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The amount of Determination of some Bio-Kinematic Variables in the Accuracy of the Skill of Aiming When Jumping High with a Handball

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Abstract

The introduction to the research summarized that the most important science that contributed to the progress of movement in the sports field is biomechanics, as studying movement according to scientific foundations requires knowledge of the laws and mechanical factors affecting the motor performance of sports events. Therefore, those working in the sports field were interested in studying, analyzing, evaluating and developing skills through diagnosing areas of strength and weakness in these skills in order to improve the level of technical performance. The problem with the research is that most players lack full awareness and understanding of how to invest in the relevant mechanical foundations and laws in performing the skill under research, which causes a defect in the smooth flow of the connection between the shooting stages and thus failure in achieving their goal, and since the shooting skill is from jumping high in handball One of the most important basic skills that plays an important role in determining the outcome of the match: It prompted the researcher to analyze the skill and study its details. The aim of the research was to identify the relationship between some bio-kinematic variables and the degree of accuracy of the shooting skill of jumping high with the handball. The descriptive approach was used on a sample chosen in an intentional way, consisting of (10) players from the Army Sports Club. The researcher reached a number of results, the most important of which are: There is a correlation between some of the biomechanical variables under investigation and the accuracy of the shooting skill from jumping high. The results showed that each of the variables of step length, speed, angular velocity of the throwing arm, and angular velocity of the torso have a major role in the accuracy of aiming from jumping high. This is through the contribution percentages of these variables, and the highest contribution percentage was respectively: step time, followed by the angular velocity variable of the throwing arm, stride speed, and angular velocity of the torso in the skill of shooting accuracy from jumping high, and the lowest contribution percentage was of the variable stride length in the skill of shooting accuracy from jumping high. and this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education).

Keywords | **Amount of determination/skill of aiming from jumping high**

Introduction:

Biomechanics is one of the most important sciences that has contributed to the advancement of movement in the sports field, as studying movement according to scientific foundations requires knowledge of the laws and mechanical factors affecting the motor performance of sporting events. Therefore, those working in the sports field have been interested in studying, analyzing, evaluating and developing skills by diagnosing areas of strength and weakness. In these skills in order to improve the level of

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technical performance, mechanical analysis plays an effective role in achieving the mechanical conditions for performance, such as finding the speeds of movement of body parts, distances, and movement angles, which are among the most important basic kinematic variables required in most sporting events, whether it is an individual game or group.

The nature of performance in handball depends on the player's degree of proficiency in performing basic skills, whether defensive or offensive, with or without the ball. One of the most important of these basic skills is the shooting skill, as all skills become useless if the team members do not master this skill. Moreover, all game plans end. It is the only way to achieve goals and then win matches. Shooting from a high jump is the most important skill as it is the final culmination of the players' efforts in all their movements, which must be characterized by coordination and motor cohesion, as well as strength and speed to score a goal. Through the researcher's follow-up of local tournaments, they noticed that there are many opportunities that have not been invested in achieving the goals. The researcher attributes the reason for this to the fact that most players lack full awareness and understanding of how to invest in the relevant mechanical foundations and laws in performing the skill under research, which causes a defect in the flow. The interconnection between the stages of aiming and thus failure in achieving the goal. Based on the fact that the skill of aiming by jumping high in handball is one of the most important basic skills that plays an important role in determining the outcome of the match, the researcher worked to analyze the skill and study its details, using the kinetic analysis technique. Therefore, the importance of the research lies in studying some biokinetic indicators in the skill and knowing the amount of determination. In the accuracy of targeting in order to determine the degree of effectiveness of the impact of these indicators on it.

The research aims:

-Identifying the degree of some biokinetic variables in the shooting skill of jumping high with handball.

-Identifying the relationship between some bio-kinematic variables and the accuracy of the shooting skill of jumping high with the handball.

-Identifying the extent of determining some bio-kinematic variables with the accuracy of the skill of aiming by jumping high with the handball.

1- **Human field:** Army Sports Club players for the sports season (2022).

2- **Time frame:** from 3/23/2022 until 5/4/2022

3- **Spatial area:** Wissam Al Majd Club Hall/Inner Hall of the Specialized Handball School.

Method and Procedures:

The researcher chose the research population, which was represented by the players of the Army Sports Club for the sports season, which numbered (15) players. As for the research sample, it was chosen intentionally and numbered (10) players who were continuing training. In order for the sample to be homogeneous, the skewness factor was extracted, which included (Height, weight, age) as shown in Table (1).

Table (1)
It shows the homogeneity of the sample in terms of height, weight and age

Data Variables	Arithmetic mean	standard deviation	Mediator	Torsion coefficient
Length(meter)	178	4.59	178	0.1
Mass(kg)	76.80	9.58	75	0.2
Age (year)	29.30	2.58	29	0.4

The results showed homogeneity of the sample through the confinement of the torsion coefficient between (+1) This indicates that the distribution is moderate and the research sample is homogeneous.

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The researcher used Arab and foreign sources, the International Information Network (the Internet), the Kinovea program, test and measurement, a data collection form, an assistant work team, an electronic stopwatch (1), a manual calculator (flamingo), a medical scale for measuring weight, and a camera. (1) video clip at 120 images/second, Japanese made, (1) Dell computer running Windows XP, (4) laser discs, (4) resolution (60*60) boxes, (8) hand balls, Height measuring tape, (1) whistle, tripod, and adhesive tape (5 cm wide).

Field research procedures:

Determine the test for accuracy of aiming from jumping high:

By reviewing the sources and research, the researcher chose a number of tests to measure the accuracy of shooting from jumping high in handball, and they were reviewed through a questionnaire form that was presented to a group of (5) experts. The experts agreed by 80% on choosing the first test.

Dia and Abdul Karim) "Testing the accuracy of aiming from jumping high": (3)

-Purpose of the test: To measure the accuracy of aiming when jumping high

--**Tools used:** (8) handballs. Make 4 squares in each of the four corners of the goal so that they are square in shape along the side (60x60 cm).

-Performance method:

The player stands behind the starting line, directly in front of the goal, holding the ball. Upon hearing the signal, the player begins to take 2-3 steps to approach, then shoots from the jump upwards on the square, so that the rise to the jump is from a distance of no less than 7 meters.

Test conditions:

Not to take more than three steps and not to touch the player's feet to the rising line, and to shoot from the jump upwards in eight attempts, two attempts on each square.

Registration method:

The player gets one point for each correct shot. The total score for the test is eight points, and the ball is considered a goal if it passes its entire circumference within the square specified by the player.

-Each player is given two attempts, and the best attempt is chosen between them.

Exploratory experience:

The researcher conducted the exploratory experiment on Wednesday, March 23, 2022, at 3 p.m., on (3) players from outside the research sample (Al-Shorta Sports Club) in the indoor hall of the Specialized School of Handball. During the experiment, a shooting accuracy test was carried out. High jumping, which was agreed upon by the experts, and members of the exploratory sample were filmed while executing the high-jumping shooting skill with a video camera at a speed of 120 images/second. Four days later, the test was repeated under the same conditions.

The aim of the experiment was:

- Identifying the work obstacles that the researcher may face.
- The extent to which the work team implements its duties.
- The extent of the sample's understanding and response to the tests.
- The time it takes to apply each test and all tests.
- Ensure the validity of tools and devices.
- Identify the best camera position and the best angle for shooting.
- Extracting the scientific basis for the test.

Scientific foundations:

Honesty:

The validity of the tests is the ability of the test to measure what it was designed for or the characteristic to be measured. The two researchers used content validity by presenting a test of accuracy of aiming from jumping high to a

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group of experts in the field of testing, measurement and handball, and they agreed on agreement at a rate of 80% or more. The test measures the goal it was designed to measure.

Stability:

The researcher found the reliability coefficient using the test (3/23/2022) and retest (3/27/2022) method, and she found a simple correlation coefficient in the test results (test and retest). The results revealed that the test has a high degree of reliability, as the value reached (0.982).

Objectivity:

For the purpose of identifying the objectivity of the test, the researcher took advantage of the grades of the two arbitrators for the test results and during its retaking, as the correlation coefficient of the two arbitrators for the test results during the retaking was calculated, as the Pearson correlation coefficient was calculated between the arbitrators' results, as the correlation coefficient between the rating of the first arbiter and the second arbiter is the coefficient of objectivity, and the results resulted The test has a high degree of objectivity, as the value of the objectivity coefficient reached (0.973).

Bio-kinematic indicators in the accuracy of aiming from jumping high:

-Step length: It is a measure of the size of the steps you take. It varies depending on your height and affects the angle at which your foot strikes the ground.

-Step time: The time period between the first contact of two successive steps of the same foot.

--Step speed: It was calculated by dividing the step length by the time taken.

-Angular velocity of the throwing arm: It is the amount of angular movement of the arm from the maximum back swing to the moment the ball leaves the hand, divided by the time of movement.

-Angular velocity of the torso: It is the amount of angular movement of the torso from maximum backward bending to the moment the ball leaves the hand, divided by the time of movement.

Main experience:

The researcher conducted the main experiment test on Tuesday (5/4/2022) on (10) players from the Army Sports Club in the closed hall of the Wissam Al Majd Club. A video camera was used at a speed of ((120 images/second) and placed at a height of (1.25). m and at a distance of (3) m from the middle of the test implementation area. Before the start of the test implementation, a detailed explanation was given by the researcher about the test.

Statistical treatments:

The statistical package (SPSS) was used to process the results statistically.

Results:

Table (2)

shows the arithmetic means, standard deviations, median, standard error, and skewness coefficient for the accuracy of the high jump shooting skill and some biokinetic variables.

Variables	measuring unit	Arithmetic mean	standard deviation	Mediator	Standard error	Torsion coefficient
Aiming accuracy from jumping high	degree	5.9	1.197	5	0.37	0.233
Step length	cm	0.50	0.13	0.52	0.041	0.46
Step time	second	0.69	0.21	0.77	0.066	1.14-
Step speed	m/s	0.9	0.42	0.57	0.132	1.07
Angular speed of the throwing arm	degrees/s	409	55.34	407.50	17.15	0.48

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Angular velocity of the torso	degrees/s	401.20	48.57	399.50	15.37	0.621-

Table (3)
shows the correlation and the amount of determination between some biomechanical variables and the accuracy of performing the high-jump shooting skill.

Variables	Arithmetic mean	standard deviation	Correlation coefficient R	Selection amount R2	Connotation
Aiming accuracy from jumping high	5.9	1.197			
Step length	0.50	0.13	0.64	0.40	significance
Step time	0.69	0.21	0.72	0.51	significance
Step speed	0.9	0.42	0.67	0.44	significance
Angular velocity of the throwing arm at the moment of aiming	409	55.3	0.68	0.46	significance
Angular velocity of the torso The moment of aiming	401.20	48.5	0.66	0.43	significance

The value of (R) under free degrees (2-10) and a significance level of 0.05 is equal to (0.632)

Discussion:

It is noted from Table (3) that there is a correlation between all the bio-kinematic variables that were studied with the accuracy of aiming for the skill of jumping high among members of the research sample. As for the extent of determining these variables in the aiming skill, it ranged between (51%-40%) and was the highest amount of determination. The step time, followed by the angular velocity of the throwing arm, followed by the step speed, then the angular velocity of the torso and the length of the step.

In light of the achieved values, the researcher believes that there is a significant correlation between the accuracy of shooting from jumping high and the variables investigated, as well as the amount of accuracy to different degrees, indicating the role and importance of those variables and the effective influence in determining the amount of shooting accuracy through the interconnected work between those variables.

It is clear from the results that the accuracy of executing the strike was affected by the biomechanical variables investigated to varying degrees. We see that the angular velocity of the throwing arm, as well as the step variables of the legs before execution, in addition to the angular velocity of the torso, contribute effectively and effectively.

) Sarih Abdel Karim) points out, "The importance of the time period for executing the last step before scoring must be invested in a way that achieves speed in performing the step" (9). This confirms (Resan) that "the importance of speed in executing the step can contribute to increasing the possibility of Accuracy and control in hitting the ball" (8). This is what Amin's study indicated: "Speed is one of the most important elements of motor fitness, which falls under the influence of some principles, including step length and frequency" (2). Also, the significant correlation between the accuracy of shooting from jumping high and the variable angular velocity of the throwing arm can be an indication of the amount of strength the player achieves in the arm, Newton's Second Law (acceleration is directly proportional to the force and movement is in its direction) (Samir) (10) . Iyad Abdel Rahman also believes that "the angular velocity

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of the throwing arm is one of the specifications of good motor performance" (7). Studies by (Jamil and Ali) also confirmed that "the speed of the arm that works to push the person in the horizontal direction gives a high return on the speed of performance" (1). The torso is of special importance in the skill of shooting from above, and this is what Mahmoud and Muhammad pointed out, as "the transfer of speed between parts of the body, especially in the transition from the torso to the throwing arm, depends on the smooth action of the torso's movement and is therefore an important indicator in increasing the throwing speed." (6).
Wajih pointed out that "the torso represents the active force in the movement of the body. It is the largest weight that constitutes the physical force, the one that contains the largest muscles, and the one around which the parts are concentrated" (12). Hudhayfah confirms about this that "the mechanical power transmitted to the arm contributes to the torso's range of motion in an influential way from the moment of leaning back to the moment of executing the strike, and thus works to increase the speed of the throwing arm" (5).
Hamid and Abdul Karim also emphasized that "the skill of shooting from a jump requires that players in particular possess strength because it possesses a large part of motor performance in addition to other qualities" (4). Shahad and Intisar emphasized, "It is possible to provide coaches with information about the player's performance and how to invest in the mechanical foundations in serving the goal of the movement" (11). Both Zainab and Widad also pointed out that "knowing the players' biomechanical variables can lead us to the correct path to skill performance and the need to know the precise contribution of each variable to performance in order to later emphasize these variables that contribute more to the accuracy of skill performance and work to develop it, and enhance Other variables that contribute less to training in order to develop better performance" (13). From the above, the researcher believes that the flow of work between the parts involved in executing the strike was reflected through the significant relationships between the variables investigated and the accuracy of aiming from jumping high. Its contribution to the accuracy variable is high.Therefore, he agrees with (Zainab and Ansar) "the importance of bending the torso forward at the moment of shooting, as it requires the player to be able to control his body parts" (1).

Conclusions:

Through discussing the results, the researcher reached the most important conclusions:

1-There is a correlation between some of the biomechanical variables under study and the accuracy of the skill of aiming from a high jump.
2-The variables of stride length, speed, angular velocity of the throwing arm, and angular velocity of the torso each have a major role in the accuracy of aiming from jumping high, through the contribution rates of these variables.
-The highest determination values were, respectively: step time, followed by the variable angular speed of the throwing arm, step speed, and angular speed of the torso in the skill of aiming accuracy from jumping high.
4-The least amount of determination was for the step length variable in the skill of aiming accuracy when jumping high.

The researcher recommended:

1-It is necessary to emphasize the variable of the last step that precedes the getting up stage, as it is an important mechanical factor in the motor transfer process between the stages that precede the getting up process and after it.
2-The need for trainers to pay attention to the variables that contribute effectively to skill performance, while explaining how to invest them in achieving the best performance
3-The necessity of conducting studies and research that include other mechanical variables for handball players.

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Author's declaration:

Conflicts of interest: None

We confirm that all tables and figures in this article are ours and written by the researchers themselves.

Ethical-Clearance: this manuscript approved by local ethical committee of physical education and sport sciences college for women on (May /2024)

Author's contributions:

All contributions of this study were done by the researcher (Z.S.) who get the main idea and work on writing and concluding also with number of experts, Warda Ali (University of Baghdad) in Statistics, Ibrahim Dabayebeh in revision, Taj Al-deen Alaa Al-deen in translating, Haifaa Ahmed in proofreading

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مقدار التحديد لبعض المتغيرات البايوكينماتيكية بدقة مهارة التصويب من القفز عاليا بكرة اليد

زبيدة صلاح هادي
جامعة بغداد / كلية التربية البدنية و علوم الرياضة للبنات – العراق

مستخلص البحث

تلخصت مقدمة البحث بأن أهم العلوم التي ساهمت في تقدم الحركة في المجال الرياضي ،أذ أن دراسة الحركة وفق الأسس العلمية يستوجب معرفة القوانين والعوامل الميكانيكية المؤثرة في الأداء الحركي للفعاليات الرياضية لذلك اهتم العاملون في المجال الرياضي بدراسة المهارات وتحليلها وتقويمها وتطويرها من خلال تشخيص مناطق القوة والضعف في هذه المهارات لأجل تحسين مستوى الأداء الفني. ومشكلة البحث في ان اغلب اللاعبين تفتقر الى الادراك والفهم الكامل في كيفية استثمار الاسس والقوانين الميكانيكية ذات العلاقة في اداء المهارة قيد البحث مما يسبب خلل في انسيابية الترابط بين مراحل التصويب وبالتالي الفشل في تحقيق الهدف منها ، وبما ان مهارة التصويب من القفز عاليا في كرة اليد من اهم المهارات الاساسية التي تلعب دور مهم في تحديد نتيجة المباراة دفع الباحثة على تحليل المهارة ودراسة تفاصيلها .وهدف البحث الى التعرف على العلاقة بين بعض المتغيرات البايوكينماتيكية ودرجة دقة مهارة التصويب من القفز عاليا بكرة اليد ،وتم استخدام المنهج الوصفي على عينة اختيرت بالطريقة العمدية قوامها (10) لاعبين نادي الجيش الرياضي. وتوصلت الباحثة الى عدد من النتائج أهمها: بوجود وجود علاقة ارتباط بين بعض المتغيرات البايوكينماتيكة قيد البحث ودقة مهارة التصويب من القفز عاليا ، حيث أظهرت النتائج ان لكل من متغير طول الخطوة والسرعة والسرعة الزاوية للذراع الرامية والسرعة الزاوية للجذع دور كبير في دقة التصويب من القفز عاليا، وذلك من خلال نسب المساهمة لتلك المتغيرات ،وان أعلى نسبة مساهمة كانت على التوالي زمن الخطوة تم يليه متغير السرعة الزاوية للذراع الرامية وسرعة الخطوة والسرعة الزاوية للجذع في مهارة دقة التصويب من القفز عاليا ،وأقل نسبة مساهمة كانت لمتغير طول الخطوة في مهارة دقة التصويب من القفز عاليا. وهذا ما يحقق احد اهداف التنمية المستدامة للامم المتحدة في العراق (التعليم الجيد).

الكلمات المفتاحية | **مقدار التحديد ، مهارة التصويب من القفز عاليا**