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The Effect of Using Weightlifting Exercises on Some Biomechanical Variables and the Level of Technical Performance of Shooting by Jumping in Basketball

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Abstract--- *The objective of this study was to prepare exercises with weights for the development of some biomechanical variables for the individuals of the research sample, and also to identify the effect of exercises for weights in the research variables of the research, as the researcher used the experimental approach to its suitability to solve the research problem, as the design of the one group with pre and posttests was chosen, and the research sample formed One of the basketball players for Al-Wahda Sports Club, with (5) players out of (15) who represent the only experimental group in researching and using the appropriate tools and devices. The exploratory experiment was conducted and then the pre tests were conducted for the group. After that, we have applied the exercises of weightlifters, then conducting post-tests for them, then emptying and statistically processing the data, displaying, analyzing and discussing them. The researcher reached several conclusions, which are:*

1. The exercises with weightlifting prepared by the researcher after their application positively affected the development of some biomechanical variables among the individuals of the experimental research sample.

2. That the gradient and diversity in the training load of weight training exercises prepared by the researcher had a positive effect in developing some biomechanical variables among the individuals of the experimental research sample.

Keywords--- *Weightlifting Exercises, Biomechanical Variables and Technical Performance.*

I. INTRODUCTION

The natural variables of the basketball game, the quality of the players, and the diversity of technical methods in attack and defense methods necessitated the coaches to increase the interest in preparing the players in an integrated number of biomechanical and skill levels to reach them to the high level of achievement by working to increase the trend to specialization in training and focus on special exercises through which He can develop some special biomechanical variables by which the level of technical performance in basketball is increased and mastery, as well as interest and focus in exercises that are important training elements and one of the main pillars of One of the important reasons for the development of the basketball game in the last era of time and according to the opinion of the specialist is that the Celtic teams possess physical and skill qualities at a high level, which gives the game a feature of speed and excitement through the performance of the most difficult skill assignments in games and this leads to the pleasure of performance and viewing in At the same time,[1] as training with barriers is one of the

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effective training methods that leads to the development of various biomechanical aspects, which leads to the development of the skill level of the athlete.

The basketball game is one of the games that is characterized by a rapid development in terms of biomechanical, skill and planning, and winning is by scoring the largest number of points that come through hitting the goal, so the researcher noted that he is a follower of the basketball game and is familiarized with many training curricula and many Previous research and studies and taking the opinion of experts and specialists in the field of training science and biomechanics. There was a lack of interest among many trainers in the use of some training methods such as training of heavyweights despite their training benefits, in addition to neglecting the biomechanical aspects in the training process. It is necessary, therefore, that the researcher considered preparing exercises using the weights to develop some biomechanical variables for basketball players and achieving the best achievements.[2]

Hence the importance of research was demonstrated through the preparation of special exercises using heavyweights and securing them to the arms and legs tightly during the performance. Their purpose is to develop some biomechanical variables and the level of technical performance of the shooting skill in the basketball game, which makes the training process within their awareness and make this information in the interaction of their hands to reach To perfect technical performance.

Research Objectives

1. Preparing exercises with barriers in developing some biomechanical variables for the members of the research sample.
2. Identify the effect of exercises with weightlifting on the development of some biomechanical variables among the members of the research sample.

Research Hypotheses

1. There were significant differences between the pre and posttests of the experimental group and in favor of the post test.

Research Fields

- The human field: Basketball players for Al-Wahda Sports Club, with (5) players
- Temporal field: for the period from (1/7/2019) to (1/11/2019).
- Spatial field: Basketball in the Al-Wahda Sports Club.

II. RESEARCH METHODOLOGY AND FIELD PROCEDURES

Research Methodology

The researchers used the experimental approach to its suitability to solve the research problem, and the design of a single group with pre and posttests was chosen.

The Research Sample

The sample included the players of the Al-Wahda Sports Club team in basketball, who were chosen intentionally, and the number of members of the research sample reached (5) out of (15) players who represent the

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only experimental group in the research, thus the percentage of the sample formed (33.333%) of the original community. By this kind of choice.

III. The Means, Devices And Tools Used In The Research

Means of Collecting Information

(Arab and foreign sources, similar studies, tests and measurement, software and applications used in computers, software and applications used in computers, information network (Internet), personal interviews, observation and experimentation, data registration form, auxiliary field work team).

Tools and Devices Used in the Research

(Basketball court, electronic calculator, type (1), advanced video camera (Sony), speed (120 images / second), German-made, number (1), for the purpose of filming the experiment in the field, a computer, a holder for carrying cameras, number (2) Functional tapes and adhesive tapes, numbered balls to record successful attempts measuring (20 x 30) cm, whistle number (2), leather tape measure (20) meters, number (8) cones, chair number (3), electronic stopwatch number (2). 1), medical scale for measuring weight (German-made).

Determination of Biomechanical Variables

In order to define the research variables and their tests, the researcher conducted the survey process for many Arab and foreign scientific references, in addition to the opinions of the scientific committee and personal interviews with the masters of expertise and specialization in many fields such as sports training science and the physiology of sports training and physics, so biomechanical variables and their tests were chosen and determined by the supervisor The researcher is as follows:[3]

- Forearm angle in prep position to jump.
- Forearm angular velocity.
- Angle of the trunk in the prep position to shoot.
- Trunk angular velocity.
- Angle of the knee in the preparatory position for shooting by jumping.
- Knee angular velocity.
- The highest height of the hip while shooting.
- Ball starting angle.
- Ball launch speed.
- The height of the ball the moment of departure.

IV. Research Tests

Biomechanical Tests

The researchers used a Japanese-made video camera (sony) with a speed of (120 p / s) for the purpose of photographing the sample in the main experiment, as the camera was placed at a distance of (4.65 m) and a height of

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(1.32 m) and these distances were set to place the camera under supervision A cadre specialized in photography,[4] through which mechanical variables were extracted.

1. The forearm angle in the preparatory position for correction by jumping: the angle between the line of the humerus (from the point of the shoulder joint to the point of the elbow joint) with the forearm line (from the point of the elbow joint to the point of the wrist joint) from the moment the player enters the pre-position to aim with three points and descend the hip The player is to the closest point from the ground as in Figure (1A).
2. The angular velocity of the forearm: It is the amount of angular transmission of a specific segment divided by the transition time. The researcher extracted the angular velocity of the wrist joint point by measuring the transition angle of the wrist joint (depending on the rotation axis which is the elbow joint) for the preparatory position to aim at three points from the moment of the maximum height of the ball over the head to the moment the ball starts from the player's hand divided by that angle by the transition time for this The angle is as shown in Figure (1B).

Figure 1: Shows the Angle of the Forearm (Fig.1A) and Angular Velocity (Fig.1B) In the Preparatory Position for Shooting by Jumping

3. The angle of the trunk in the preparatory position for correction by jumping: It is the angle between the line of the trunk (from the point of the shoulder joint to the point of the hip joint) with the horizontal line passing through the point of the hip joint of the player shooting to aim at three points as in the figure(2A).
4. The angular velocity of the trunk: It is the amount of angular travel of a specific part divided by the time of transmission. The researcher extracted the angular velocity of the point of the shoulder joint by measuring the transition angle of the shoulder joint (depending on the axis of rotation, which is the hip joint) from the moment of the maximum bending to the moment of straightening the body during the correction by three points, dividing that angle by the transition time of this angle as in Figure (2B).

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Figure 2: Shows the Angle of the Trunk (Fig.2A) and Angular Velocity (Fig.2B) in the Preparatory Position for Shooting by Jumping

5. Knee angle in the preparatory position for shooting correction: the angle between the leg line (from the point of the ankle joint to the point of the knee joint) with the thigh line (from the point of the knee joint to the point of the hip joint), was determined after the first bending by the player to perform the throw With three points to the moment of straightness of the leg, the researcher worked to track the angle of the knee until it reached the maximum curvature and to and considered it the second position which I adopted in the analysis as in the figure(3A).
6. The angular velocity of the knee: It is the amount of angular transmission of a specific part divided by the transition time, and the researcher has used the angular velocity of the knee joint point by measuring the transition angle of the ankle joint for the triple shooting, (depending on the rotation axis which is the knee joint) from the moment of the maximum curve to The moment of straightening the body divided by that angle by the transition time of this angle, as shown in Figure (3B).

Figure 3: Shows the Angle of the Knee (Fig.3A) and Angular Velocity (Fig.3B) in the Preparatory Position for Shooting by Jumping

7. Highest hip height during shooting: the vertical distance between the ankle joint point (the player in the last touch of the ball) with the horizontal line of the floor as shown in the figure(4).

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Figure 4: Shows the Highest Height of the Hip While Shooting

8. The starting angle of the ball: It is the angle between the line connecting from the center of the ball the moment of the last touch to the first transition of the ball from the hand with the horizontal line passing through the center of the ball to the last point of touch as in the figure(5).

Figure 5: Shows the Starting Angle of the Ball

9. The speed of the ball's launch: It was extracted by dividing the first transition distance of the ball by the time of this transition for triple shooting, as shown in Figure(6).

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Figure 6: Shows the Ball's Launch Speed

10. The height of the ball at the moment of departure: the vertical distance between the center of the ball and its maximum height in the case of a three-pitch with the horizontal line of the ground, a situation in which the player works to move the ball over the level of the head and in which the elbow angle is at its maximum flexion i.e. before embarking The process of pushing the ball towards the basket, as shown in Figure(7).

Figure 7: Shows the Height of the Ball the Moment of the Launch

A Benchmarking Test for Shooting from Three-Point Jump.[5]

The purpose of the test: to measure the level of performance for a target of three points.

Basketball court, legal basketball balls (3), leather tape measure (2), adhesive tape, electronic stopwatch, two chairs, and whistle.

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Procedures: The starting point is set in front of the arc of the central circle in the middle of the stadium, in which the laboratory leading player stands for shooting and is (7) m from the side line, and a distance of (11) m from the final line, then a central point is set at the bottom of the basket that depends on marking some ? The main points, and determines the location of the first area on the side (right) of the goal is 7 meters from the center of the point below the basket and away from the side line of the stadium (3.80) meters. It represents the position of the shooting player and in front of him a defender player is located (1) meters represents the position of the defender player The imaginary line between the shooting player and the basket, then determines the location of the second area on the right side of the goal and is 1 meter from the side line of the stadium and a distance of 2 meters from the final line of the stadium, which represents the stance of the player handled as in the form (3-36).

Performance description: The handled player stands on the first left side point pointing to the ground, and at the same time carries the ball with him and at the start signal the ball is delivered by chest handling from the handing player to the laboratory player who performs the correction by jumping (three points) directly as the player performs The laboratory has three attempts.

Test conditions: speed in performance, and assisting the laboratory player (alert) to perform attempts from its specified location by a member of the working team standing on the front point by delivering (3) balls each ball separately according to the performance description.

Test administration:

Timer: It gives the starting signal as well as calculating the time taken to perform for each attempt and individually for each correction from the moment of receipt to the moment the ball leaves the hand of the player and if there are certain speed cameras can be replaced. The work of the timer, which is more accurate in calculating time.

The registrar: Calls the names first and marks both successful and failed attempts, and time second.

Score calculation: Calculates the time since receipt. The player testing the ball until the end of the attempt after the ball leaves the player's hands.

Degree: the division of the outcome of the attempted accuracy over its time.

- (4) degree for the ball directly in the basket.
- (3) degree of the ball entering by touching the throat.
- (2) of the entering ball by touching the board.
- Degree when it touches the throat or plate and does not enter the basket.
- Zero except that.

Pilot Study

The researchers conducted the pilot study on Saturday, 6/7/2019, on a sample consisting of (10) players, who are the same sample. The purpose of the exploratory experiment was:

- Knowing the suitability of the tests for the sample level.
- Bypass errors that occur when performing the test.

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- Organizing the work and procedures of the educational unit, represented by its timing and all its departments.
- Knowledge of the efficiency of the team.
- Make sure the place is suitable for carrying out the tests as well as the suitability of the tools and devices used.
- Know how to measure and record data.

V. FIELD RESEARCH PROCEDURES

Pre Tests

The researcher conducted the pretests on Thursday, 11/11/2019 at the basketball court of Al-Wahda Sports Club, and the researcher was keen to establish the special conditions for the tests in terms of (time, place and climate) so that they can create similar or similar conditions when conducting post-tests.

Weight Training Exercises

After the researcher was briefed on many Arab and foreign scientific sources and similar studies available in the field of sports training science and the physiology of sports training and basketball as well as personal interviews with some experts, as the researcher designed exercises for heavyweights supplement (1) taking into consideration the relative weights of body parts According to the Fisher Law, weights were designed according to this equation, in which the researcher took into account matters related to the training unit according to its divisions, as well as the available devices and tools, and weights and foam Rolling exercises were implemented for the period (7/13/2019) Until (10/12/2019).[6]

The application of weight training exercises took (12) twelve weeks, at a rate of (3) three training units per week, and the time taken for weight training exercises (30) minutes from the time of the main section of the team's training unit, which is (70) minutes out of (90) minutes for the full training unit As for the experimental group, as (Saturday - Monday - Wednesday) were training days, and thus the total of training units reached (36) thirty-six training units, and this is consistent with the opinion "that the number of units per week is between (2 - 3) Training units, and the number of weeks is not less than (6) weeks in order for the development to appear ".[7]

Post-test

The post-exams were conducted on Saturday, 5/10/2019 in the basketball stadium of Al-Wahda Sports Club, after completing the application of weightlifting exercises, and the researcher was keen to create the same conditions in terms of (time, place and climate) that were applied in the pretests.

Statistical Means

The researcher used the statistical means appropriate to the subject of the research and was in accordance with the statistical bag system (SPSS).

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VI. RESULTS AND DISCUSSIONS

Table 1: Shows the values of the mean, the standard deviations, the mean of the mean, the deviations, the standard error, the calculated value of (t), the error rate, and the pre and posttest tests of the biomechanical variables of the experimental group

S	Variables	Units	Test	Mean	SD	Mean diff.	SD diff.	(t) value	Sig.
1	Right shooting	Degree/Sec.	Pre	2.38	2.33	-0.15	.34	1.00	0.376
			Post	2.53	2.28				
2	Angle of the trunk	Degree	Pre	75.60	7.02	1.80	3.35	1.20	0.295
			Post	73.80	8.79				
3	Trunk angular velocity	Degree/Sec.	Pre	125.67	2.33	-2.47	1.24	4.45	0.011
			Post	128.14	3.39				
4	The highest height of the hip	Meter	Pre	0.26	0.05	-0.03	0.01	13.88	0.000
			Post	0.29	0.06				
5	Ball starting angle	Degree	Pre	48.20	3.77	-1.00	4.74	0.47	0.662
			Post	49.20	1.48				
6	Speed of the starting ball	Meter/Sec.	Pre	7.29	0.60	.12	1.11	0.24	0.824
			Post	7.17	0.56				
7	Forearm angle	Degree	Pre	62.60	11.08	1.60	4.51	0.79	0.472
			Post	61.00	7.97				
8	Forearm angular velocity	Degree/Sec.	Pre	363.35	85.07	-19.02	117.81	0.36	0.736
			Post	382.37	188.89				
9	Rising the ball the moment of launch	Meter	Pre	2.28	0.08	-0.06	0.03	4.63	0.010
			Post	2.34	0.06				
10	Knee angle	Degree	Pre	121.40	13.20	16.80	14.25	2.64	0.058
			Post	104.60	4.93				
11	Knee angular velocity	Degree/Sec.	Pre	294.61	11.87	-17.46	10.06	3.88	0.018
			Post	312.08	15.03				

It is clear from Table (1) that there are four variables whose results showed significant differences, which are (the angular velocity of the trunk, the highest hip height, the height of the ball at the moment of its departure, and the angular velocity of the knee) and in favor of the post test, and this shows the effect of the use of weights on the sample.

While there was an evolution rate in the values of computational media between the pre and posttests of some biomechanical variables, but the statistical treatments did not show significant differences for the same variables as, there is an improvement in the level of performance that reached (6.30%) and at the angle of the trunk there is a decrease of (2.43%) and the development of both variables of the angular velocity of the trunk by (1.96%) and the highest hip height by (11.35%) and the starting angle of the ball increased by (2.07%) and decreased Both the starting velocity of the ball by (1.67%) and the forearm angle by (2.62%), and the angular velocity of the forearm increased by (5.23%), the height of the ball at the starting time by (2.63%), the knee angle by (16.06%) and finally the angular velocity of the knee By (5.929).

Through Table (1), it appears that the results proved the significance of the differences for the experimental group. The reason is that the use of these weights at different times alternates between parts of the body and completely, so the development of the speed of the trunk as the largest mass in the athlete's body gives priority to jumping, especially in the movements that take the vertical path. The vertical jumping movements are determined

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first by the speed of the movement of the trunk,[8] and the work of the legs will complement this movement and exert the maximum force to reach the highest height. There is also a scientific fact that the direction of the movement of the body during the jump and departure and its path is determined by the direction of the force in the trunk. As for the other parts, their goal is to balance the body towards the goal of movement or to take positions commensurate with the goal of skill ".[9]

The researcher believes that the use of heavyweights in parts of the man and the hand has affected the development of their strength and the trunk as well, and as a result the evolution of their angular velocity. During the training units of their physical, motor, and skill types, the player adapts to loads that increase his ability to bear the burdens of the game and resist fatigue so that performance continues with high efficiency for the longest possible period, as heavyweights are not limited to strength only. Cases of correction by jumping to (3Point 3 points) during the game that there are different physical factors and capabilities that affect the effectiveness of shooting when they are not very efficient as a result of deficiencies in their training, which must suit performance and high pressure, especially cases of fatigue in the core muscles ".[10]

And that speed and strength are among the basic elements of good and successful performance during play and this is achieved by the heavyweights in the sample. The increase in speed is an evolution of strength, because the basketball game contains speed and strength due to competition with the opponent in the playing field, providing both elements when the player gives him an advantage over the opponent in attack movements The defense and the performance of skills, when shooting the player falls under the influence of the defense to prevent him from putting the ball in the basket and the effect of this is clear and the preference for the defender is to prevent the attacker when his movement is slower and the ability to rise is weaker, therefore the movement speed and the ability to rise up operate with a greater level of defender Li attributed the striker to give high success in the correction, "that increases in muscle strength will improve performance and usually attributed to increased muscular coordination and neural activation and improvements in motor performance skills that are associated with vertical jumps and speed of movement".[11]

The researchers believes that any development in the strength of a group that is trained on that means that either there will be a deficiency in the level of strength due to failure to train the players appropriately or failure to use modern and auxiliary methods in training them for their development and that was one of the main goals of the study, which is developing strength by finding ways to help In addition to this preference lies its importance as we mentioned earlier that it is associated with the skillful performance of the players, as he "The significant improvement in the ability to jump and the strength of body parts as a result of strength training is evident due to the lack of specific exercises to improve the performance of jumping When players during units Taxation ".[12]

The method of using heavyweights associated with skill performance has positive effects on athletic strength, in other words it leads to increased levels of jumping and performance during shooting, and in fact it is better to match the resistance training with performance to take full advantage of the neuromuscular adaptations developed in training in proportion to the performance requirements, Because that gives more effect when there is a mixture of both ".[13]

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VII. CONCLUSION

1. The exercises of heavyweights prepared by the researcher after their application had a positive effect on the development of some of the individuals in the experimental sample.
2. That the gradient in the training load and the diversity in the exercises of heavyweights prepared by the researcher had a positive effect in the development of some biomechanical variables among the individuals of the experimental research sample.
3. Weightlifting exercises have a major role in the development of the technical performance level for correction by jumping basketball among members of the experimental research sample.

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