

The Momentary Strength Exercises and The Strength Distinguished By Speed with Electrical Stimulation (Ems) And Its Effect On Some Biomechanical Variables And Achievement Of Hammer Throw

Nasser Hussain Ali, Bilal Ali Ahmed, Ibn Sina, Eman Sabeeh Hussein

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Abstract

The effectiveness of throwing a hammer is one of the of games that require high-level technical performance and requires that the archers possess a correlation in Physical abilities such as types of strength rotational speed and compatibility as well as mastering the technical aspects according to the mechanical conditions that characterize this effectiveness, Through the experience of field researchers in the field of athletics, especially in throwing events, he noted that there is a low level of digital achievement and a large difference between the numbers recorded in this event for the youth category between the countries of the world and what is recorded for hammer archers in Iraq. The importance of research in preparing the momentary strength exercises and the strength distinguished by speed with electrical stimulation (EMS) and knowing their effect on some vital mechanical variables and the level of archers achievement of the category (youth) The research assumes that there are statistically significant differences between the pre and posttests of the research sample in values(Angular transmission speed, Hammer launch speed, The instantaneous strength of throwing for the full performance of the two legs , The instantaneous strength of throwing from a steadfast leg. The instantaneous push time of the arms at the moment of throwing , The instantaneous strength of the arms at the throwing, Completion distance for full performance). The implementation of the training curriculum took 12 weeks, at the rate of (3) training units per week, i.e. with a total of (36) training units during the research period. The researcher has concluded several conclusions, the most important of which were the effectiveness of exercises (instantaneous strength and strength distinguished by speed with electrical stimulation), which were used within the prepared training Approach In improving the values of the number of biomechanical variables at the moment of throwing, which had a significant impact on the Evolution of achievement.

Introduction

The sports field is at the forefront of fields that have witnessed a remarkable development in recent times and this development included many sports through the participation of many psychological, physiological and biomechanical sciences that study effectively in reaching the highest achievement, As well as studying weaknesses and treating them, as planning for training, especially for young, that aims to organize comprehensive development procedures for players (physically, skilfully) and this development in all aspects does not take place through theoretical procedures only, but rather comes through the use of different training methods that trainers use to develop the athlete's ability to achieve the best achievement. The hammer throwing event is one of the most important sports that have witnessed progress in the achievements as it is considered one of the events that need high-level technical performance. It also requires that the player possesses a correlation in physical capabilities such as strengths, rotational speed, and compatibility as well as mastering the technical aspects according to the mechanical conditions that characterize this event. The achievement of the record numbers requires the development of training methods and tools, and this did not happen by accident, but rather came as a result of the use of other sciences, especially training science and biomechanics. Biomechanical science is the cornerstone of the progress of players in their technical kinetic performance, as it is "the science that is concerned with the analysis of human movements based on the (kinematical) description of movement as well as identifying the causes of sports movement (kinetic), which guarantees an economy and effectiveness in the effort, hence the importance of research In linking the momentary strength exercises and the strength distinguished by speed with electrical stimulation (EMS), in addition to knowing its effect on some

biomechanical variables and the level of achievement of the athletes of affiliated to the Iraqi Athletics Federation.

Research problem

During the field researcher's experience in the field of athletics, especially in throwing events, noted that there is a low level in the achievement numbers, and a significant difference between the numbers recorded in this event for the youth category among the countries of the world and what is recorded for our players and this is due to many reasons, including weakness in physical variables, especially the momentary strength exercises and the strength distinguished by speed for this age group. It also lacks observance and identification of the biomechanical variables and their impact on performance, and the lack of modern devices that measure these variables, as the event of hammer throw depends primarily on the momentary strength exercises and the strength distinguished by speed, as it is characterized by technical performance and special mechanical conditions that constitute the kinetic method.

Research aims

1 -Preparing the momentary strength exercises and the strength distinguished by the speed with electrical stimulation (EMS).

2- Identify the effect the momentary strength exercises and the strength distinguished by the speed with electrical stimulation (EMS) on some biomechanical variables and hammer throwing achievement.

Research hypotheses

There are statistically significant differences between pre and post-tests in some biomechanical variables and achievement of the hammer throw.

Research fields

The human field: Players of the hammer throw event for young from the Iraqi Central Athletics Federation in Baghdad.

Timeframe: 5/1/2019 to 10/3/2019

Spatial field: Stadium of the College of Physical Education and Sports Science, University of Baghdad.

Research Methodology

The researcher used the experimental approach as it fits with the nature of the research and the problem to be researched by the design of a single group.

The research samples

The sample that was chosen included the hammer throwers of the Iraqi Athletics Federation for youth U 20 years, whose number is (8) players, as the sample percentage reached 80% of the total number of throwers in the youth category. To knowing the sample distribution naturally, the researcher used the coefficient of skewness, as shown in Table (1).

Table (1):details of the research sample

Rank	Variable	Units	Mean	Standard deviation	Median	Skewness
1	Age	Year	18.4	0.699	16.5	0.78
2	Mass	Kg	78.8	4.66	73.5	0.664
3	Length	cm	172.23	7.42	170.01	0.489
4	Training age	Year	5.00	0.101	5.21	0.647

Devices and tools used in the research:

Tools used in the research:

- 1- Two cameras, type: Casio. Camera shutter speed with 240 frames per second
- 2- Two tripod holders for a camera.
- 3- Weights belts with different weights (100 g to 2 kg).
- 4- Four wooden boxes with dimensions (70 cm width and 3 meters long).
- 5- Phosphorescent signs.
- 6- Metal tape measure / 60 meters.
- 7- Two stopwatches.
- 8- Whistle.
- 9- Electronic scale, type: Staves
- 10- Electrodes with the electrical stimulation (EMS).
- 11- Six electrical stimulation (EMS) devices, type: Beurer EM 80 3-in-1 digital TENS/EMS unit.
- 12- Ten Throwing Hammer Weight (6 kg)(Number 10)

Devices used for testing:

The electronic foot scanner (Dynafoot) is one of the modern scientific devices in biomechanical laboratories in the world. This device consists of several parts, including (Soles, Pressure sensors technology, Shock Sensor Technology, Data transmission, Power supply, Computer Communication and Bluetooth 10m range). In order to

obtain data, it is necessary to enter some important information for the player so that the device can work before starting and includes the name, age, weight, and shoe size until the data is read correctly during the test. After testing, we extract some variables under study, including applied force, the impulse time of the player. The Dynafoot device also measures the amount of pressure applied to each part of the foot, as well as gives the entire time from the beginning of the first movement of the foot to the moment the test is completed.

Procedures of the field research:

Testing of achievement of the hammer throw

-Test objective: to measure the best horizontal distance that hammer traveling (achievement) from the overall performance mode and the hammer throw test from the steady position (throwing mode).

-Performance description: Through the performance of the player through the throwing circle with a diameter of 2.13 m, after which he threw the hammer inside the area designated for the throw, and the player is given (3) attempts for each thrower and the best distance achieved is chosen from the 3 attempts and a throwing test from the steady mode, which the situation similar to the throwing moment. The player is given (3) attempts for each thrower and the best distance achieved is chosen from the 3 attempts.

Measurement of some biomechanical variables:

All biomechanical variables were extracted (the moment of throwing and throwing), the starting speed, the angular velocity of rotation of the hammer, the instantaneous strength of the two legs, the momentary momentum of the legs and arms, the moment of leaving the hammer through the use of the Kinovea analysis program

Exploratory experience:

The exploratory experiment was conducted on 1/3/2019 at 2:00 p.m. in the stadium of the College of Physical Education and Sports Science in Baghdad, on one player from the same sample, and the aim of this experiment was as follows.

- Knowing the total time of installing the device on the feet.
- The sample members must understand the tests used and perform them in a consistent manner.
- How to overcome the problems that may accompany the work.
- Training the assistant team to perform and understand the nature of the research experience and its measurements, especially the sequential stages of preparing the work of the (Dynafoot) device and recording data in the special forms for this purpose.
- Knowing the appropriate distance and height to place the video camera

pre-tests:

After completing the exploratory experiment and avoiding all obstacles and difficulties, the researcher conducted the pre-tests for the individuals of the sample, as the tests started on 2/3/2019, and the researcher conducted the tests prepared on the players (6) of the sample members and three attempts were given to each thrower, including the best achievement for conducting statistical operations.

The main experience:

The researcher adopted the prepared training curriculum where the curriculum was applied to the research sample in the special preparation period for the sample individuals on 3/3/2019 in the stadium of the College of Physical Education and Sports Science in Baghdad as it included a training curriculum for the sample and the use of prepared exercises with electrical stimulation by (EMS)

Training curriculum and training used in the research:

The main training time took from (45-60 minutes) and the following muscles were selected (Femoral straight muscle, musculus trapezius and Deltoid). The proposed curriculum continued to be applied for a period of (12 weeks), when the researcher relied on the basic principle of training, which is the progression in the training load in the prepared training units, as of intensity, comfort and size were dealt with through the application of the principle of diversity in load. The proposed training curriculum consists of (36) training units, and the researcher used the main part of the training unit, as it was two days per week for strength exercises and the strength distinguished by speed and one day for electrical stimulation exercises and as shown by the exercises for the first week of the first day exercises (Weighing the arms with a weight of 3% of the weight of the arms, then the throw from the position of stability, holding the hammer with a weight of 6 kg and then rotating for 10 turns with adding weight to the arms 3% of the weight of the arms, on a wooden box (70 cm width and 3 meters long) The height of the ground is diagonally at a degree of 15 with the weighting of the legs at 3% of the weight of the legs and the weight of the arms with 3% of the relative weight of the arms and the rotation with the hammer 6 kg with electrical stimulation, the weight of the legs during the full performance of the hammer throw and then the throwing and be b Weighing 3% of the weight of the legs, turning 10 cycles on a slope, down an angular slope of 10 degrees) As for the electrical stimulation, it was about one day, as the intensity of the stimulation increased gradually in terms of the current frequency increase (HZ) and the stimulation time of the target muscles, which were mentioned previously

Post-test

After completing the training program for the sample, the researcher conducted the post-test for the sample individuals on 6/6/2019. The researcher was keen to meet the same conditions in which the pre-tests were conducted in terms of place, time, tools, method of carrying out the tests, calculating the grades and with the presence of the same assistant team in the pre-tests.

Statistical means:

The researcher used the SPSS system to obtain the search results by using the following laws:

-The arithmetic mean, standard deviation, medium, and torsion

-One-Sample T Test

Analysis of results and discussion

Display the results of the differences in some biomechanical variables and achievement the hammer throw from the position of stability and the full performance of the pre and post-testing, analysis, and discussion.

Table No (2) biomechanical variables and achievement the hammer throw

The researcher attributes the reason for the progress made in the level of the values of some of the biomechanical variables mentioned in Table No. (2) to the special exercises with electrical stimulation that were used according to the performance and which influenced high effectiveness and had a great impact on the development of these values where its importance appears in the throwing stage. The exercises that have been used have affected the development of the muscle groups working in bend and stretch exercises movements on the joints related to these movements (*Dinu, Natta, Huiban, & Houel, 2014*) so that this can affect the times of contraction and dilation muscles as little as possible (*Juhanis*), this results in a decrease in the impulse time of the thrower at the time of throwing (*Brice, 2014*), It also led to an increase in the instantaneous explosive muscle strength (*Duchateau & Hainaut, 2003*) and rapid response to produce the largest muscle capacity according to the type of resistance used and its gradual upgrading (*DAPENA, GUTIÉRREZ-DÁVILA, SOTO, & ROJAS, 2003*). This means an increase in its kinetic energy represented by an increase contractile and dilation (*Lacerda et al., 2020*), which is reflected in the increase of achievement distance for hammer throwers (*L. W. Judge et al., 2016*). Thus, the number of kinetic units operating will increase, and its capacity to produce kinetic energy accordingly increase (*Duchateau & Hainaut, 2003*) Also, methods of developing momentum strength and the

Variables	Unit	Test	x	±S. D	M.D	Std. E.M	(T) Cal	Error level	Significance																																																																																				
Angular transmission speed	degree / time	Pre	7.143	0.238	1.355	0.315	10.611	0.000	Sig.																																																																																				
		Post	8.498	0.346						Hammer launch speed	Meter/second	Pre	22.850	0.799	0.655	0.547	2.930	0.033	Sig.	Post	23.505	0.496	The instantaneous strength of throwing for the full performance of the two legs	Newton	Pre	1817.12	141.43	412.87	208.34	5.605	0.001	Sig.	Post	2230.0	231.82	The momentary strength of the two legs for throwing from a steady position	Newton	Pre	1138.6	110.7	139.0	100.91	3.896	0.006	Sig.	Post	1277.6	61.890	The instantaneous push time of the arms at the moment of throwing	second	Pre	0.488	0.035	0.118	0.049	6.720	0.000	Sig.	Post	0.370	0.048	The momentary strength of the tow arms moment of throwing achievement	Newton	pre	1860.8	107.12	401.87	185.85	6.116	0.000	Sig.	post	2262.7	212.8	Achievement distance from steady position similar to throwing	meter	pre	56.078	1.091	2.356	1.741	3.314	0.021	sig.	post	58.435	1.623	Achievement distance from steady position similar to throwing	meter	pre	35.02	2.252	2.656
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strength distinguished by speed only come as a result of the training, which depends on the exercises of muscle contraction (*Vantrease, Townsend, Sapp, Henry, & Johnson, 2020*), according to performance as it gives a clear difference in the level of muscle strength (*Sakr, 2012*) The momentum strength and the strength distinguished by speed are among the important physical characteristics of the players during rotation at the moment of throwing (*Zatsiorsky, Kraemer, & Fry, 2020*), and therefore the development of these characteristics affects raising the level of skill numbers and reaching the correct kinetic tracks of the economy by exerting effort and providing the highest level of strength for the throwing moment (*Tidow, 1990*) Therefore, the researcher has prepared a training curriculum to develop these important characteristics in addition to other characteristics, taking into account the gradual difficulty in exercises through an increase in partial weights and an increase in

the values of electrical stimulation to serve the motor activity and its goal (DAPENA *et al.*, 2003), the most important characteristics of instantaneous strength increase the motor performance in the sense that the strength gained from this type of training leads to a better movement activity in the sports activity practiced by increasing the ability of the muscles to contract at a faster and more explosive rate during the range of movement in the joint and all the speeds of movement (Zatsiorsky *et al.*, 2020). The researcher attributes the reason for this moral difference to the training curriculum that was prepared, and its use to various methods of training that led to the development of variables related to achievement by focusing on the maximum achievement of the working muscles (Brice, 2014), and according to the vocabulary of the training, which made the differences in the values of this. The variable tends to the results of the dimensional tests (Wang, Li, Wan, Zhang, & Shan, 2018) and this was reflected in the development of the achievement of hammer throwing from the steady position and from full performance (W. L. Judge, Bellar, McAtee, & Judge, 2010), also, the exercises that were used according to the kinetic performance of the effectiveness had a positive effective impact in developing the achievement values for the hammer archers (Wang *et al.*, 2018), as "the use of exercises that are consistent in the nature of their performance with the general form of performing specialized skills leads to better results (Ohta, Umegaki, Murofushi, Komine, & Sakurai, 2009), and that these exercises were programmed according to the scientific foundations chosen for the training curriculum, so that the effect of the training on the results of the post-test clearly appeared. The curriculum also focused on exercises that tend to focus on working muscle groups for throwing and its correct path (Sakr, 2012) in a way that secures the economy in effort and ensuring the smoothness of the movement, as it emphasizes (Tillin & Folland, 2014) "that skill is an attribute of performance effectiveness and development. The kinetic responses of the learner mean the organization and arrangement of the muscle groups in the direction of movement.

Conclusions and Recommendations:

Conclusions

Through the presentation, analysis and discussion of results, the researcher reached the following conclusions:

- 1-The research showed the effectiveness of the exercises that were used within the vocabulary of the proposed training curriculum and developed according to performance in developing the momentary strength.
- 2- The results showed the effectiveness of exercises (instantaneous strength, momentary strength exercises and the strength distinguished by speed and electrical stimulation), which were used within the training method prepared to improve the amount of biomechanical variables of the throwing moment, which had a significant impact on the progress of the achievement.

Recommendations

- 1-Approving the results of the researched variables and making use of them to compare with the results of athletes for other throwing events
- 2-Diversity in the use of modern training methods and various training methods and the development of sporting achievement in shooting activities.
- 3- The importance of studying and knowing the amount of forces held by the arms and legs of the throwing moment for other throwing activities

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Author Information

Dr. Nasser Hussain Ali

Baghdad University, Baghdad, Iraq
 University of Medical & Pharmaceutical Sciences,
 Baghdad, Iraq
 Baghdad University, Baghdad, Iraq

Ibn Sina

Baghdad University, Baghdad, Iraq
 University of Medical & Pharmaceutical Sciences,
 Baghdad, Iraq
 Baghdad University, Baghdad, Iraq

Dr. Bilal Ali Ahmed

Baghdad University, Baghdad, Iraq
 University of Medical & Pharmaceutical Sciences,
 Baghdad, Iraq
 Baghdad University, Baghdad, Iraq

Dr. Eman Sabeeh Hussein

Baghdad University, Baghdad, Iraq
 University of Medical & Pharmaceutical Sciences,
 Baghdad, Iraq
 Baghdad University, Baghdad, Iraq
