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A comparative study of the values of some biokinetic variables between two different types of rapid smash hit and their relationship to the accuracy of volleyball performance

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***Abstract*---**The importance of the study was manifested in obtaining accurate scientific information, through the biomechanical analysis of the two patterns of rapid crushing beating in front and behind the stomach, to know the strengths and weaknesses in the performance of these two patterns, when measuring the levels of exerted force, and the manifestations of movement that are commensurate with the nature of each pattern, to improve the technical performance of this skill with its patterns. Diverse to the highest levels add to that a statement of the biomechanical properties, and the kinetic manifestations of each style, to advance the requirements of skill performance in a manner consistent with the required motor duty. As for the research problem, through the researcher's follow-up to many Iraqi Premier League matches in volleyball, and his attendance to some training units for these clubs, note that there are weaknesses in the performance of rapid smash patterns; resulting from the lack of clarity of the biomechanical information and the kinetic features that govern its nature; Which led to a low level of performance in scoring points. The aim of the research is to identify the differences in the values of some biokinetic variables between the two types of crushing.

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The researchers used the descriptive approach and the tools and devices that helped in completing the research.

Keywords---relationship, skill performance, strengths and weaknesses.

Introduction

Introduction and importance of research

The world is witnessing development in all fields, due to the application of modern scientific and technological foundations, aimed at raising the scientific level in general, and with the development of contemporary sciences and the overlapping of their problems, sciences that include more than one specialization have emerged, including physics, which has become a common denominator between multiple binary sciences, such as chemical biological physics, And medical physics, mechanical physics, and mathematical physics, which made it easy to reach a high achievement, by following the results presented by those sciences, including biomechanics, which linked human movements to his biological conditions, focusing his attention on overcoming the mechanical obstacles facing the player or athlete, in Performing the mechanical requirements for any skill performance in proportion to the performance of the required motor duty.

The use of biomechanics has had a great impact on the improvement and development of many sporting events, including volleyball, the game distinguished by its multiplicity of defensive and offensive skills, which has a high audience in the world. Biomechanics, in order to raise the level of players to achieve the best achievements .The skill of crushing beating is one of the important offensive skills for this game, as it is possible to score direct points to determine the outcome of the match, and its performance depends on the great coordination between the preparer and the hitter, by diversifying the attack in various places along the network, especially since the development of offensive plans today witnessed a leap Great quality through the multiplicity of offensive formations and plans for the front and back line players at the same time.

This skill can be performed in several styles, including: the rapid smash hit in front of the stomach, and the quick smash hit behind the stomach. Overlap in performance when implementing these two patterns, and in order for the performance to be successful and feasible in achieving its main objective, which is to score points for the team .Hence the importance of the study to obtain accurate scientific information, through biomechanical analysis of the rapid crushing beating patterns in front and behind the stomach, to know the strengths and weaknesses in the performance of these two patterns, when measuring the levels of exerted force, and the manifestations of movement that are commensurate with the nature of each pattern, to improve the technical performance of these The skill with its varied patterns for the highest levels. Add to this a statement of the biomechanical characteristics, and the kinetic manifestations of each style, to advance the requirements of skill performance in a manner consistent with the required motor duty, by diagnosing the minutes of the movement path, and its

positive and negative aspects to enhance aspects of strength, and address areas of weakness, which achieves ideal technical performance, and then achieves High achievement.

Research problem

Since the skill of striking volleyball is one of the basic and important skills; Being the team's first offensive weapon in scoring points, and it is a complex skill that requires speed and strength in performance, with the availability of the element of accuracy, in addition to that it contains many patterns and types, and continuous movements towards the centers of the attack, it was required to analyze these patterns within the biomechanical entrances, and the kinetic manifestations of performance The skill to be studied.

Through the researcher's follow-up of many of the Iraqi Premier League's volleyball matches, and his attendance at some of the training units of these clubs, he noticed that there is a weakness in the performance of the rapid smash hitting patterns; resulting from the lack of clarity of the biomechanical information and the kinetic features that govern its nature; Which led to a low level of performance in scoring points. Hence, the research problem was manifested in the lack of known information about the patterns used in the rapid crushing beating, as well as the lack of values of the most important biomechanical variables and their kinetic manifestations, which differ in the values of their variables - especially the mechanical payment between players - and in their different ways, we find a contradiction in opinions about these patterns; It has not been subjected to scientific and practical experience by following biomechanical approaches, including: force entrance, instantaneous acceleration, force push entrance, and change in the amount of movement, in addition to other variables and manifestations; Because self-observation cannot achieve mechanical requirements without adopting codified scientific observation and scientific measurement methods, including: force measurement platforms, and biomechanical analysis of technical performance requirements for this skill - under study.

Research aims

The research aims to

1- Recognizing the values of some biomechanical variables for the rapid smash hit in front and behind of the players of the Iraqi Premier League clubs in volleyball.
2- Identifying the differences in the values of some biokinetic variables between the performances of the rapid smash in front and behind the prepared for Iraqi Premier League volleyball players.

Research assumes

There are significant statistically significant differences in the values of some biokinetic variables between the performances of multiplication

Research areas

1- The human field: Iraqi Premier League volleyball players (senators) for the sports season (2021-2022).
2- Time domain: To be determined later.
3- Spatial domain: The indoor sports hall in the College of Physical Education and Sports Sciences, Thi Qar University.

Research methodology and field procedures

Research Methodology

The selection of the research method to solve the problem depends on the nature of the problem, so the descriptive approach was adopted by the method of comparison and correlational relations for its suitability to the nature of the problem

Research community and sample

The research community is "the sum of the vocabulary that the researcher aims to study to achieve the results of the study and he can generalize the results of the study to all his vocabulary, either the research sample "represents a number of individuals or things that are chosen according to a specific rule or method from the statistical community that represents this community" (Hence, the research community was determined by the intentional method represented by the Iraqi Premier League players (centers) in volleyball, who numbered (50) players for the sports season (2021/2022). As for the research sample, it was chosen by the intentional method, and they are the players of the teams (Bahri - South Gas - Police - Army), which number (16) players, and they represent (32%) of the community of origin.

Sample homogeneity:

Table (1) between the values of the arithmetic means, standard deviations, and the value of the skew coefficient for a research sample

Measurements	Arithmetic mean	standard deviation	standard error	skew modulus	Variation coefficient	indication
mass (kg)	82.87	2.62	0.564	0.104	%3.173	homogeneous
Training age (year)	12.62	1.82	0.564	0.395	%14.42	homogeneous
total length (cm)	191.06	1.52	0.564	0.910	%0.795	homogeneous
Chronological age	27.54	1.76	0.564	0.376	%6.39	homogeneous

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Sample homogeneity:
Aids, tools and devices;

Medical scale (1).

1. A Japanese-made SONY video camera with a frequency of 300 images per second.
2. A Japanese-made SONY video camera with a frequency of 25 frames per second.
3. A Japanese-made SONY video camera connected to a computer via a USB connection to synchronize the camera with the force measurement platform.

Camera stands (2)

- ✓ Swedish-made FORCE PLATFORM platform.
- ✓ HP laptop computer.
- ✓ DVD discs, 4 pcs.
- ✓ The volleyball court is legal.
- ✓ Legal volleyballs type (MIKASA) (Vietnamese) number (4)
- ✓ Adhesive tape 5 cm wide.
- ✓ Additional interior lighting for photography.
- ✓ Scale length (meters)

Field Research Procedures:

These procedures aim to introduce all the procedures carried out by the researcher in order to prepare to collect the necessary data to answer the objectives of the research and to verify the validity of the hypotheses.
Tests and variables used in the research:
Quick Smash Test:

- ✓ Study variables
- ✓ biokinetic variables
- ✓ Approach speed:
- ✓ linear momentum
- ✓ knee joint angle:
- ✓ Shows the knee joint angle at maximum flexion
- ✓ Ankle joint angle at the time of rising:
- ✓ Highest hip joint height:
- ✓ Momentum = (mass x velocity)
- ✓ linear kinetic energy:
- ✓ Body mass starting angle:
- ✓ body velocity:
- ✓ The angular velocity of the stem at the moment of hitting the ball:
- ✓ The circumferential velocity of the arm at the moment of hitting the ball:
- ✓ elbow angle at the moment of hitting the ball:

- ✓ Angular velocity of the arm at the moment of hitting the ball:
- ✓ Ball launch speed:
- ✓ Overall performance speed
- ✓ Distance of the ball from the longitudinal axis of the player:

Exploratory experiments
First reconnaissance experience

The exploratory experiment is considered a "practical training for the researcher to identify by himself the negatives and positives that he encounters during the test in order to avoid them" (3) in order to overcome the difficulties and obstacles that the researcher may face during the implementation of the main experiment and for the purpose of identifying and testing the performance of the devices used and testing them. The exploratory experiment was conducted on Thursday corresponding to (13/1/2022 at ten in the morning in the closed sports hall, College of Physical Education and Sports Sciences, University of Thi Qar, where the test was applied to a sample of (8) players representing the athletic Euphrates, where the power platform and cameras were used. The aim of the experiment was to identify the following- :

The time period for the test
-Adequacy of the auxiliary work staff(•)

The work and efficiency of the devices and tools used
-The appropriate dimensions for placing the cameras and the clarity of photography

The most important results of the survey
The possibility of conducting tests, knowing the time they take, the suitability of the tests to the sample and the adequacy of the tests

Auxiliary work staff
The movement of the camera is clearly visible from the beginning to the end of the movement

Second exploratory experiment
A second exploratory experiment was conducted on Tuesday (18/1/2022) at eleven o'clock in the gymnasium in the College of Physical Education and Sports Sciences, University of Thi Qar, where the test was applied to a sample of (8) players representing clubs (Suq Al-Shuyoukh and Al-Nasr). The purpose of this experiment was to find the scientific parameters of the test.

The scientific basis of the test

Test validity:
The researcher found the validity coefficient by adopting the validity of the content, and the validity of the content is defined as (a test that measures what was prepared to measure) (1), so the questionnaire form annex (2) is considered to be the validity of the test content after the researcher presented it to experts and

specialists (•). The experts and specialists agreed that this test measures the quality for which it was developed, and Table (2) illustrates this.

Table No. (2) Shows the percentage of experts' opinions on the validity of the test

Test name	number of experts	The number of agreed opinions	percentage
Fast Smash Test	7	7	100 %

Test stability

The static test means "the test that gives close results or the same results if it is re-applied more than once and in the same conditions" (2). The researcher extracted the stability coefficient by applying the test and reapplying it in two different days on a sample of (8) players representing the clubs of Souq Al-Shuyoukh and Al-Nasr in volleyball. The test was applied on Tuesday (18/2/2022), and the test was re-applied to the same sample and under the same conditions on Monday (24/2/2022), and the simple correlation coefficient (Pearson) was found between the scores of the first application and the second application of the test. The value of the correlation coefficient was significant at the level of significance, which indicates the stability of the test, as shown in Table (3).

Table (3) shows the stability of the test

No	The test	Stability coefficient	Indication level
1	Fast smashing	0.932	.0000

Test objectivity:

The objective test "is the one in which there is no discrepancy between the opinions of the arbitrators if he arbitrates for the tested individual more than one judgment" (1) and the most important features of a good test is the high degree of objectivity, as the objectivity of the test is due to the extent of clarity of the instructions for the application The test, since the objectivity of the test is high if tests with specific conditions are used, and since the test used has specific and clear conditions, it is characterized by high objectivity as the results do not accept interpretation “as the test is highly objective when the test conditions are specified, because they are not affected by the assessment The arbitrators' subjectivity" (2).

Main experience

The main experiment was conducted on Thursday (3/3/2022) after the exploratory experiment ended and the devices and tools were valid. This experiment was conducted on the gymnasium at the College of Physical Education and Sports Sciences - Thi Qar University. The test was applied to the research sample, with the help of the assistant work team, with (3) attempts for each of the two types of rapid smashing hitting in front and behind the stomach. When the performance of the rapid crushing beating is in front of the equipment, and the

platform is placed in the place designated for the test, provided that it is moved according to the rhythm in which the rapid crushing beating is performed,

Statistical means

The researcher used a set of statistical methods and the data was processed through the use of the statistical program (SPSS).

Presentation, analysis and discussion of results

Presentation and analysis of the results of the differences in the values of some biokinetic properties between the smash hit in front and behind the stomach for the Iraqi Premier League players in volleyball

Table (4) shows the significant differences in the values of some biokinetic properties between the smasher in front and behind the prepared for the Iraqi Premier League players in volleyball

Variables	measuring unit	in front		behind		t	sig	indication
		S	A	S	A			
approach speed	m/s	3.7269	0.39336	3.4663	0.28649	3.460	0.002	moral
knee joint angle	min	131.4375	1.89627	123.8750	1.54380	12.371	0.000	moral
rise angle		73.1875	1.97379	67.0000	1.78885	9.291	0.000	moral
linear momentum		308.848	2.7658	287.252	3.543	9.653	0.000	moral
Highest point at the hip joint		46.6875	2.79806	41.9375	1.56924	5.923	0.000	moral
linear kinetic energy		575.117	1.765	497.634	1.762	12.875	0.000	moral
Angle of departure for the center of mass of the body		59.6250	3.94757	54.1875	3.16689	4.298	0.000	moral
body velocity		2.7175	0.05348	2.3131	0.09617	14.699	0.000	moral
The angular velocity of the stem at the moment the ball is hit		197.9375	4.69707	185.2500	3.10913	9.010	0.000	moral
The circumferential velocity of the arm at the moment of hitting the ball		15.6250	1.07659	13.3931	1.37458	5.113	0.000	moral
elbow angle at the time of hitting the ball		166.8750	2.12525	160.5000	4.11501	5.506	0.000	moral

It was found that there are significant differences between the two types of crushing beating the studied biokinetic variables and the researcher attributes these differences to the approach speed and the speed of the last step, which are among the basic variables affecting the rest of the studied variables and has a role in the player gaining vertical vehicles, the vertical speed of the body at the moment of its launch is considered one of the most important The variables that control the determination of height unless any external forces interfere in the inverse effect.

As for the variables of the linear momentum at the moment of rising and the linear kinetic energy, the researcher attributes the significant differences in the results of the values of the variable of the linear momentum at the moment of rise and the kinetic energy to the different resistance exercises, which had a significant and clear effect in increasing the value of these variables for the players of the experimental group, which expresses the amount of strength the body possesses It is related to the mass of the body and its speed, as the different resistance exercises worked to increase the force produced from the lower extremities, which led to raising the player's ability to overcome the moments of resistance and thus increase the speed of his movement. The addition to the player's body during the performance of the exercises and the increase in the amount of rapid force that was appropriate to the movement of the player and the increase in the amount of his movement and kinetic energy in line with the performance of the skill of crushing serve, which requires the largest amount of strength and speed, and Omar Hossam El-Din indicates that "muscle fibers have the ability to produce great strength from During the use of resistance, the number of motor units will increase, and accordingly their ability to produce force, and thus the speed of the movement will increase for the player, which leads to an increase in the amount of movement for the player.

The researcher attributes the development in the angle of rise variable "that the higher the values of the angle of rise, the higher the values of the center of gravity of the body", as well as the effect of the speed factor that the player tries to maintain, and the coordination process between speed and angle of rise is one of the factors that are important Very, as that angle must be proportional to the horizontal speed.

The researcher believes that obtaining this result is due to the effectiveness of the different resistance exercises adopted by the researcher and the repetition of performance that it includes, as they have an effective role in preparing the correct motor paths, which increased the abilities of the players (the research sample) by imprinting on advancing the appropriate angle in the correct manner.
The process of coordination between speed and the angle of advancement is one of the factors that are very important, as that angle must be proportional to the horizontal speed in order to maintain the amount of movement gained from the approximate speed and based on the law of propulsion in the activities that require speed in its performance, such as the smashing serve. In a short period of time so that the final amount of movement is greater than the amount of the first movement and therefore the effect of the force used is greater to obtain a better result.

And the moral differences that appeared in the values of the variables of the angle of departure of the center of mass of the body and the speed of flight of the body, the researcher attributes to the development in the amount of speed that the player gained during the approaching stage, especially the last step, which is important in increasing the movement speed of the body and works to achieve an appropriate speed in the starting stage The body needs to quickly reach a suitable point to hit the ball faster than it is in the pre-test, and this requires a good flight speed, as the starting speed is one of the most important variables that control the determination of the height, unless any external force interferes with the opposite effect.

And (Ahmed Abdel-Amir Shuber 2008) states, “There is a direct correlation between the vertical height of the hip with each of the angle and starting speed of the body, as the player tries to increase the speed of his launch by increasing the angle of flight of the body with the horizontal ratio, as the greater the starting angle of the body, "The hip contributes to improving the kinematic transmission with high accuracy and smoothness of the movements leading in the air, and then increasing the force produced to achieve the acquired speed of the ball".

As for the significant differences in the values of the variable maximum height of the center of body mass, the researcher attributes them to the different resistance exercises, as they had a great role in helping the players to master the correct transition between the moments of pivot and thrust, ensuring a kinetic path for the center of body mass in these two moments, and the higher the height of the center of body mass Whenever there is an opportunity for the player to send the ball quickly and with high accuracy and at a sharp angle into the opposing team's square.

In order to achieve the maximum height of the center of mass of the body, the player must direct all the outputs of the thrust in the vertical direction without the appearance of an angle of inclination between the line of action of the force and the place of impact (the center of mass of the body), and the laws that govern the movement of the center of mass of any body are the same laws that govern the human body In a launch to achieve the maximum possible height, the vertical velocity of the body at the moment of launch is considered one of the most important variables that control the determination of the height unless any external force interferes in the opposite effect.

The player must obtain the highest height of his center of gravity according to the nature of the performance on the one hand and the height of the ball on the other hand, and this depends on the link between the approach steps and the process of advancing at the highest possible speed that contributes to placing the player’s center of mass at the highest possible point and at an appropriate angle of flight, as it expresses Economy of effort within a short period of time, and this is one of the advantages of the explosive force because the direction of the force is towards the vertical vehicle.

The researcher attributes the development in the circumferential velocity variable of the arm at the moment of hitting the ball to the effect of the different resistance exercises prepared by the researcher, which worked to increase the speed of the

muscular contractions of the arms and the nature of the differential resistance exercises, especially the medical ball exercises and TRX exercises, which worked to develop the length of the arm when hitting In which the movement begins at this variable to achieve an increase in the peripheral velocity of the hitting arm due to an increase in the radius, through the mechanical principle that says, "The higher the speed of the striking arm at the moment of striking, the greater the speed of the ball after the collision, and thus the speed of the ball's rebound by increasing the length of the striking arm".

The researcher attributes the development in the values of the elbow angle variables at the moment of hitting the ball and the angular velocity of the arm at the moment of hitting the ball to the different resistance exercises that work to develop the strength of the arms, such as the medical ball exercises and TRX exercises. The technical performance of this stage, which emphasizes the tensioned arc, which in turn reduces the moment of inertia, as we indicated to obtain an increase in the angular velocity and circumferential velocity of the striking arm, as the relationship between the average angular and circumferential velocity of the striking arm is directly proportional to each other and is affected by the difference in the radius of rotation and the relationship It is inverse with the angular velocity and direct with the circumferential velocity, so the player must take advantage of these relations to obtain the highest angular velocity and thus the highest circumferential velocity so that the player benefits from it in the strength and speed of sending the ball as the player works to reduce the turning radius of the striking arm by reducing the elbow joint angle.

The researcher attributes the development in the values of the ball launch speed variable to the different resistance exercises that worked to develop the values of some biomechanical variables, which resulted in obtaining an appropriate starting angle for the ball, high striking force and a great height for the sending player to be able to hit the ball from the top in order to achieve great speed when performing a skill Crusher transmitter.

The researcher believes that the reason for the increase in the ball's starting speed is due to the amount of force that the player gained at the beginning of the preparatory section, which is important in increasing the kinetic speed of the body that works to achieve an appropriate speed during the main section at the moment the ball meets the striking arm as a result of converting the potential energy into Kinetic energy in the main part of the movement, which is what generated that speed and thus its transmission to the tool (the ball). On this basis, the force gained in the preparatory section is of great importance in increasing the kinetic speed to achieve the main goal of the movement, which is the speed and accuracy of the ball.

As for the variable of the speed of the total performance, the researcher attributes the significant differences that appeared in the results of this variable between the two groups in the post tests to the different resistance exercises and their great role in developing the efficiency of the working muscles of the lower extremities in producing strength and overcoming the external force that hinders movement, in addition to that The development in the values of the previous variables had a positive impact on the improvement of the overall performance speed values, and

the researcher emphasized on the members of the experimental group that the exercises intended to develop momentum should be performed at the highest speed (in the least possible time), and this stimulates the nervous system to perform fast, and Abu El-Ela mentions Ahmed to train.

Conclusions and recommendations

1- There were significant statistically significant differences in the values of some biomechanical variables between the two types of fast crushing beating in front and behind the stomach and in favor of the quick crushing beating in front of the stomach
2- The differences in the values of some biomechanical variables result from the increase in the approach speed when performing the rapid crushing beating behind the stomach, which in turn affected the other biomechanical variables.

Recommendations

The need for those in charge of training operations to pay attention to the mechanical principles and foundations so that they can benefit from them in discovering the best ways to reach the ideal performance.

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