Stability of skill performance based on some muscular and biomechanical variables of free shooting for basketball female players

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Abstract

The aim of the research is to determine the stability degree of the skill performance through the relative change in the skill and mechanical characteristics of the movement. The plays condition was changed and they reached the fatigue stage as they do during the match through the free shooting shooting during 60 seconds. It is a test to measure fatigue during shooting.

A synchronization analysis for muscle and biomechanical characteristics were usedfor the best 3 players at the aiming skill and the free shooting skill in season ٢٠١٤ - ٢٠١٥. The electrodes were placed on 8 muscles, namely, (Deltoied - poterior, antherior, Triceps brachii, Bicepbrachii, Extenor of the writ, Flex carpiulnairs, Gastrocnemius- medil, Quadricepsfemoris).

Results shows significant statistical correlation between the Mean Power Frequency (MPF) index and the movement quantity index of the body weight centers during the first attempt. 45 values of values ranged between (0.751 *: 0.978 *). There was a significant statistical correlation between the Averaged EMG (AEMG) and the motor index of the body weight centers during the first attempt. 39 values with values ranged between (0.764 *: 0.997 *). Based on the results it seems that the trainers need to train their players to perform in different circumstances until their skill level is stable to overcome these conditions, so the coaches will not need to replace their tired players to perform free throw.

Keywords: performance stability, fatigue, biomechanical analysis, muscle analysis

Research problem and its importance

The determination of the stability of the skilled performance of modern methods, which influenced the scientific progress of the skillful performance of the female players in different types of sports in general and in basketball especially, which have had the most impact in winning the championships. (23:153-159) (21: 9)

The performance of the skill is a description of the

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degree of nearness and similarity of this performance with the chosen model as the most ideal or logical mathematical models or patterns based on biomechanical, physiological, and psychological considerations and concepts. The relative change in the skillful performance of the muscular and biomechanical characteristics of the movement when re-performed under variable conditions tends to be difficult as a change in the condition of the player and its link to muscular fatigue. This technique is currently used to assess the technical skills of effective performance activities (19: 37) (33: 49)

The most important evaluation procedures for technical performance cases is to identify areas of weakness and strength of the level of performance of the players through finding a means of evaluation and analysis of the diagnosis is the appointment of stages and trends to measure and evaluate the mechanism in the performance skill to reach the highest levels of sports, which helps in providing standard models as solution Ideal for motor and skill performance problems and determines the quantity and quality of errors during real competitions to develop the right ways to overcome them and address weaknesses.

Basketball is probably one of the most attractive sports in the world. Flashy scoring, mostly by slam dunks or powerful lay-ups, but also by long distance, that very often, in last seconds of a game, determine a winner, is something that attracts spectators all around the globe.

Recent studies have showed that fatigue is a very complex phenomenon that includes both psychological and many physiological factors (Astrand and Rodahl, 2003), that negatively influence cognitive abilities ,basketball passing accuracy (Lyons et al., 2006), basketball shooting accuracy (Erčulj and Supej, 2009). Physiological demands of basketball and fatigue effects of the game impose a need for constructing new field tests that evaluate basketball shooting accuracy in physiologically more demanding conditions that produce fatigue.

By the above, it is clear to researcher that although many studies and scientific research of skill in many research trends and aspects such as the biomechanical side of the performance of skill, but such studies have only dealt with the descriptive side of the biomechanical variables of the performance of skill, and to the knowledge of researcher did not like These studies

determine the degree of stability of the skillful performance of the free shooting during fatigue based on the related physical and mechanical characteristics, which may contribute in improving the level of skilled performance, which called on researcher to study the stability of performance for the free shooting in order to reach objective criteria and measurements.

Aim of the Search:

The aim of this research is to determine the stability of the skill performance by comparing some of the muscular and biomechanical parameters of the free shooting of the ball by basketball female players which can be achieved by identifying:

1- The amount of change of the muscle variables for free shooting in the case of fatigue.

2- The amount of change to the movement amount of the centers of gravity and body links for free shooting in the case of fatigue.

3- The connotations of the muscle variables and the amount of movement and its relationship to the stability of the skillful performance of free shooting in basketball.

Questions of the Search:

1- How much of the change of the muscle variables of the free shooting in the case of fatigue?

2- What is the amount of change to the movement quantify of the gravity centers and body links for free shooting in case of fatigue?

3- What are the correlations of the muscle variables and the motion amount and its relation to the stability of the skillful performance of free shooting in basketball?

Procedures of the Search:

- Research Methodology

The researcher used the descriptive approach based on the synchronization between the muscular and biomechanical analysis of its suitability to the nature of the research

The sample of the research

The team was chosen by the way to the best 3 proficient skill players shooting free shooting within the team of the University of Alexandria for the sports season 2014 - 2015 Each player has performed 3 attempts was the number of attempts 9 attempts true. The following is a description of the search sample.

Table (1)

Characterization of the research sample

Variables	Age	Weight	Longevity	Age Training
1st player	٢٠ years	٧٣ kg	١٨٠ M	١٠ years
2nd player	٢١ years	٦٣ kg	١٦٧ M	٢١ years
3rd player	٢٠ years	٦٧ kg	١٦٩ M	9 years

Fields of the Research:

A. Time domain:

The basic study was conducted on Saturday, 14/11/2015

B. Spatial domain:

Photographed was done at the basketball court at Faculty of Physical Education, and the mechanical and biomechanical analysis was carried out in the biomechanics laboratory at Faculty of Physical Education, for girls, Alexandria University.

- Data collection tools and means used in the research:

In light of the results of the theoretical readings related to the subject of research and according to its requirements, the researcher conducted the reference survey of studies and previous scientific research and after reviewing the specialized scientific references that dealt with some of the main axes were identified devices related to the subject of research as follows:

1. Equipment and instruments physical measurements.

• Rastamer device for measuring the length (in cm)

• Measuring lengths and links to each of the upper limb and lower-body bar (poison)

• A medical thermometer to measure the weight (kg)

2. Equipment and video imaging tools:

• Two (2) brand 9800 jvc camera with a high-speed frequency (60) Cadre / w and Hachach show.

• One model Panasonic DVC video tape.

• One tripod for the camera.

• Drawing measure 1.25 meters long Divided accurately to determine the scale placed in the field of motion moment of photography.

• Electrical connection.

3. Equipment and instruments painter electric muscle:

• Camera-style video CANON-HV40 EKIT

• One model DVC Panasonic video tape

• A computer for data storage and analysis.

• 16 channel to draw the electrical activity of muscles (EMG).

4. Polar hour to measure pulse (heart rate):
Measure maximum heart rate, and the length of time needed to restore healing (an average heart rate or time).

5. Tools and testing devices used muscle fatigue under discussion:

- Balls basket. - My watch stopped.
- Cones. - Tape measure.

Guideposts to locate the beginning and end of the test and performance venues skill under discussion.

- Form to record the names of the players and their numbers.

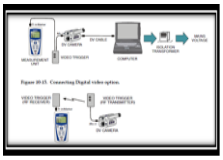
6. Synchronization process between Biomechanics analysis and painter electrical activity of muscles:

- Simultaneous recording of a number of (2) digital camera.

- online has been filming connect the camera directly via cables fire wire to a major recording and computer outside of the laboratory using a fee Wireless muscles cameras only then was loaded video files and signals fee muscle to the program of works coincided an automatic sketch with muscle signals.

8. Determine the test muscle fatigue:

This test is intended to question the arrival of the research sample to fatigue sports stage (physical) through embedded in this test of different physical exercises.



A. Video photography and computer analysis:

(1) Preparation of players for photography:

- The electrodes of the Electromyography mega wine 1600, which is three poles for each muscle, are stabilized by 8 muscles and placed on the mid-abdominal line of muscle between the tendon muscle and the nearest nerve supply area perpendicular to the length of the muscle fibers so that they are equal in position and equally distanced. Illustrated by www. seniam.org, as shown and illustrated in the following shape (Figure 1)

Figure (1) shows the placement and installation of electrode positions on the working muscles in the skill of free shooting

working Muscle								
	Deltoied-poterior	Deltoied-antherior	Triceps brachii	Bicep brachii	Extenor of the writ	Flex carpiulnairs	Gastrocnemius-medil	Quadriceps femoris

(B) Location Processing:

The cameras were installed, calibrated and adjusted in the photography location, which is vertical on the player and facing the right side. The cameras were biomechanical and muscular analysis (12 meters) and the height of the two cameras on the ground (1.40 meters) and taking into account the wide lens cameras, 1.25 m and placed in the field of imaging on the ground next to the skill area performance.

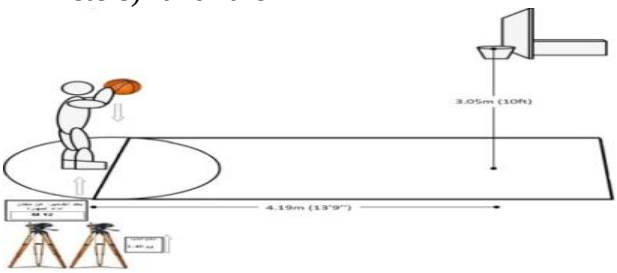
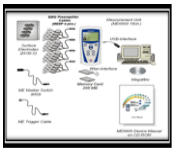


Figure (2) shows the location and distances of the cameras

(C) The accuracy of the performance of the skill Test of free shooting in the conditions of fatigue under search:

- The heart rate of the players of the study sample is recorded by a Polar clock, ranging from 90 to 100 beats per minute (b / m).
- The players are a set of warm-up exercises, which are some running, rotation and shootings of different ball exercises, The heart rate was measured by Bolar clock and it was from 115 to 120 beats per minute (b / m), in addition to recording the heart rate during the performance of the Fatigue Test as follows:



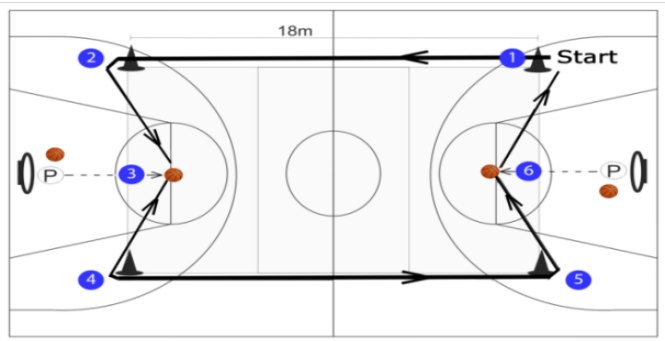


Figure (3) the accuracy of the performance of free shooting skill Test in fatigue conditions

Starting warming up and going through testing procedure. Before testing protocol, every group accomplished 10 minutes of general warm up with the ball, 7 minutes of dynamic stretching and 12 minutes of specific basketball shooting drills. The first testing session included testing of free shooting accuracy, the second included testing of field goal shooting accuracy and the third session included testing of three point shooting accuracy. All testing sessions were performed in random order. Every test was performed three times with a five-minute rest period between each trial.

Free shooting shooting during 60 seconds fatigue protocol

For easier organization of the testing we used volleyball court lines (**Figure** 3). Each player performed five series of two free throws with running between the series. Each series has to be completed in 12 seconds. A player starts the test with 18-meter sprint (volleyball court sideline), makes a turn around a cone and runs 4.6m to free shooting line. After performing two free throws he/she runs 4.6m to another cone where he/she waits for a signal to start the next series. One tester uses a stop watch to measure 12 seconds, and to give a signal to player. Other tester counts the number of made free throws. Two other players pass the balls to the tested. A stop watch, a whistle, four cones and four basketballs are needed for the testing.

Scientific Processes for the Test during Search:

Verify the validity and stability of this test on the Egyptian environment. The following scientific transactions were carried out:

First: The Differentiation Sincerity of the Test

In order to achieve this, a sample of Alexandria University players was selected from outside the sample of the basic study and represented the distinguished group of (3) players and another sample of female students of the Faculty of Physical Education for girls (basketball), with number of (3). The performance of free shooting in fatigue conditions Haris P., Vlatko S. 2014) for the two groups and the following table shows The Differentiation Sincerity of the Test during Search.

Table (2)

The Differentiation Sincerity of the Test during Search for the distinct and non-distinct group (N 1 = 3 n 2 = 3)

No	Test name	Non-distinct group		Distinct group		"U" Value	"Z" Value
		Grade Average	Grade Total	grade Average	Grade Total		
١	The accuracy of free shooting performance in fatigue conditions Test	4.50	36.00	12.50	100.00	0.00	*3.363

The Z Tabulated Value at (0.05 = 1.96)

From table (2) and using the Mann-Whitne Test to calculate the significance of the differences between two distinct and non-distinct groups, the calculated Z value is greater than the scale (Z) of the scale equal to (1.960). This means the ability of this test to distinguish between the high and the low level, which confirms the validity of differentiation, that is, it is a true test to measure the qualities for which it was developed.

Second: Test Stability

Table (3)

Transaction values between the first and second applications

No	Test name	First applications		Second applications		"R" Value
		S	A ±	S	A ±	
١	The accuracy of free shooting performance in fatigue conditions Test	7	0.681	7.6	0.686	*0.920

* The "R" tabular value level at 0.05 = 0.754

Table (3) shows that there is a statistically significant correlation between the samples of the standardization sample in the first application of the test and the second application grades at a time interval of one week. The correlation coefficient of the test during search is (0.920) which is greater than the value of (R) Stability of the test used in the search.

Presentation and Discussion of Results

Table (4)

The differences between the three attempts of muscle fatigue in the AEMG MF index for the players in the performance of free shooting performance in basketball N = 9

Muscles	Grade Average						Z		Significance Level	
	1st Try		2nd Try		3rd Try					
	MPF	AEMG	MPF	AEMG	MPF	AEMG	MPF	AEMG	MPF	AEMG
Anterior deltoid Muscle	3.00	2.00	5.33	5.00	9.67	8.00	*7.756	*7.200	*7.756	.027
Rear deltoid Muscle	2.00	3.00	5.00	4.00	8.00	8.00	*7.200	*6.600	*7.200	.042
Musculoskeletal muscle	4.33	4.00	5.00	5.33	5.67	5.67	.356	.622	.356	.733
Biceps brachial muscle	3.00	3.00	4.00	4.00	8.00	8.00	*6.600	*6.600	*6.600	.042
extensor carpi radialis Muscle	3.00	4.00	4.00	5.33	8.00	5.67	*6.600	.622	*6.600	.733
Second wrist muscle radialis	2.00	2.00	5.00	5.00	8.00	8.00	*7.200	*7.200	*7.200	.027
Gemellus muscle (medial lobe)	4.00	3.00	4.33	4.00	6.67	8.00	1.689	*6.600	1.689	.042
rectum femoralis Muscle	4.00	3.00	4.33	4.00	9.67	8.00	*6.689	*6.600	*6.689	.042
Heart Rate Average	130	130	172	172	188	188	*7.200	*7.200	*7.200	.027

Table (4) shows that there are differences between the three attempts in all muscles of the third attempt at the AEMG index, MF for the calculated Z value, and there are no differences in the three attempts in muscle fatigue of the muscles (the "twin muscle") At a significant level of 0.05

MPF: (Mean Power Frequency) MPF is the weighted average frequency, in which each frequency component is weighted by its power.

AEMG: (Averaged EMG) One average EMG value is calculated from every FFT frame

Table (5)
Differences between the three attempts to change the amount of movement of the players in the performance of free shooting in basketball

Biomechanical variable for Quantum motion	Grade Average			Z	Significance Level
	1st Try	2nd Try	3rd Try		
The amount of movement of the gravity center of the body	7.33	5.67	2.00	*6.956	.031
The amount of movement of the gravity center of lower limb	7.00	6.00	2.00	*6.600	.033
The amount of movement of the gravity center of the upper limb	7.33	5.67	2.00	*6.956	.041
The amount of movement of the gravity center of trunk	7.33	5.67	2.00	*6.956	.031
The amount of movement of the gravity center of the shoulder joint	8.00	4.33	2.67	*6.956	.031
The amount of motion of gravity center of Elbow joint	8.00	4.67	2.33	*6.489	.039
The amount of motion of the gravity center of the hand joint	2.67	2.33	1.80	1.156	.561
The amount of motion of the gravity center of the hip joint	8.00	4.33	2.67	*6.956	.032
The amount of movement of the gravity center of the knee joint	7.00	6.00	2.00	*6.600	.033
Heart Rate Average	130	172	188	*7.200	.027

The value of Z Tabulated at (0.05 = 1.96)

It is clear from Table (5) that the value of Z calculated at a significant level of 0.05 for the quantity of the movement of the differences between the three attempts in all joints of the body in favor of the first attempt, as it is evident that there are no differences in the three attempts in the amount of motion to center the weight (hand joint) Morality at 0.05

Table (6)
The association of the index of muscle fatigue MPF and the amount of movement of the centers of body links during free throwing in basketball. (N = 9)

Attempts	Name of muscles / Quantum motion	Anerior deltoid Muscle	Rear deltoid Muscle	Musculoskeletal muscle	Biceps brachial muscle	extensor carpi radialis Muscle	Second wrist muscle radialis	Gemellus muscle (medial lobe)	rectum femoralis Muscle
1st Try	The amount of movement of the gravity center of the body	-.521	-.531	-*.843	-.514	-.408	-*.868	*-.832	*-.836
	The amount of movement of the gravity center of lower	-*.907	-*.902	-.512	-*.910	-*.856	-.091	-.415	-.689
	The amount of movement of the gravity center of the upper limb	*-.860	*-.866	*-.941	*-.855	-.743	*-.763	*-.954	-.637
	The amount of movement of the gravity	-.975*	-.978*	*-.888	-.973*	*-.870	-.598	-.565	-.729
	The amount of movement of the gravity center of the shoulder joint	*-.782	*-.789	*-.936	*-.777	-.664	*-.812	*-.932	*-.863
	The amount of motion of gravity center of	-.678	-.669	-.173	-.684	-.672	-.245	*-.836	-.522
	The amount of motion of the gravity center of the hand joint	-.966*	-.969*	-*.900	-.963*	-*.858	-.623	*-.867	-.721
	The amount of motion of the gravity center of the hip	*-.751	-*.759	-*.930	-.745	-.632	-*.826	*-.822	*-.963
	The amount of movement of the gravity center of the knee joint	-.696	-.586	-*.839	-*.769	-*.873	-*.821	-*.769	-*.773
	The amount of movement of the gravity center of the body	*.800	*.802	*.945	*.836	.485	.227	.426	.374

Follow Table (6)
The association of the index of muscle fatigue MPF and the amount of movement of the centers of body links during free throwing in basketball. (N = 9)

Attempts	Name of muscles / Quantum	Anterior deltoid Muscle	Rear deltoid Muscle	Musculoskeletal muscle	Biceps brachial muscle	extensor carpi radialis Muscle	Second wrist muscle radialis	Gemellus muscle (medial lobe)	rectum femoralis Muscle
2nd Try	The amount of movement of the	.574	.586	*.907	.525	*.917	.630	.492	*.786
	The amount of movement of the gravity	*.826	*.838	.680	*.771	*.818	.692	.283	.537
	The amount of movement of the gravity	.476	.486	*.764	.425	*.755	.065	.995*	*.911
	The amount of movement of the gravity	*.955	.959*	*.929	*.939	.959*	.415	*.758	*.885
	The amount of motion of gravity center of	*.841	*.848	*.811	*.858	.624	.193	.736	.597
	The amount of motion of the gravity	*.907	*.912	*.886	*.882	*.992	.219	*.851	.962*
	The amount of motion of the gravity	.451	.462	*.785	.401	.720	.693	.986*	*.881
	The amount of movement of the gravity	*.963	*.862	*.926	*.863	*.865	.227	.426	.374
3rd Try	The amount of movement of the gravity	-*.875	-*.879	-*.828	-*.847	-.995*	-.095	-*.865	-.979*
	The amount of movement of the gravity center of lower limb	-.582	-.596	-*.799	-.545	-*.796	-*.964	-.630	*-.951
	The amount of movement of the gravity center of the upper limb	-*.794	-*.782	-.345	-*.801	-*.887	-.180	-.715	-*.861
	The amount of movement of the gravity center of trunk	-.483	-.496	*-.903	-.457	-.517	-.636	-.691	-.578

Follow Table (6)
The association of the index of muscle fatigue MPF and the amount of movement of the centers of body links during free throwing in basketball. (N = 9)

Attempts	Name of muscles / Quantum	Anterior deltoid Muscle	Rear deltoid Muscle	Musculoskeletal muscle	Biceps brachial muscle	extensor carpi radialis Muscle	Second wrist muscle radialis	Gemellus muscle (medial lobe)	rectum femoralis Muscle
	The amount of movement	-*.774	-*.775	-*.822	-.732	-*.844	*-.997	-.548	-.632
	The amount of motion of	-*.914	-*.902	-.449	-*.918	-*.983	-.195	-*.819	-*.986
	The amount of motion of	-.692	-.706	-.681	-.656	-*.875	-*.834	-.586	-*.893
	The amount of motion of	-.068	-.075	-.314	-.013	-.461	-.560	-*.822	-.693
	The amount of movement	-*.903	-*.869	-*.839	-*.839	-*.989	-*.895	-*.869	-.969*

Table (6) con.

* The value of the "R" tabular level at 0.05 = 0.754

It is clear from Table (6) that there is a statistically significant correlation between the MPF index and the kinetic movement index of the weight centers of the body joints during the performance of the free shooting skill of the three attempts. The number of correlation value statistically in the first attempt was 45, (0.751 *: 0.978 *), while the number of non-statistically significant correlation value was 27 ranging between 0.091 and 0.745. The number of correlation values statistically in the second attempt was 41 ranging from 0.755 to 0.995. The number of non-statistically significant correlation values was 31. The number of correlation values was statistically significant in the third trial. The values ranged between 0.774 and 0.995. The number of statistically significant correlation values was 32 ranging from 0.013 to 0.732. .

Table (7)
the correlation between the AEMG indicator and the amount of movement of the body joint centers during free shooting in basketball. N = 9

Attempts	Name of muscles / Quantum motion	Anterior deltoid Muscle	Rear deltoid Muscle	Musculoskeletal muscle	Biceps brachial muscle	extensor carpi radialis Muscle	Second wrist muscle radialis	Gemellus muscle (medial lobe)	rectum femoralis Muscle
1st Try	The amount of movement of the gravity center of the body	*.968	*.894	*.788	*.821	.587	.632	.579	*.928
	The amount of movement of the gravity center of lower limb	*.977	*.901	.708	*.826	.576	.637	.571	*.930
	The amount of movement of the gravity center of the upper limb	.644	*.781	.365	*.809	.029	.728	.324	*.779
	The amount of movement of the gravity center of trunk	*.977	*.912	.714	*.838	.600	.647	.569	*.909
	The amount of movement of the gravity center of the shoulder joint	*.781	.661	*.889	.362	.547	.380	*.793	.996*
	The amount of motion of gravity center of Elbow joint	.153	.160	.079	.975*	*872	.970*	.030	.121
	The amount of motion of the gravity center of the hand joint	*.909	.740	*.836	*.941	*.877	.167	*.850	*.764
	The amount of motion of the gravity center of the hip joint	*.766	.619	*.927	*.806	*.877	.230	*.881	*.931
	The amount of movement of the gravity center of the knee joint	.711	.560	*.997	*.805	.354	.130	*.965	*.894
	The amount of movement of the gravity center of the body	-*.941	-*.830	-*.998	-.511	-*.797	-.578	-.699	*-.795

Follow Table (7)
the correlation between the AEMG indicator and the amount of movement of the body joint centers during free shooting in basketball. N = 9

Attempts	Name of muscles Quantum motion	Anterior deltoid Muscle	Rear deltoid Muscle	Musculoskeletal muscle	Biceps brachial muscle	extensor carpi radialis Muscle	Second wrist muscle radialis	Gemellus muscle (medial lobe)	rectum femoralis Muscle
	The amount of movement of the gravity center of lower limb	-*.952	-*.845	-*.983	.521	-*.788	-.588	-.713	-*.792
	The amount of movement of the gravity center of the upper limb	-.589	-.551	-.416	-*.979	-.291	-*.868	-.705	-.529
	The amount of movement of the gravity center of trunk	-*.940	-*.791	-*.976	-.463	-*.824	-.572	-.653	-*.826
	The amount of movement of the gravity center of the shoulder joint	-*.824	-*.979	-*.932	-*.872	-.591	-.462	-*.974	-.486
	The amount of motion of gravity center of Elbow joint	-.228	-*.793	-.477	-.503	-.256	-*.867	*-.931	-*.760
	The amount of motion of the gravity center of the hand joint	-*.954	-.469	-.549	-.545	-.014	-.453	-.453	-.007
	The amount of motion of the gravity center of the hip joint	-*.861	-*.757	-*.789	-*.828	-.335	-.418	-*.757	-.226
	The amount of movement of the gravity center of the knee joint	-*.819	-.728	-*.798	-.735	-.260	-.344	-.700	-.119
3rd Try	The amount of movement of the gravity center of the body	-*.800	-.523	-.623	-.595	-.646	*-.830	-*.894	-.670
	The amount of movement of the gravity center of lower limb	-*.810	-.517	-.693	-.584	-.655	*-.823	-*.888	-.668

Follow Table (7)
the correlation between the AEMG indicator and the amount of movement of the body joint centers during free shooting in basketball. N = 9

Attempts	Name of muscles / Quantum motion	Anterior deltoid Muscle	Rear deltoid Muscle	Musculoskeletal muscle	Biceps brachial muscle	extensor carpi radialis Muscle	Second wrist muscle radialis	Gemellus muscle (medial lobe)	rectum femoralis Muscle
	The amount of movement of the gravity center of the upper limb	-.718	-.237	-.509	-.089	-*.892	-.367	-.475	-.485
	The amount of movement of the gravity center of trunk	-*.801	-.568	-.656	-.638	-.651	*-.837	-*.916	-.704
	The amount of movement of the gravity center of the shoulder joint	-.689	-.137	-.282	-.274	-.527	*-.776	-.690	-.326
	The amount of motion of gravity center of Elbow joint	-.296	*-.777	-*.924	-.416	-.373	-.016	-.398	-*.871
	The amount of motion of the gravity center of the hand joint	-*.950	-.359	-.106	-.330	-*.802	-.306	-.147	-.115
	The amount of motion of the gravity center of the hip joint	-.742	-.143	-.049	-.023	-.584	-.599	-.444	-.074
	The amount of movement of the gravity center of the knee joint	-.710	-.251	-.062	-.112	-.561	-.554	-.360	-.037

Table (7) con.

*** The value of the "R" tabular level at 0.05 = 0.754**

It is clear from Table (7) that there is a strong statistical correlation between the AEMG and the quantitative movement index of the weight centers of the body joints during the performance of the free shooting reel for the three attempts. The number of correlation values statistically in the first attempt was 39, (0.764 *: 0.997 *), while the

number of non-statistically significant correlation values reached 33 with values ranging between 0.029 and 0.740. The number of correlation values statistically in the second attempt reached 34 values ranging from 0.757 * to 0.998. * The number of non-statistically significant correlation values were 38 (0.776 *: 0.950 *). The number of correlation values was statistically insignificant: 56 values ranged between 0.016 and 0.735. The number of correlation values was statistically significant in the third attempt.): (0.742).

Table (8)

The average amount of the performance of the players affecting the stability of the skill of the free shooting

Attempts	Speed of departure (M/S)	Angle of departure (°)	Hight of departure (m)	Heart Rate Average (b/m)
1st Try	6.372	54.61	1.741	130
2nd Try	5.762	50.73	1.663	172
3rd Try	5.317	45.2	1.611	188

It is clear from Table (8) that the average speed of launching during the performance of the free shooting skill in the first attempt (6.37 m/ s), while the second attempt (5.76 m/ s), while in the third attempt (5.31 m/ s). The average starting angle for the first attempt was 54.61 °, while the second attempt was 50.73 °, while the third attempt was 45.2 °. The average height of the first attempt was 1.74 m, The second attempt (1.66m), while the third attempt (1.61 m), and the average rate of heart tumors in the first attempt of (130 b / m), while the second attempt (172 b/ m) while the third attempt reached (188 b / m).

Results Discussion

The results of Table (4) for determining the significance of differences in muscle fatigue scores (MPF, AEMG) through the electrical activity of the muscles working in the free shooting in basketball between the three attempts to test the accuracy of the performance of the skill of free shooting in fatigue

conditions, which occurs in real situations of play, (0.05) in each of the working muscles used in the study (frontal muscle, posterior dorsal muscle, musculoskeletal muscle, biceps musculoskeletal muscle, musculoskeletal muscle, musculoskeletal muscle, The twin muscle" "Femoral lobe", the femoral straight muscle), and this led to a decrease in the electrical value of the muscles working. The heart rate average in the first attempt during the test was 165 b / m at an average time of 36 s, and the average heart rate in the second attempt was 172 b / m. The mean heart rate in the third attempt is 179 b / m at an average time of 42 s (85-90% of the maximum heart rate), McInnes, Carlson et al. (1995) indicates that this value is Heart rate average is the real value of basketball players during the game and players spend 75% of their playing time with an heart rate average Is greater than 85%. This is what the test during the search. The muscles in this case protect themselves by reducing the strength of their contractions. This is explained by the Muscular Wisdom, which states that "the muscles work to reduce the rate of action of the motor units to suit the change which occurs in the case of the muscle during fatigue." A protective condition in which the muscle and nervous system try to reduce the incidence of injuries expected to result from muscle fatigue.

This is agree with Enoka and Duthateau (2008), where it is shown that the cause of a decrease in the effectiveness of muscles is caused by the nervous system, which leads to a decrease in the strength of the second muscle of the elbow joint at the performance of muscle contraction of the joint, the proportion of the stability of the performance of skilled be lower the degree of muscle fatigue be higher.

The reason for the high electrical value in the muscle fatigue indicators (MPF, AEMG) of the muscles during the search in the third attempt, researcher point out that the inability of players to maintain the performance of skill level required because of their feeling tired, which leads to the generation of additional muscle strength for the purpose of completion of muscle work, which increased from (18% to

33%). Janet et al (2008) referees that when the muscle fibers work, the person increases the voluntary effort of his muscles to use the motor units of some muscles more.

In the light of the above, researcher believe that the answer to the first question, which is: "How much of the change of the muscle variables for free shooting in the case of fatigue?

The results of Table (5) for the determination of the significance of the differences for the measure of the amount of movement of the body weight centers of the body connections from the biomechanical analysis of the players in the performance of the free shooting in the basketball between the three attempts to test the accuracy of the performance of the free shooting skill in fatigue conditions revealed statistically significant differences in both the gravity centers of (body, lower limb, upper limb, trunk), as well as in the weight centers of the joints (shoulder, elbow, thigh, knee), indicating the effect of the movement and the role of fatigue Musculature on the muscles during study, where there is a decrease in the amount of movement in the third attempt, which is the other is lower than the initial attempt, as the table shows that there is no difference of statistical significance at the level of significance (0.05), indicating that the impact of muscle fatigue on the players in the initial attempt, which was low fatigue level players achieved a consensus in the first attempt (3.33 kg/ m/ s), while in the third attempt (2.00 kg/ m/ s), the researcher agreed with Paola Contessa (٢٠٠٩) that the cause of confusion in the transfer of quantitative amount of movement due to a weakness in the compatibility of musculoskeletal outcome Central fatigue and peripheral, which is reflected in the decline in the amount of movement when the skill performance in the third attempt for the first and second, which led the instability of the performance skills of players

In the light of the above, researcher believe that the answer to the second question, which is: "How much is the change to adjust the movement of the gravity centers and body links to free shooting in the case of fatigue?

The results of Tables (6), (7), of the muscle fatigue index (MPF, AEMG), of the electrical activity of the working muscles and the quantization of the movement of the biomechanical analysis of the players and their relation to the level and time of the performance of the free shooting skill in basketball between the three attempts for the test, at a significant statistical level (0.05), there was a positive correlation between each of the variables of muscle fatigue and the quantity of movement in the free shooting in the basketball where in the first attempt the best level of skill performance less image of normal muscle fatigue and the level of the amount of movement at the highest of its value, having an inverse relation to that Abnormal performance level in the second and third attempts where the muscle began straight thigh to work first to achieve the full tide in the knee joint followed by the muscular twin muscle working to push in the direction of the upper and then followed by the dorsal muscle posterior and then the frontal muscle up to the muscle with three heads of brachial and Biceps to complete the complete torsion movement of the elbow joint for the purpose of correction and follow the muscle of the wrist of the ankle to the arm and followed by the second muscle of the wrist, which worked to bend the wrist for the purpose of directing the ball towards the basket.

Table 8 shows the average performance of the players affecting the stability of the skill performance of the free shooting. There is a decrease in the values of starting high for the first attempt. Vladimir (٢٠٠٠) indicates that the arm plays an important role in directing the amount of movement generated by the body. The speed of the arm is an important mechanical principle, which increases the speed of the periphery of the remote end of the arm, ie., the palm and then to the height of the launch of the ball, and agree with researcher also on the importance of the role of the height of the start of the ball and the full tide of the joints of the body because this extension will provide a suitable motor path for the correction and increase the height of the starting point of the ball and thus get The right

speed is to take advantage of the strength of the body and push the ball not only to the top but to the top and forward so that the player can hit the goal.
In the opinion of the researcher that the instability of the performance of the skill and change in the case of the player and access to fatigue has made a clear difference in the values of the speed of the start of the ball in the attempts, especially the second and third adversely affected the proper performance of the implementation of the skill, where confirms that the speed of departure is the speed that The player will be able to control the amount of muscular strength needed to make the ball starting with the speed he wants.

In discussing the results of the correlation between the indicators of muscle fatigue and biomechanical indicators (the amount of motion) of the skill in questions, the researcher found that the results showed that the players did not reach the required level of stability in the level of performance, although they are advantageous in the performance of free shooting shot as they are tired. In contrast, the accuracy and consistency of the work of the muscles in the research sample at the performance of the free shooting, which led to the emergence of a decline in the performance of the movement of skill, with a decrease in the speed and angle and the height of the start of the ball, which led to a decrease in the level and effectiveness of performance, indicating their need Z training performance in different conditions so that their level of skill is characterized by stability.

Conclusions

The results of the muscle fatigue indicators (EMG) showed that all the muscles in the study were subjected to muscular fatigue by a large percentage of the three attempts in favor of the third attempt, while the muscle (with three brachial heads) and the muscle fatigue when performing the free-shooting skill during search.

- There is a strong statistical significance between the index of muscle fatigue MPF and the measure of the amount of movement of the centers of weight and body links during the first attempt

the first 45 values ranged between (0.751 *: 0.978 *)

-There was a statistically significant correlation between the AEMG index and the kinetic movement index of the body weight centers during the first attempt. The values ranged between (0.764*: 0.997*). The number of correlation values statistically in the third attempt was 16 between (0.776 *: 0.950 *)

-The heart rate average of the first attempt (130 b/ m), while the second attempt (172 b/ m), while the third attempt (188b/ m).

-The results of indicators of muscle fatigue extracted from the analysis of electrical activity of muscles that higher the rate of muscle fatigue and through the high heart rate decreased the amount of movement of the joints that are linked to muscles and then decrease the values of the amount of movement between the links when the performance of the skill during the search.

-There is an inverse correlation between the signs of muscle fatigue and the quantitative movement index of the three attempts during the performance of the free shooting skill of the basketball during the search.

Recommendations:

Based on what the abstracts indicated, the researcher recommends to:

- Guiding by the scientific foundations used in research and rely on the results of biomechanical and muscular analysis in improving the level of skill performance.
- Taking into consideration the application of variable training in difficulty to improve the free shootings within the training units and during breaks between the training loads to reach the players in the stability in the skill performance.

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