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BIOMECHANICAL ANALYSIS AND ELECTRICAL ACTIVITY OF THE MUSCLES OF THE LEGS AND ARMS FOR THE SKILL OF PEACEFUL SHOOTING IN BASKETBALL

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Abstract

The research aims to biomechanical analysis and the electrical activity of the working muscles during the exercises of the arms and legs during the moments that can determine the quality of the performance of the peaceful scoring steps in basketball. Reaching the maximum strength and imaging using (Sony) cameras at a speed of 400 images / sec. Biomechanical imaging was done using the (Kenova) program for kinetic analysis to extract biomechanical variables for the center of gravity of the body. Vertical strength, stability of the torso, angles of the joints of the upper and lower extremities in terms of the crown, horizontal and vertical force, the moment of the push, and the angle of the elbow joint. The results of this research can be used in selecting exercises to be used. In developing the maximum speed for accuracy of training in the stages of peaceful scoring technique in basketball.

Keywords: biomechanical analysis, electrical activity, peaceful scoring skill in basketball.

Chapter one

1- Introduction and the importance of research:

The game of basketball, especially the skill of peaceful scoring, is considered one of the critical offensive skills for the results of the matches that cannot be divided during the performance, but it can be trained according to certain stages, as it requires high technical capabilities and compatibility in addition to the physical capabilities.

The specificity of training for the skill of peaceful scoring in basketball, which is determined by the level of vital energy and biomechanical indicators. This is done through the link between training and technical performance to reach the highest levels as a basis for training programs which positively affect the transfer of the impact of training and thus affect the development of biomechanical effectiveness assigning indicators of the effectiveness of Achieving skillful performance The idea of setting biomechanical indicators and criteria for evaluating the effectiveness of jazz or achieving skillful performance is summarized in comparing the achieved sports result. Peaceful basketball through exercises for the three steps and the kinetic compatibility of the feet with the movement of the arms during the motor transfer. The preparation for the ascent stage and then the scoring leads to the activation of the working muscle groups during the skillful performance to avoid mistakes and adjust the biomechanical variables to achieve the achievement. The electrical activity of the muscles is used to know the electrical activity of the working muscles during Performance through the existence of some variables through which we can know the applied effort arising from the working muscles, and through them we can determine the kinetic paths of performance and overcome the mistakes that we face during the performance.

1-2. Research problem:

Through the researcher's follow-up to the Premier League matches in basketball, he noticed a weakness in the level of skillful performance of the skill of peaceful scoring, as this skill is considered decisive in the results of the matches, so the researcher decided to know the weaknesses in training this skill through the use of biomechanical analysis of the three steps of the skill of peaceful scoring and measuring electrical activity For working muscles during performance to find out where the imbalance lies in the amount of muscle contraction or in applying the three-step exercises (technique)

1-3. Research objective:

- Identify the biomechanical variables and the electrical activity of the muscles working for the skill of peaceful scoring in basketball.

1-4. Imposing the search:

- Identifying some biomechanical variables and the electrical activity of working muscles for the skill of peaceful scoring in basketball.

1-5. areas of research:

1-5-1 The human field: Al-Quwa Al-Jawiya Youth Basketball Club for the season 2021-2022

1-5-2 Spatial field: the indoor hall of Al-Quwa Al-Jawiya Club

1-5-3 Time range: The research was conducted from the period (15 /12/2021) to (18/8/2022)

Chapter II

2- Research methodology and procedures:

2-1. Research Methodology:

The researcher used the descriptive approach in the manner of survey studies due to its relevance to the nature of the research.

2-2. Research Sample:

The research sample was chosen by the intentional method from the Al-Quwa Al-Jawiya Youth Basketball Club for the year 2021-2022, and their number was (10), then they were distributed as follows: (2) players for the exploratory experiment, and (5) players for the main experiment, and (3) players were excluded for non-compliance with the measurements. The number attempts was (5) for each player, and the best two attempts were chosen for the study according to the evaluation of the arbitrators and the motor analysis, and thus the basic research sample became ten (10) attempts.

Table (1). Statistical characterization of the research sample of Al-Quwa Al-Jawiya Youth Basketball Club players

Variables	Arithmetic mean	Standard deviation	Torsion coefficient	Flattening coefficient
the weight	85	5.3	0.02	0.00
height	186.3	1.79	1.69	0.00
training age	10	1.72	1.47	0.00

Table (1) shows that the statistical significances of the variables and the statistical description of the research sample are moderate, not dispersed, and characterized by the normal distribution of the sample, as the torsion coefficient ranged from (0.02 to 1.69), which confirms the moderateness of the data.

2-3. Tools used in the research:

2-3-1. Imaging and motion analysis tools:

1. A medical scale for measuring weight

2. A device for measuring length
3. (4) Sony cameras (at a speed of 400 images / sec)
4. Camera tripod (4)
5. Synchronization box between all devices
6. Scale drawing
7. Phosphorescent adhesive to show joint points during kinetic analysis
8. Guidelines to determine the range of movement
9. Tape measure
10. (Kenova) program for kinetic analysis

2-3-2. Devices and tools for measuring the electrical activity of working muscles:

1. Electromyograph (Mayota) device (EMG) for measuring the electrical activity of muscles with four electrodes. The device operates (Wireless) through a program installed on the computer
2. Electrodes (kit) (20) for the (EMG) device
3. Alcohol, cotton, razors, one bag containing (10 blades), (2) medical adhesive tape

2-3-3. Tools and devices for measuring force (force measuring platform):

- Force Measuring Platform (190-FORCE PLATE)

2-4. Biomechanical variables:

1. The angle of the knee joint of the pivot foot
2. The angle of the wrist joint of the pivot foot
3. Scoring arm attachment angle
4. The angle of the shoulder joint of the scoring arm
5. High center of gravity
6. Time
7. Torso angle
8. Vertical force
9. Horizontal force
10. The net force

2-5. Muscles working and used in electromuscular activity:

1. Quadriceps femoris anterior
2. Posterior biceps femoris
3. The anterior biceps brachii muscle
4. Posterior triceps muscle

2-6. Tests used in the research:

2-6-1. The peaceful shooting test:

- ✓ The aim of the test: measuring the accuracy of the peaceful shooting skill.

Necessary tools:

- ✓ Legal basketballs number (10).

✓ sign.

ϖ Performance description:

The player stands on the arc of the circle of the free-throw area, then starts to take the ball placed on the palm of the test operator (the laboratory), performs the peaceful shooting, then returns to perform the second shot after turning from behind the sign placed on the arc of the circle, and so on, the performance continues for ten attempts.

➢ **Registration counts the number of successful attempts**

2-7. Exploratory Experience:

The exploratory experiment was conducted on players from outside the research sample, on Tuesday corresponding to (11/1/2022) in the closed hall of Al-Quwa Al-Jawiya Club, through which:

1. Adjusting and defining the parameters of the imaging process.
2. Determine the dimensions of the imaging cameras in terms of their distance from the players, the height of the lens from the ground, as well as the imaging angle.
3. Locate the calibration model (scale drawing).
4. Then install the first camera on a vertical tripod on the shooting field from the left side of each player, and it is (4 meters) away from the scoring area. The same applies to the second camera from the right side, a distance of (4 meters), and the height of the middle of the camera lens from the ground is (125) centimeters.
5. Ensure how the phosphorescent markers are installed on the centers of the joints of the body of the study sample, as well as their degree of clarity.
6. Wearing appropriate clothing that its color matches and the nature of the field of photography.

Then, determining the location of the calibration model, the place of performing the steps of the peaceful scoring skill in basketball, as it was filmed before and after the performance.

2-8. Procedures for Imaging and Motion Analysis (Main Experiment):

The main experiment was conducted on five (5) players, then the players were filmed with a motor analysis show on Wednesday corresponding to (19/1/2022) in the indoor hall of Al-Quwa Al-Jawiya Basketball Club at exactly five o'clock in the afternoon, and (5) attempts were made for each player, then The best two attempts for each player were chosen according to the arbitrators' evaluation and motor analysis, and thus the research sample became ten (10) attempts, and the following was done:

1. The variables that will be extracted have been identified through the used measurement devices that work simultaneously for the stages of performing the skill of peaceful scoring in basketball.
2. The player and tools were equipped by placing (4) cameras in their places and adjusting them, then the player was equipped by placing electrodes in their specific places on the muscles by shaving hair and applying alcohol before placing the electrodes on the muscles in order to ensure the quality and accuracy of the signal.
3. The anatomical points of the working joints and muscles in the body are identified, where phosphorous markers are placed on them, and the scale is placed in the correct place. And making sure that the connections and devices are valid for work by adjusting the (EMG) device and making sure that it is connected to the force measurement platform device, while making sure that the signal from the two devices is well received.
4. The player warms up for 15 minutes before taking the measurements, then makes a test attempt
5. The calibration device was filmed in the middle of the path of approaching the place of ascent (field of movement), then it was pushed away. Photographing and recording the attempts of the research sample players in the skill of peaceful scoring for the three steps. Selection of the best (2) attempts

in terms of performance level to be subjected to biomechanical analysis procedures using the (Kenova) program.

6. The stages concerned with the study were identified in the skill of peaceful scoring in basketball, which was represented in the number of three moments, which are (the moment of starting the first step - and the moment of fulcrum with the foot of the ascent in the second step - and the moment of placing the ascent and flight for scoring in the third step) on the kinetic analysis device using the program (Kenova)
7. The measurements were analyzed and the variables for analyzing the electrical activity of the muscles were extracted at a frequency of (1500 hz) and the extracted measurements were processed using the EMG program
8. Arm and leg exercises (*)

2-9. Statistical means:

The statistical bag (spss) was used to extract the search results

- Arithmetic mean
- Mediator
- standard deviation
- Torsion coefficient

Chapter III

3- Presentation and discussion of the results:

3-1. Presentation of the results of the biomechanical variables of the skill of peaceful scoring in basketball

Table (2). Biomechanical variables (the moment of starting the first step of the arms and legs exercises) for the skill of peaceful scoring in basketball

biomechanical variables	measruing unit	Arm exercises		Leg exercises	
		Exercise (1)	Exercise (2)	Exercise (3)	Exercise (4)
The angle of the knee joint of the pivot foot	degree	89.16	98.17	121.12	131.11
The angle of the wrist joint of the pivot foot	degree	75.13	81.18	97.23	80.11
High center of gravity	meter	1.12	1.78	1.89	1.54
Angle of the elbow joint scoring arm	degree	78.13	87.26	92.12	89.21
Shoulder joint angle of the scoring arm	degree	67.13	71.33	69.42	70.01
time	second	10.12	19.22	21.23	18.51
Torso angle	degree	153.11	163.13	147.14	167.31
The vertical force of the pivot foot	Newton	187.41	347.04	478.53	411.61
The horizontal force of the pivot foot	Newton	1370.01	2124.15	4211.31	5233.02
The resultant force of the pivot foot	Newton	1387.30	2131.26	4232.26	5247.03

Table (2) shows the most important biomechanical variables at the moment of starting the first step of the arms and legs exercises in the skill of peaceful scoring in basketball for the pivot leg, the scoring arm, the angles of the scoring arm, the pivot leg, and the torso.

Table (3). Biomechanical variables (the moment of fulcrum, the lifting foot in the second step) for the skill of peaceful basketball scoring

biomechanical variables	measruing unit	Arm exercises		Leg exercises	
		Exercise (1)	Exercise (2)	Exercise (3)	Exercise (4)
The angle of the knee joint of the pivot foot	degree	167.25	155.03	161.23	158.13
The angle of the wrist joint of the pivot foot	degree	78.03	95.33	102.02	97.12
High center of gravity	meter	1.22	1.31	1.37	1.24
Angle of the elbow joint scoring arm	degree	73.16	85.11	79.09	81.22
Shoulder joint angle of the scoring arm	degree	69.55	78.41	83.34	78.61
time	second	9.95	11.12	18.27	17.78
Torso angle	degree	157.06	159.76	162.13	165.82
The vertical force of the pivot foot	Newton	257.23	377.65	389.23	486.77
The horizontal force of the pivot foot	Newton	1245.45	1322.06	1257.67	1379.08
The resultant force of the pivot foot	Newton	1251.03	1332.15	1265.76	1387.15

Table (3) shows the most important biomechanical variables, the pivot moment, the lifting foot in the second step of the arms and legs exercises in the skill of peaceful scoring with basketball for the pivot leg, the scoring arm, the angles of the scoring arm, the pivot leg, and the torso.

Table (4). Biomechanical variables (the moment of lifting and flying for scoring in the third step) for the skill of peaceful scoring in basketball

biomechanical variables	measruing unit	Arm exercises		Leg exercises	
		Exercise (1)	Exercise (2)	Exercise (3)	Exercise (4)
The angle of the knee joint of the pivot foot	degree	177.13	178.11	179.01	171.22
The angle of the wrist joint of the pivot foot	degree	165.87	169.19	170.09	167.92
High center of gravity	meter	1.97	1.98	1.96	1.99
Angle of the elbow joint of the scoring arm	degree	178.05	177.96	176.55	174.23
Shoulder joint angle of the scoring arm	degree	175.64	173.56	173.11	178.29
time	second	9.04	10.13	11.57	9.95
Torso angle	degree	169.41	170.06	172.59	168.48

The vertical force of the pivot foot	Newton	1287.78	1399.13	1664.16	1544.67
The horizontal force of the pivot foot	Newton	198.86	195.45	287.12	211.77
The resultant force of the pivot foot	Newton	1293.21	1416.27	1687.70	1573.34

Table (4) shows the most important biomechanical variables, the pivot moment, the lifting foot in the second step of the arms and legs exercises in the skill of peaceful scoring with basketball for the pivot leg, the scoring arm, the angles of the scoring arm, the pivot leg, and the torso.

3-2 Presenting the results of the electrical activity values of the working muscles in the peaceful scoring skill in basketball

Table (5). The values of the electrical activity of the working muscles in the skill of scoring in basketball

Muscles working for electrical activity	Arm exercises				Leg exercises			
	Exercise (1)		Exercise (2)		Exercise (3)		Exercise (4)	
	microvolts/sec %	contribution percentage %	microvolts/sec %	contribution percentage %	microvolts/sec %	contribution percentage %	microvolts/sec %	contribution percentage %
Anterior quadriceps muscle	176.23	36.14	187.37	37.87	187.37	37.87	157.54	34.16
Posterior biceps femoris muscle	167.43	32.86	178.17	33.13	178.17	33.13	148.15	31.84
Anterior biceps muscle	100.02	19.27	102.09	15.67	102.09	15.67	105.67	17.74
Posterior triceps muscle	99.89	11.73	100.11	13.33	100.11	13.33	101.23	16.26

Table (5) shows the electrical activity of working muscles (arms and legs) for the skill of scoring peacefully in basketball

3-3. Discussing the results:

Through table (2) there are three time moments for each of the arms and legs exercises for the skill of peaceful scoring in basketball for three moments, which are (the moment of starting with the first step - and the moment of fulcrum of the ascent foot in the second step - and the moment of ascent and flight mode for scoring in the third step) and it is clear from the table (2) The first exercise for the two legs is partridge in place on one leg alternately (5 seconds), then the triple movement is made for direct targeting from several points outside the arc of the _3 points over and over again, so one of the feet is based on the ground and pushes it, and the other leads the body by placing the thigh parallel to the ground It leads to the bending of the knee joint and the instep of the foot, while the kinetic transfer is from the first step leg to the second leg, that is, moving the thigh and the knee simultaneously towards the ground for the second leg below the center of gravity, and the two legs are alternately exchanged. This exercise is similar to the first step for the peaceful scoring technique. To be on the opposite leg of the aiming hand for the purpose of balance and control during the jump and to enable the player to obtain a high elevation during the jump, due to the momentum in the movement that took place during the run for the player who preceded the shooting process. But in any case, there are players who get up on the leg similar to the target hand, although this technique does not guarantee jumping as high as possible and the balance is less as in the case of using the opposite leg, but it guarantees that the rise is up by shifting the horizontal speed by moving up. (119.2017.1)

This is confirmed by (Donaldson) that many players have a variety of three-step exercises for the skill of peaceful scoring that work to develop motor and harmonic patterns. These exercises are designed to help the player practice performing the three steps of peaceful scoring. (186.2020.11)

This is confirmed by the results of Table (2), where the maximum vertical force of the pivot foot of the partridge exercise in place on one leg alternately for a period of (5 seconds) and then the triple movement of direct targeting from several points outside the 3-point arc reached (187.41) Newtons, while the maximum horizontal force reached (1370.01) Newtons, while the total force of the support foot amounted to (1387.30) Newtons. The value of the working muscles of the two legs in the first exercise was as follows. Its value is (159.13) microvolts/second, with a contribution rate of (35.24%), followed by the biceps muscle with a value of (98.77) microvolts/second with a contribution rate of (20.28%), in which the posterior triceps muscle has a value of (87.78) microvolts/second with a contribution rate of (10.72%).) While the results of Table (2,3) indicate that the angle of the knee joint of the pivot foot reached (167.25) degrees, and that is for the moment of the pivot foot, while the height of the center of gravity reached (1.22) meters, and the angle of the wrist joint of the pivot foot reached (78.03) degrees, in The pivot moment, while the height of the center for the strong rebound push exercise of a medicine ball weighing (5 kg) coming from the colleague towards the front and the top using one arm passed and the other with the arms for a distance of (7 m) (1.78) meters, and the angle of the knee joint of the pivot foot reached (98.17) degrees and the angle of the wrist joint The pivot foot was (81.18) degrees, and the elbow joint angle of the scoring arm was (87.26) degrees, and the shoulder joint angle of the scoring arm was consistent with the study of (P. Allard), the convergence of the angles of the upper limbs with the technique of peaceful scoring in basketball in the second exercise through the biomechanical installation of the three steps in the second exercise. (139.2019.13)

The results of Table (3) indicate that the maximum horizontal force of the pivot foot for exercise (1) amounted to (1245.45) Newtons, while the maximum vertical force of the pivot foot reached (257.23) Newtons, and the resultant force of the pivot foot was (1251.03) Newtons. The direction of force in this exercise is up and forward from During the swing of the other foot, the center of gravity is shifted during the steps of the peaceful scoring compared to the first exercise, the direction of force in which is the highest only without forward movement of the center of gravity, while the results show in Table (5) that the most contributing muscle in this exercise is the anterior quadriceps muscle, with a value of (176.23).) microvolts/sec at a rate of (36.14%), followed by the posterior thigh muscle with a value of (167.43) microvolts/sec at a rate of (32.86%), followed by the anterior biceps muscle with a value of (100.02) microvolts/sec at a rate of (19.27%), followed by the triceps muscle brachialis posterior, where its value amounted to (99.89) microvolts / sec, with a rate of (11.73%). These results agree with what (Reiman) indicated that the quadriceps femoris anterior muscle and the biceps femoris posterior muscle underwent a cycle of lengthening and shortening during the last half of the ascent and flight phase. The shortening part occurs in the last 15% of the steps of the peaceful scoring just before touching the ground, and the excitation of the biceps femoris muscle increases significantly between 60 and 70% of the steps of the peaceful scoring and continues at the end of the swing immediately after the start of the muscle excitation process, after which a slow electrical muscle contraction occurs dramatically Large as the tendon lengthens and elastic energy is stored. (147.2011.16)

The results of Table (3) for exercise (2) indicate that the angle of the knee joint of the pivot foot amounted to (155.03) degrees, and the angle of the wrist joint of the pivot foot amounted to (95.33), while the angle of the attachment joint of the scoring arm amounted to (85.11) degrees, and the angle of the shoulder joint of the scoring arm was (173.56) degrees. Also, the height of the center of gravity (1.31) for that biomechanical structure, which consists of the pivot stage, where the leg pushes the ground by leaning on the joint, the wrist of the foot, the knee, the knee, and the swinging of the free leg up and forward, and that is by bending the knee joint to move the center of gravity up and forward to reach the foot at the moment of touching the ground Then the rotation takes place between the two from the leg push stage in which the pivot leg works by pushing the body and in a straight line below the center of gravity of the body and the instep of the foot here refers to the highest push after taking a distance forward and back to touch the ground again and while pushing with the pivot foot also points up and the weighted movement takes place in the form of A circle until the ground is touched again, and the swing is done in a short time with a slight height in the center of gravity by moving the scoring steps

alternately between the legs and arms. A change occurs in the amount of force mobilized by the working muscles, and thus the time period for scoring is reflected. (205.2019.17)

The results in Table (3) indicates that the maximum horizontal force of the fulcrum foot for exercise (2) amounted to (1322.06) Newtons, and the maximum vertical force of the fulcrum foot reached (377.65) Newtons, and the net force of the fulcrum foot reached (1332.15) Newtons as a result of the vertical reaction force of the ground in this The exercise is due to the load that falls on the foot of the anchor leg and the low height of the other leg, as the time reached (11.12) seconds. The working muscles in exercise (2) were as follows: the quadriceps femoris anterior muscle with a value of (176.23) microvolts/second with a contribution rate of (36.14%) and the two-headed muscle The posterior thigh amounted to (167.43) µV/sec with a contribution rate of (32.86%), then the anterior biceps muscle reached (100.02) µV/sec with a contribution rate of (19.27%), then the posterior triceps muscle amounted to (99.89) µV/sec with a contribution rate of (11.73%).).

As for exercise (3), hopping in place on one leg alternately for a period of (5 seconds), then making the triple movement for direct aiming from several points outside the arc (3) points once and again from outside it. The angle of the knee joint of the pivot foot reached (161.23) degrees, and the angle of the joint reached The wrist of the pivot foot reached (102.02) degrees, the angle of the attachment joint of the scoring arm reached (79.09) degrees, the angle of the shoulder joint of the scoring arm reached (83.34) degrees, and the angle of the torso reached (162.13) degrees at a time of (18.27) seconds, with a height of the center of gravity of (1.37) meters, while the force reached The horizontal force of the fulcrum foot is (1257.67) Newtons, and the vertical force of the fulcrum foot is (389.23) Newtons, while the net force of the fulcrum foot is (1265.76) Newtons. During the process of kinetic transfer of force, then the ground is pushed by extending the joints of the foot, the knee and the torso in conjunction with swinging the arms and then flying and straightening the body straight in the air. Flexion of the joints as the ground is pushed, in order to identify the force of the reaction of the ground and the extent of the deviation of the torso from the vertical axis of the body and its correspondence with the moment of ascent for scoring, (99.2018.2) The working muscles in exercise (3) were as follows: the quadriceps muscle of the anterior thigh with a value of (187.37) µV/sec with a contribution rate of (37.87%), the posterior biceps femoris muscle amounted to (178.17) µV/sec with a contribution rate of (33.13%), then the anterior biceps muscle reached (102.09) µV/sec with a contribution rate of (15.67%), then the triceps brachii muscle The background amounted to (100.11) microphotos / sec, with a contribution rate of (13.33%).

Where the results indicate in Table (3) for the fourth exercise (doing the triple movement once with the right leg and once with the left with the ball, then scoring from outside the arc of (3) points once and from inside the arc again and back quickly again) that the maximum horizontal force of the pivot foot for the exercise 4) It reached (1379.08) Newtons, and the maximum vertical force of the fulcrum foot reached (486.77) Newtons, and the net force of the fulcrum foot reached (1387.15) Newtons as a result of the reaction force of the vertical ground in this exercise due to the load that falls on the foot of the fulcrum and the decrease in the height of the other leg, which time reached (17.78)

The feet are spread in the reaction force of the vertical ground, although the exercise is performed with the feet, but the step alternates between the feet, and this is confirmed by Susan J. Hall. Earth's reaction force in the vertical direction. (227.2010.19)

The working muscles in Table (3) Exercise (4) were as follows: the quadriceps femoris anterior muscle amounted to (157.54) microvolts/second with a contribution rate of (34.16%), and the posterior quadriceps femoris muscle amounted to (148.15) microvolts/second with a contribution rate of (31.84%), then The anterior biceps muscle amounted to (105.67) µV/sec with a contribution rate of (17.74%), then the posterior triceps muscle amounted to (101.23) µV/sec with a contribution rate of (16.26%).

The results in Table (4) for arm exercises (2.1), respectively, indicate that the maximum horizontal force of the fulcrum foot reached (1379.08), (178.11) Newtons, and the maximum vertical force of the fulcrum foot reached (486.77), (1399.13) Newtons, and the resultant force of the fulcrum foot reached (

(1387.15), (1416.27) Newton is due to the result of the force of the reaction of the vertical ground in this exercise due to the load that falls on the foot of the pivot leg and the decrease in the height of the other leg, as the time reached (9.04), (10.13) seconds, and the angle of the knee joint of the pivot foot amounted to (177.13) , (178.11) degrees, and the angle of the wrist joint of the pivot foot reached (165.87), (169.19) degrees, and the angle of the elbow joint of the scoring arm reached (178.05), (177.96) degrees, and the angle of the shoulder joint of the scoring arm reached (175.64), (173.56) degrees, and the angle of the torso reached (169.41), (170.06) degrees, while the height of the center of gravity reached (1.97), (1.98) meters.

The results indicated in Table (4) for the arm exercises (4.3), respectively, that the maximum horizontal force of the fulcrum foot reached (287.12), (211.77) Newtons, and the maximum vertical force of the fulcrum foot reached (1664.16), (1544.67) Newtons, and the resultant force of the fulcrum foot reached ((1687.70), (1573.34) Newton is due to the result of the reaction force of the vertical ground in this exercise due to the load that falls on the foot of the pivot leg and the decrease in the height of the other leg, as the time reached (11.57), (9.95) seconds, and the angle of the knee joint of the pivot foot amounted to (179.01). , (171.22) degrees, and the angle of the wrist joint of the pivot foot reached (170.09), (167.92) degrees, and the angle of the elbow joint of the scoring arm reached (176.55), (174.23) degrees, and the angle of the shoulder joint of the scoring arm reached (173.11), (178.29) degrees, and the angle of the torso reached (172.59), (168.48) degrees, while the height of the center of gravity reached (1.96), (1.99) meters.

The high speed of the push from the lower extremities and the lack of support for a longer period, with the decrease in the degree of construction in the corners of the joints of the lower limb and the increase in the reaction force of the ground with the steps of peaceful scoring in terms of the speed of the push and directing the metatarsal of the foot at the moment of the push up in order for the body to be stabilized during the steps leads to a failure Deviation of the torso from the vertical axis except to a small degree. (P.Grimshaw) confirms to judge the role of the external resistance. Accept that the player decreases the maximum force when extending the leg. Using two models to measure the external resistance. In the first case, the measurement of the maximum isometric contraction was taken by extending the leg when the leg position Semi-fully extended, and this is consistent with daily observations. The center of gravity can be raised during training. However, if the force of the leg is recorded in the dynamic movement, such as the rise, on the contrary, in this case the maximum force is generated, and this is similar to the mechanical work of the pivot leg to the work of the hip. The greater the flexion of the knee, the greater the force. The player reaches the maximum effort, and thus changes both the size of the force and the interrelationship between the path of the three steps, and thus causes a change in the type of resistance that impedes performance, as well as leads to understanding the weight and inertia of the player's body. (169.2020.15)

Moments (the moment of starting the first step - and the moment of anchoring the ascent foot in the second step - and the moment of ascending and flying for aiming in the third step) where the pelvic and knee joints are bent, the feet and arms are slightly widened, then the joints are opened and the ground is pushed in relation to the support foot, while the free foot is in a position Creation from the knee joint and the pelvis to reach the seat. The position is parallel to the ground. The two arms, one of them advanced to the front, is the arm opposite the free leg. As a result of the flexion of the elbow joint, the torso is vertical, meaning that the lifting leg is in this position from the beginning to the end of the exercise. The exercise is performed through the moment of pushing and flying while keeping By putting the ascent leg, i.e. the support leg, after its height rate, because it carries the whole body. As for the other leg, it will be in a stable position in the form of weighted forward, despite the performance of this exercise in the ascent leg through the convergence of the moments of push and flight, and the scoring steps during the moments of triple support for the joints of the lower extremities The wrist, the knee and the pelvis) leads to the stability of the torso and the arrival of the other leg to the weighted position and the body command and the angle of the elbow joint and the arm during the change of time in those moments. (174.2012.3)

(J.Hay) confirms that the absence of resistance and stiffness in the muscles and tendons reduces the distance of the three steps in the peaceful scoring, and it will also lead to a decrease in the center of gravity of the body and reduce the resistance of the muscles and tendons of the lower limb and increase the stability of the body and the lack of resistance causes the need to generate more From the force that pushes the body up and forward, the ability to reduce the effort exerted during the scoring steps is produced, and thus is reflected in the amount of electrical muscle contraction, where the largest electrical muscle contraction is accumulated during the flight, while the knee maintains the height of the body's center of gravity, which allows the effective transfer of the momentum from the legs To the arms (the kinetic transfer of force) will lead to the rise to the highest flight distance to reach the scoring ring. (157.2010.12) This agrees with (Al-Sumaidai et al.) that the way the basketball player applies force on the ground (less ability) is more important. in a basketball player's performance from the amount of total force that is produced to physical ability). (114.2009.5) This is what (Uday Al-Mikaili) pointed out that the most active muscles for ground pushing force were the quadriceps femoris anterior muscle and the posterior quadriceps femoris muscle. (193.2010.7)

the fourth chapter

4- Conclusions and recommendations

4-1. Conclusions:

1. The first exercise, the movement of the arms during the performance of the steps of the peaceful scoring technique in basketball at the moments of pushing, ascent and flight, the stability of the torso alternately, the movement of the reverse arms of the advanced leg and the return of the other leg upwards leads to the transfer of force through the general muscles through the transmission of electrical muscle activity between the working muscles when exchanging between The three steps.
2. The second exercise, the movement of the arms during the transfer of the ball during the steps of peaceful scoring is the closest to the technique of exchanging the step in terms of some angles of the shoulder and elbow joints and the kinetic structure that consists of the fulcrum stage, where the arm carrying the ball during the scoring steps changes angles and transfers the force torque from the torso via Stretching and bending the joints with swinging and exchanging the feet up and forward in order to move the center of gravity of the body up and forward until the moment of flight.
3. The third exercise The exchange between the two legs during the steps of peaceful scoring and the transfer of force through the electrical muscular change of the biceps and triceps muscles works to develop the top level of the electrical signal during scoring by reducing the flight time during peaceful scoring with a ball, as it takes place in the form of a small range of motion that leads to convergence of angles The joint of the torso, the leg of the pivot foot, and the angle of the joint of the wrist of the lifting leg with the steps of peaceful scoring.
4. The fourth exercise, during the exchange between the movement of the two legs during the steps of peaceful scoring, leads to the maximum speed in terms of increasing the production of vertical force, stabilizing the torso, and the speed of touching the ground, where the jump is done by changing the angles of the joints of the legs to a small degree, and directing the metatarsals of the foot upwards, and the vertical force begins to increase at the expense of Horizontal to reach the farthest vertical distance

4-2. Recommendations:

1. Arm exercises work to develop the technique of scoring peacefully with a ball in terms of the motor structure, the steps of peaceful scoring, and the biomechanical specificity.
2. The arm exercises contain a motor performance through jumping or pushing up and forward, such as jumping and partridge exercises.
3. Exercises for the legs are performed with body weight without external resistance so that the angles of the joints are preserved and the speed of bending leads to a smooth performance of the exercise.

4. Putting exercises similar to performing the skill of peaceful scoring to improve performance.
5. Using other exercises on other biomechanical variables to find alternative methods during the training process.

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Appendices:

Accessory (1)

Arm exercises		Leg exercises	
Exercise (1) Handling a medical ball weighing (3 kg) by alternating between the arms for a distance of (5 m), then receiving a ball from a colleague to perform the peaceful scoring steps at a specified time from specific areas inside and outside the (3) point arc	Exercise (2) the strong rebound push of a medical ball weighing (5 kg) coming from the colleague towards the front and the top using one arm and the other with the arms for a distance of (7 m) to perform the steps of peaceful scoring	Exercise (3) Partridge in place on one leg alternately for a period of (5 seconds), then make the triple movement for direct targeting from several points outside the (3) arc, once and again from outside it	Exercise (4) making the triple movement once with the right leg and once with the left with the ball, then shooting peacefully from outside the arc of (3) points once and from inside the arc again and back quickly again