

# ANALYTICAL STUDY OF SOME BIOMECHANICAL VARIABLES FOR THE ACCURACY OF THE PERFORMANCE OF THE CORRECTION SKILL BY JUMPING FORWARD WITH A HAND BALL

Motasim Mahmoud Shatnawi<sup>1</sup>, Dr. Dhurgham A. Neamah Al-Jadaan<sup>2</sup>, Dr. Muhammad Abu Ahmad<sup>3</sup>, Dr. Muhammad Saeed Al-Saeedin<sup>4</sup>

<sup>1</sup>Professor, Mutah University, Jordan. E-mail: alsedeenmohmd@yahoo.com

<sup>2</sup>University of Basra, Basra, Iraq.

<sup>3</sup>College of Trainers - Nazarh.

<sup>4</sup>Teacher in the Ministry of Education, Jordan.

## ABSTRACT

The study aimed to Identify the values of some biomechanical variables for the player and the ball when performing the shooting skill by jumping in front of the hand ball with the research sample, To know the accuracy of the skill performance when performing the shooting skill by jumping forward with the hand ball of the research sample.

The research sample included some players of Basra Municipality's handball club 2020-2021 AD, whose number is (8) players, because they are of high level, and their percentage (50%) from the original community of (16) players. A special video camera with (Dart fish) sport skill analysis programmer were used to determine the biomechanical variables. All data were treated by SPSS-Ver 21 Statistical programme.

It was found through the biomechanical variables that the research sample possesses good qualifications in performing the skill of shooting by jumping forward and thus their results were good, the research sample did not have an acceptable level in the accuracy index variable due to the fact that the goal-hit accuracy results were weak, which led to a low level of accuracy index indication despite the fact that Time ratio they have good.

**Keywords:** Biomechanical and Sport, Handball Scoring, Kinetic Analysis.

## I. INTRODUCTION

Handball is one of the games that have the character of accuracy and rapid performance during play, whether from the movements of the players or the ball, which depend on the number of injuries recorded by each team in the goal of the other team, so it is necessary to master the skill of correction of all kinds because it is the essence of the offensive process, and that the correction process In handball, it is very important, and shooting with low accuracy is sometimes what limits the opportunity to shoot, and one of the reasons for low accuracy in shooting occurs due to a change in biomechanical performance often, especially if there is a wall or a blocking wall in front of the player who is shooting, but these errors are almost invalid. Accurately known due to its fast performance, Dhurgham Abdul Salam Neamah and Wael Kassem Jawad (2015) point out that anything the player or team does is a contribution towards creating scoring chances because it is the winning team in the game that has brought the ball into the opponent's goal more often and legally, and that this process is not done Only through scoring<sup>(1)</sup>.

Biomechanics has a great role and interest through applied work and subjecting the players to scientific experiments, so this science contributed greatly to the events of tangible progress in all fields and not to sports activities by identifying the values of the most important biomechanical variables with a positive impact in achieving the best level of performance or achievement together as well as diagnosing The weaknesses that are negatively characterized when implementing the biomechanical requirements for performance through which the skill performance is evaluated. These experiments included the mechanics of the skill performance of each

player, which gives or instructs the coach to the extent of the player's ability during the match in addition to the extent of his ability to perform the required duty in terms of tactics. It was individual or collective through a pre-agreed tactical sentence, that the performance requirements lie in the player's access to a high level of accuracy as the skill of correction is the final outcome of all moves and plans drawn by the coach and that not hitting the goal means that all offensive skills are useless. All coaches strive to end this stage with a successful shot in order to defeat the opposing team, Hussam Mohamed Gaber and others (2017) points out that the aiming is only the final result of the attack in the hope of scoring a goal where a suitable situation is created in which a team member can perform a direct throw with a good opportunity to score <sup>(2)</sup>.

Through the researchers 's follow-up of the scientific training resources, research and studies, he noticed that there are many experiments with the skill of shooting in handball and that their purpose is to identify the biomechanical variables of skill in general, and the researchers did not notice a study that in the case of increasing the approximate jog distance, will there be changes in the level of skill performance Mechanically, are there changes in the path of the ball or its mechanical variables and thus will affect the accuracy of the skillful performance, which is the final outcome of the correction phase. Hence, the importance of research in studying and subjecting players to research and experimentation in order to stand some biomechanical indicators that affect the accuracy of skill performance in order to identify The obstacles that players face during performance in addition to developing their skillful performance through accurate performance in the handball game, and thus contribute to raising the level of our players, which will benefit the results of our teams at various levels.

## II. THE AIM OF THE STUDY

1. Identify the values of some biomechanical variables for the player and the ball when performing the shooting skill by jumping in front of the hand ball with the research sample.
2. To know the accuracy of the skill performance when performing the shooting skill by jumping forward with the hand ball of the research sample.

## III. METHODOLOGY

Since the selection of the appropriate approach to research any problem depends on the nature of the problem itself, so the researchers has taken the descriptive approach for its suitability to solve the research problem and to achieve its objectives, The research sample included some players of Basra Municipality's handball club 2020-2021 AD, whose number is (8) players, because they are of high level, and their percentage (50%) from the original community of (16) players. In order to ensure the homogeneity of the sample in the variables that may affect the course of the experiment, the researchers conducted a statistical treatment using the coefficient of variation and it appeared that all the values of the coefficient of variation were less than 30% <sup>(3)</sup>, Which indicates the homogeneity of the individuals of the research sample in the variable. Anthropometry variables for this value is indicating homogenic sampling as (Arithmetic Mean/Standard Deviation) ratio for the variables are as follow:

*Total length* (187.5/2.10)

*Mass* (78.6/2.54)

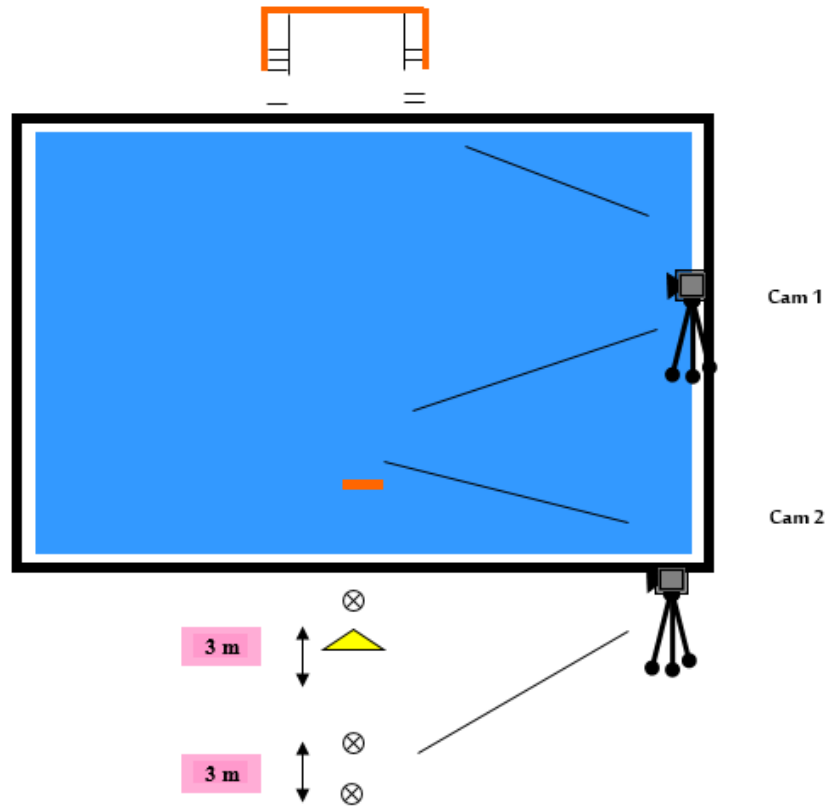
*Age* (25.4/2.34)

*Training age* (13.4/1.80)

The test used by research: Test name Dhurgham test, measuring the accuracy of the forward-jumping shooting skill <sup>(4)</sup>

The researchers conducted an exploratory experiment on 10/4/2020 AD on a sample of Naft Al Janoub players, totaling (4) players, and the purpose of which was to identify the appropriateness of the measurements made by the researchers in addition to identifying the required measurements between the corrected player and the defending player. And determine the point or place from which the performance is performed, The researchers conducted the main experiment for a period of two days on 12-11 / 10/2020 AD at the Naft Al Janoub Sports Club hall in Basra Governorate on some players of Basra City with handball for the category of applicants, where the players were photographed while performing the aiming attempts, the researchers used two video

cameras. The researchers used a SONY video camera, number (2), made in Korea, with a frequency of (100) pictures per second, and the first camera was placed at a distance of (6.40 m) from the field of movement of the player and at a height (1.27 m) measured from the ground to the focus of the camera lens. On the right side of the right player, through which the variables of the player are fully identified, while the second camera was placed on the right side of the player to identify the variables of the ball until the moment it entered the goal, where it was placed inside the field and close to the side line of the stadium and at a distance of (8 m) and at a height (1.30 m) measured from the ground to the focus of the camera lens, which included tracking the ball's variables until it entered the goal (squares).



**Figure 1.** It Shows the Location of the Player's Performance of the Front-to-end Shooting Skill and the Position of the Cameras

Computer analysis (kinetic performance), upon biomechanical analysis, should determine the goal of the skill to be studied. "One of the first steps in biomechanical analysis is to define the basic goal of the motor skill, or as it is called, the mechanical goal of the skill. Without clarity and defining the goal of the skill, it is not possible to evaluate the effectiveness of its performance" <sup>(5)</sup>, so The researchers did the following:

1 / Converting the movie from Sony's imaging memory to DVD using a computer (Pentium 4) in order to facilitate the analysis steps.

2 / The movie was stored in the form of files inside the calculator with speed 2.4 (CORE 2 DUOE)) RAM 2 GIGA BIT. And then transfer these files to the program (dart fish) version VI, which is installed on the calculator, and this program is dedicated to the analysis of mathematical movements, and as in the figure below:

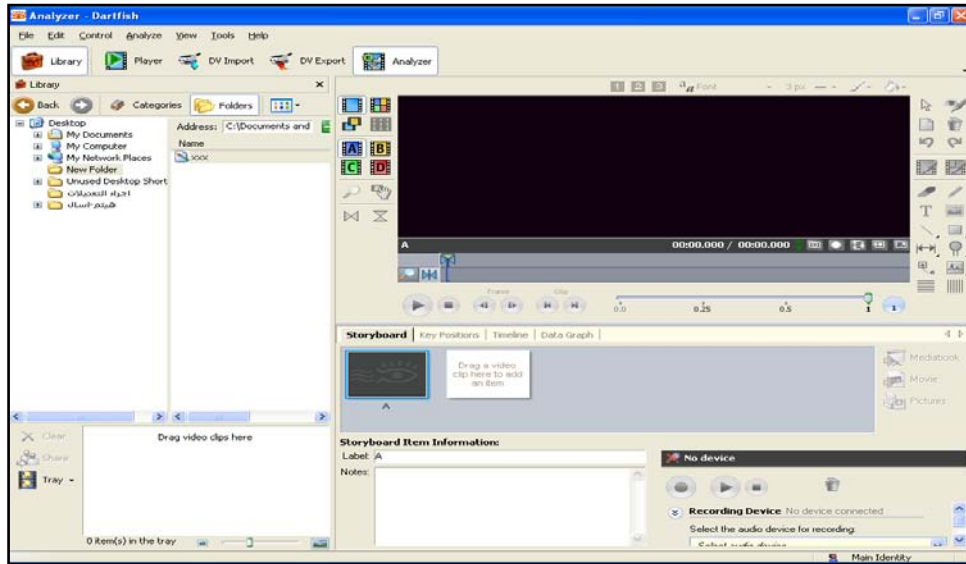


Figure 2. Explains the Interface of the Program (Dart fish)

The biomechanical variables were calculated as follows:

1. Approach speed: It is the result of dividing the horizontal distance traveled by the player during the last two steps by its time, measured in meters / second.
2. Pushing time: It is the limited period from the moment of the first increase in the values of the knee joint after reaching the maximum flexion to the moment of reaching its full extension, i.e. the last image of the player contacting the ground and is measured by the second.
3. Ball velocity: It is measured by calculating the distance between the center point of the ball at a certain point and another point after (5) images divided by the time of transmission of the ball center between two points, and it is measured in meters / second.
4. The kinetic energy of the ball =  $0.5 \text{ mass} \times \text{the square of its velocity}^{(6)}$
5. Accuracy / Time Index: The total performance scores obtained by the tester divided by the time of its performance, and the greater the score, the higher the accuracy, and you get the time of the ball from the moment the ball is thrown to the point it reaches the goal.

$$\text{Accuracy} = \text{ideal performance (degree)} / \text{performance time (minutes or seconds)}^{(7)}$$

The data were analyzed statistically by statistical bag (spss) version (21) to extract.

1. The arithmetic mean
2. Standard deviation

#### IV. RESULTS AND DISCUSSION

The data analysis for this study is the backbone to indicate the scientific quantitative and qualities indexes which can approve the acceptance or rejection of the resultant values<sup>(8)</sup> After the data were processed statistically, the results appeared, which are shown in Table (1).

No	Biomechanical Variables	measuring unit	Mean	Standard Deviation
1	Approach speed	m / s	4.096	0.143
2	Impulse time	s	0.224	0.004
3	Speed ball	m / s	24.785	0.630
4	The kinetic energy of the ball	Jules	31.049	0.921
5	Accuracy / time indicator	Degree / s	16.045	0.590

### 1. Approach Speed

The researchers believe that the greater the distance, the greater the speed of approaching, so that the player can increase his speed through an increase in the length of the step in a short period of time in addition to an increase in the output of the thrust during the period of time by overcoming the moment of his inertia and thus the increase is done with the speed and the researchers believe that The performance requirements impose on the player to approach faster than the time period to take advantage of the speed and convert it through the kinetic transfer process from the lower part to the upper part represented by the arm and then to the tool which is the ball so it is required on him in addition to that that the use of approach speed in this case is according to the requirements of the situation The defensive situation faced by the player and what imposes him on him is the defense situation of the opposing team and the area he is trying to shoot, as in some cases the player is forced to shoot in the lower areas and sometimes in the upper areas where the defensive situation is important and large for the correction area in addition to the position taken by the goalkeeper And how close and far from the goal line is, and that this speed increase will be evident in the case of prolonging the approximate steps while preserving the amount of time and mentioning Salman's success. The increase in the approach speed occurs as a result of the change in the final step distance in proportion to the mechanical requirements of the uplift stage for the purpose of lowering the center of gravity of the body before the rise stage to facilitate the diversion of the body's path from as well as increasing the amounts of impediment in the frontal support to suit the increase in the approaching speed<sup>(9)</sup>

### 2. Impulse Time

The researchers believe that the speed of approach has a major role in reducing the time of support and propulsion by increasing the amount of movement, so this stage is of great importance as it takes place from the moment of increase in the values of the knee joint, i.e. from the moment of extending the knee joint after the amount of obstruction or braking to the moment it leaves the ground, which is done according to A specific mechanism by which the center of gravity of the body of the player who is aiming is converted from the horizontal direction to two speeds in the horizontal and vertical direction, and thus there is a loss of speed or a loss of the amount of movement where the less time, the less the lost speed and the process of converting the horizontal speed to the resultant speed is good and an indication of a process Indicator of good movement of movement, and Adel Mohamed Rushdie indicates that momentum means exerting force in the least possible time to change the momentum of the body from one direction to another, as happens when pushing the ground by foot<sup>(10)</sup>. Where the relationship of thrust is a direct relationship with force and inversely with time, the more time, the less driving force, and this is an indication that the speed is low, and the shorter the time, the good and the great force, the speed is high. In order to preserve the largest amount of energy and invest it in motor performance<sup>(11)</sup>. This means that the thrust time is less than it is, and the researchers believe that the push time for them is greater and this is due to the momentum possessed by the player's body, which works to convert the speed into a resultant velocity, trying to reduce the time to maintain the speed and reduce the lost speed during this stage.

### 3. Speed Ball

The researchers believe that the trunk has a major role in the increase in the flexion of the trunk at a moment and the role it plays in the correction process through the kinematic transmission process from the moment the foot left the ground to the moment of correction and the ball left the player's hand where during the pulling the arm back, the trunk will store energy in this large part, transforming To a potential energy stored in it and when it reaches the maximum twisting of the trunk by pulling the arm, then the potential energy is converted into kinetic energy to be used in the aiming process, transferring the kinetic energy to the aiming arm and then to the tool (the ball) and as a result of this role, i.e. the process of transformation with kinetic energy. Latent and then kinetic, through which the torso is bent and according to the amount of velocity achieved by the aiming arm, the more the arm is fast, the more the angle of the hip joint is low, i.e. there is an inverse proportion between the energy stored in the trunk and the angle of the hip at the moment of correction and thus transferred to the aiming arm and then to the aiming arm which is considered a summary The stages that the player goes through in terms of approximate steps, rise and then correction, it is necessary to master the skill well in order for the outcome of the process to be good, the more the speed of the ball is large km The probability of hitting the goal was great conditional on accuracy, which is considered one of the most important factors affecting the correction.

### 4. The Kinetic Energy of the Ball

The researchers believe that this variable depends heavily on the ball's velocity variable, so the higher the speed of the ball is, the higher the kinetic energy output is, the fact that the mass of the object is fixed and does not

change, so the kinetic energy is large because the approach speed is large and thus affects the amount of the ball's velocity during correction, which is the energy output. The kinematic is large, that is, the proportion is directly proportional between both the velocity of the ball and the kinetic energy of the ball. This is what Hachim Shani referred to as the law of kinetic energy = half the mass of an object multiplied by the square of its velocity<sup>(12)</sup>. And the researchers believe that the interpretation of this may be because the speed comes from dividing the distance by time, meaning that the speed is directly proportional to the distance and inversely with time, and since time was its inverse relationship with the degree of rulers and it is inversely proportional to the speed, the distance was that which affected the amount. Speed negative correlation<sup>(13)</sup>.

## 5. Accuracy / Time Indicator

The researchers believe that this variable depends greatly on the accuracy of the correction on the goal, which depends on the result of entering the ball into the goal. Significantly, whenever the result of the match is good, and thus leads to the team winning as a result of the number of goals entering the goal legally and without errors, and the time variable is one of the parties to the equation, which is highly influential. Brown, et al. Saying The accuracy and good speed of the ball mean that there are appropriate conditions for a player to obtain these two variables<sup>(14)</sup>. Dhurgham Abdul Salam (2014) points out that the player needs to have a high level of accuracy in the implementation of the proximity of the attacking player to the goal as he tries to reduce the distance between the area from which the player and the goal, which is an important factor and the main handball, the closer the distance, the more likely the success. Shoot more<sup>(15)</sup>.

## V. CONCLUSIONS

We have concluded the following:

1. It was found through the biomechanical variables that the research sample possesses good qualifications in performing the skill of shooting by jumping forward and thus their results were good.
2. The research sample did not have an acceptable level in the accuracy index variable due to the fact that the goal-hit accuracy results were weak, which led to a low level of accuracy index indication despite the fact that Time ratio they have good.
3. The sample level may be average from a mechanical point of view, but in terms of accuracy it is almost weak according to the results obtained by the researchers.

## REFERENCES

1. Dhurgham Abdel-Salam Neamah Wael Kassem Jawad. (2015). The relationship of the inertia torque of the kicked parts of the finer performance of the scoring skill of football for the halls. *Journal of Physical Education Studies and Research*, 43 (1818-1503), 401-412.
2. Hussam Mohamed Gaber, Kamel Shanin Menahi, Dhurgham Abdel-Salem Neamah. (2017). The effect of parallel training to develop the use of the opposite arm on the strength and accuracy of the aiming handball. *Journal of Physical Education Studies and Research*, 50 (1818-1503), 27-38.
3. Wadea Y. Mohammed and Hasan M. Abid, (1999). *Computer Base Statistical Applications for Physical Education Research's*. Dar Alkitab publications, p.161.
4. Dhurgham Abdel-Salam Neamah (2015). Comparative study of varying distances of approximate running on some biomechanical variables to accurately perform the aiming skill by jumping forward in hand. *Journal of Physical Education Studies and Research*, 44 (1818-1503), 46-70.
5. Talha Husam al-Din (1994): *Principles of the Scientific Diagnosis of Movement*, Edition 1, Dar Al-Fikr Al-Arabi, p. 25.
6. Samir Musallat Al-Hashemi (1999): *Mathematical Biomechanics*. 2nd Edition, Mosul, Dar Al Kutub and Publishing House, p. 179.
7. Sareeh Abdul Karim Al-Fadhli (2010): *Biomechanical Applications in Sports Training and Motor Performance*. 2nd Edition revised, Baghdad, p. 201.
8. Saleh Hamad Al-Assaf (1995); *Introduction to Research in Behavioral Sciences*: Riyadh, Obeikan Library, p. 11.
9. Najah of Salman Hamid (2006): *The effect of special exercises in the development of some physical characteristics and biochemical variables on the skill of long-distance shooting by jumping high among handball players*. PhD thesis, unpublished, Basra University, College of Physical Education, p. 124-125.
10. Adel Mohamed Rushdie (2008): *Movement Mechanics*. Egypt, The General Company for Publishing and Distribution, p. 86
11. Karl Heinz and Caird Shorthair (2011): *Rules of the Arena and Field Games*, translated by Qasim Hassan Hussein and Atheer Sabri Muhammad, University of Mosul, Dar Al Kutub Directorate for Printing and Publishing, p. 429
12. Dr. Niran J. (2018). *Anorexia Nervosa Medication Analytical Implications*. *International Journal of Intensive Care*, 14(01), 08-11.
13. Dr. Ali Say. (2018). *Pressure Injuries: An Exploration of How Evidence-Based Practice Has the Potential to Improve Care Delivery*. *International Journal of Intensive Care*, 14(01), 12-14.
14. Hachim Shani Odeh (2010): *Eighth Lecture for PhD students*, College of Physical Education, Basra University, p.25.
15. Talha Hossam El-Din and Others (1998): *Applied Kinesiology*, 1st Edition, Al-Kitab Center for Publishing, Cairo, Egypt, p. 156
16. Brown, E. (1993): *Three Dimensional Kinematics of the Direct Free Kick in Soccer When opposed by a defensive Wall* *Biomechanics in sport XI*. Hamill, J, Derrick, p. 334-338.
17. Dhurgham Abdulsalam Neamah. (2014). *Relation of time with some biochemical variables of the advancement of the aiming skill by jumping forward in hand*. *Maysan Journal of Physical Education Sciences*, 9(9), 144-158.