in football training. Egypt: Arab Thought House, 1999.
4. Khaled Muhammad Attiyat, studying the amount of thrust and some mechanical variables of the two men in the attack movement in fencing. PhD thesis, College of Physical Education, University of Baghdad, 1997.
5. Khaled Najm Abdullah: The relationship between some biomechanical variables for the three-point correction of a basketball jump. PhD thesis, College of Physical Education, University of Baghdad, 1997.
6. Diobold B. Van Dalen, Research Methods in Education and Psychology, translated by Muhammad Nabil Nofal (and others), Cairo: Technoprint House, 1984.

7. Ron Greenwood (et al.) The modern European football training method. Translated by Walid Youssef Tabra. Baghdad: Salma Modern Art Press, 1989.
8. Raysan Khuraibet. Encyclopedia of measurements and tests in physical education and sports. Basra: Higher Education Press, C1, 1989.
9. Raysan Khuraibet and Najah Mahdi. Kinetic analysis. Basra: House of Wisdom, 1992.
10. Zuhair Al-Khashab (and others). football. Mosul. Dar Al Kutub for Printing and Publishing, 2nd Edition, 1999.
11. Sami Al-Saffar, Football Technical Numbers, Baghdad: Baghdad University Press, 1984.
12. Stanjov Timovice. Junior football. Translated by Kazem Al-Rubaie and Abdullah Al-Mashhadani. Basra University: Dar Al-Hikma Press, 1991.
13. Suleiman Ali Hassan and Awatif Muhammad Labib, Muscular Strength Development, Cairo: Contemporary Thought House, 1978.
14. Samir Musallat Al-Hashemi, The Principles of Jumping and Jumping in Arena and Field Games, Baghdad: Al-Hawadith Press, 1981.
15. Samir Musallat Al-Hashemi, Biomechanics, University of Baghdad: Higher Education Press, 1991.
16. Samir Musallat Al-Hashemi. Mathematical Biomechanics, University of Mosul: Dar Al-Kutub for Printing and Publishing, ed. 2,1999.
17. Sawsan Abdel Moneim (and others): Biomechanics in the Mathematical Field. Egypt: Dar Al Ma'arif, Part 1, 1977.
18. Saeb Al-Obaidi (et al.) Applied Biomechanics, University of Mosul: Dar Al-Kutub for Printing and Publishing, 1991.
19. Sabah Muhammad Mustafa and Louai Ghanem Al-Sumaida'i. Correcting the skill of hitting the head for some matches in the 1996 European Championship in football. Physical Education Journal. College of Physical Education, University of Baghdad, Volume 4, October 1999.
20. Talha Hussein Hussam El-Din. Biomechanics theoretical and applied foundations. Cairo: Arab Thought House, 1, 1993.