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## EFFECT OF ELECTRICAL STIMULATION AND HIERARCHICAL EXERCISES IN THE MAXIMUM STRENGTH, EXPLOSIVE ABILITY AND DEFENSIVE CONFRONTATION SKILL FOR YOUNG HANDBALL PLAYERS

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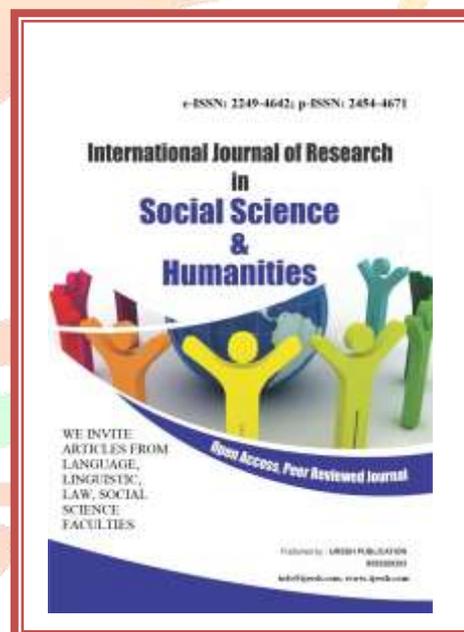
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**ABSTRACT**

The importance of the research lies in experimenting with exercises using hierarchical training methods and electrical stimulation and knowing their effect on maximum strength, explosive ability, skill and defensive confrontation for young handball players. Where the research aimed to prepare exercises by hierarchical training and electrical stimulation methods for young handball players aged (18-19) years. As well as identifying the effect of using electrical stimulation exercises and hierarchical training in developing maximum forces, explosive ability and defensive interview skill among the research sample members. In addition to recognizing the superiority of the differences in the post-test of the two experimental groups in the development of maximum strength, explosive ability and defensive interview skill for young handball players. The researchers used the experimental design with two experimental groups to suit the nature of the problem studied. The researchers also identified the research community with the Karbala handball club players, the youth group aged (18-19) years, who numbered (16) players, and they were divided equally into two groups, the first group trained by the hierarchical training method, and the second group was the electrical stimulation method. The researchers will conclude that electrical stimulation and hierarchical exercises have a role in the development of maximum strength, explosive ability and defensive interview skill for young handball players. The hierarchical training method has a better return than the electrical stimulation method. It develops maximum strength, explosive ability and defensive interview skill for young handball players.

**Keywords:** *Electrical stimulation , Hierarchical exercises.*

**INTRODUCTION**

The twenty-first century is characterized by rapid scientific progress in the field of sports in general and handball in particular. There is no doubt that the use of modern devices and tools in the game of handball plays an important and significant role in sports activity in terms of physical and skill, among these devices is the (electrical stimulation) device, which is one of the effective devices in sports training for all games in general and the game of handball in particular, which works to develop the ability of the muscle to contract with high intensity with high speed contraction as

well, this is what suits the performance of most modern handball skills, if not all of them, such as the defensive interview skill (which is one of the most important skills in handball if not the most important because of its importance in determining the winner and loser in the match, as all skills and plans are useless if not the team defends correctly , and this skill is the same as all skills as it depends on a physical aspect represented by the elements of physical fitness, and among these elements is the maximum strength and explosive ability through the activity of the working muscles, as the elements of maximum strength and explosive ability are among the basics of the handball

player in these two skills and others, what distinguishes the modern handball player is the very high strength, which appears clearly in the performance of all skills in general and the skill of the defensive interview in particular. In addition, the hierarchical training method is one of the important methods that many coaches rely on in developing the strength of the players. Hence the importance of research in experimenting with hierarchical training and electrical stimulation exercises and knowing their effect on maximum strength, explosive ability, skill and defensive interview for young handball players.

#### **RESEARCH PROBLEM:**

By informing the researchers of the scientific sources of sports training, as well as by watching and following up on the various training processes, since the researchers were one of the former handball players and coaches, they noticed that there is a clear weakness in the maximum strength, explosive ability and defensive interview skill. There is a clear lack of information on the effect of hierarchical training and electrical stimulation on some basic qualities, abilities and skills in handball. The lack of trainers' use of modern equipment and techniques in the training process that helps raise the players' abilities to the highest level faster and better, so the

researchers decided to use (hierarchical training and electrical stimulation) to identify their effect on the maximum strength, explosive ability and defensive interview skill for young handball players, Hopefully this research will be of assistance to coaches in training their players in the future.

#### **RESEARCH OBJECTIVES:**

- Preparing exercises using hierarchical training methods and electrical stimulation for young handball players aged (18-19) years.
- Identifying the effect of using electrical stimulation exercises and hierarchical training in developing maximum forces, explosive ability and defensive interview skill among the research sample members.
- Recognizing the superiority of the differences in the post-test of the two experimental groups in the development of maximum forces, explosive ability and defensive interview skill for young handball players.

#### **RESEARCH HYPOTHESIS:**

- There is a positive effect of the exercises of the two experimental groups in developing the maximum strength, explosive ability and

defensive interview skill for young handball players

- The preference of the first experimental group that used hierarchical training over the second experimental group that used electrical stimulation in developing maximum strength, explosive ability and defensive interview skill for young handball players.

### **RESEARCH FIELDS:**

**The human field:** Karbala Youth Handball Club players aged 18-19 years.

**Time field:** from 19/11/2020 to 4/3/2021.

**Spatial field:** Gymnasium in Karbala province.

### **RESEARCH METHODOLOGY AND FIELD PROCEDURES**

#### **Research Methodology**

The researchers used the experimental design with two experimental groups to suit the nature of the problem studied.

#### **Community and Sample Research:**

The researchers identified the research community with the Karbala handball club players, the youth group aged (18-19 years), who numbered (16) players, and they were divided equally into two groups, the first group trains by the hierarchical training method and the

second group is the electrical stimulation method.

### **MEANS, TOOLS AND DEVICES USED IN THE RESEARCH**

#### ***Means of collecting information***

- Objective tests and standards.
- Note.

#### ***Tools and equipment used***

- Recording record (2).
- Two (2) Japanese-made kasio610 manual stopwatches.
- (2) FOX whistles.
- Press Hummer Shoulder Device.
- Debney Smith apparatus.
- Iron tablets of different weights from (0.5 kg to 25 kg).
- Vertical jumping board (30 x 150 cm) number (1).
- Sony camera, 1200 images per second, number (1).
- Medicine balls (2 kg)
- Iron chair
- Belt number 2.
- Tape measure.
- Medical scale.
- Response speed device.
- Video camera.
- Lenovo laptop calculator (1).

#### **Search Procedures:**

***Description of the tests used in the research:***

**First test: Maximum strength test for the legs:**

The purpose of the test: To measure the maximum muscle strength of the legs.

Test requirements: a regular weight machine (Smith), weights of different weights.

Description of the test: Ordinary Smith device. The tester stands, fixes the bar on his shoulders, bends the knees to sit with the full weight, and then takes the standing position by extending the legs, observing the verticality of the torso when performing.

- He puts each laboratory weight commensurate with his capabilities.
- The belt wraps the leather around the center of the laboratory to increase safety.
- The laboratory starts from a standing position on the base of the device, with the feet opened at the level of the width of the chest.
- The laboratory bends the feet and looks forward.
- The test is performed by extending the legs together to the top, not excreting the maximum force.

Calculation of grades: Each laboratory is given two or three consecutive attempts, and the best score is calculated.

**Second test: Bryce Hammer Shoulder.**

Purpose of the test: To measure the acoustic forces of the two arms

Test requirements: Press Hammer Shoulder, discs of different weights.

Description of the test: After placing the appropriate weights, the laboratory takes a standing position on the device so that the grip is suitable and the legs are opened for balance. The laboratory pushes the bar from the top of the chest by extending the arms up to raise the iron bar to the top so that the arms are fully extended.

- The arms should be fully extended.
- Legs opening must be appropriate.
- Not bending the legs or pushing the torso during the performance.

**Third test: Vertical jumping test of the muscles Article for the legs.** (Al-Shennawi, Mamdouh Muhammad, 2003, p. 112)

**Purpose** of the test: To measure explosive power.

**Test requirements:** vertical jumping board (30 x 150 cm) (marked in centimeters and fixed on the wall at a height of one meter from the ground), camera, tape measure, recorder, referee, whistle.

**Test description:** The tester stands barefoot with his whole foot on the floor and facing the wall, and points with his hand as high as possible above his head, after which the tester moves to a comfortable position on the wall, and when the referee gives the start signal, the tester bends the legs slightly and jumps as

high as he can and touches the board. With the maximum jump height and the body must not rotate, the researcher will photograph the performance of the test to extract the time from the moment the foot leaves the ground to the moment the plate is touched by the hand to use it in the explosive power law to calculate it in watts.

**Fourth test: Throwing a medicine ball from sitting on a chair.** (Al-Ramli, Abbas Abdel-Fattah, 1993, p. 102)

**Purpose of the test:** To measure the explosive power of the two arms.

**Test requirements:** medical balls weighing (2 kg), iron chair, 2 belts, camera, tape measure, referee, recorder, whistle, space area not less than (30 m) in length and (5 m) width, medical scale.

**Description of the test:** After taking the amount of mass for the laboratory, he sits on a chair with his feet flat on the ground, both the hips and chest are tied with a belt, and under these conditions, only the arms can throw the medicine ball, and the ball is behind the head and is held by both hands and the elbows are bent. When the referee gives the signal to start (whistle), the tester swings the arms forward with force and as fast as possible to throw the medicine ball as far as possible. The researcher has photographed the performance of the test to extract the time to be used in the

explosive power law to calculate it in watts.

**Register:** After extracting an amount of mass for the arms and the ball, each laboratory is given three attempts and the best attempt is calculated, and the explosive power measurement will be adopted according to the following law (6).

$$\text{Explosive power} = \frac{\text{Arm and ball mass} \times G \times A}{\text{Time}}$$

**Fifth test: Testing the speed of the corresponding defensive motor response:**

**Purpose of the test:** To measure the speed of response to the defensive move (defensive interview) handball.

**Tools:** response speed device, video camera, handball court.

**Test administration:** Photographer, shooter.

**Performance description:** The player stands near the response speed device with the distribution of digital pieces 3 m away from him that represent the movements of the defender with the handball, and when passing in front of the device, the device gives him an audio signal specifying a number from (1) to (4) randomly and the player must respond to this number and move for the region representing this number, the performance is depicted to calculate the response time.

**Register:** The response time in seconds and its parts is calculated from the moment the stimulus appears to the moment the foot touches the specified number through imaging, with the laboratory given two attempts and calculating the best attempt for it.

**Experimental Experiment:**

The researchers conducted their reconnaissance experiment on 28/11/2020 on a sample selected from the research community, which numbered (6) players.

**Pre-test:**

The pre-test was conducted on the research sample on (Monday) corresponding to (30/11/2020), in the gym.

**Main experience:**

After completing the tribal tests, the researchers introduced exercises in the two methods of electrical stimulation and hierarchical training that they had prepared. Within the training program assigned to the research sample at the beginning of the main section of the training unit, then the main part will be completed together with the same exercises as the trainer, and will be done according to the following:

- 1- The start date for the exercises was on (Sunday) corresponding to 6/12/2020.
- 2- The exercises were applied in the special preparation stage.
- 3- The duration of the experiment was (8) weeks distributed over (24)

training units at a rate of three units per week.

- 4- A special trainer has been identified for each group. They are given the special exercises scheduled for them at the beginning of the main part and on the gymnasium on days (Sunday, Tuesday, Thursday) and at the same time, and after completing the special exercises, they are merged again to complete the training unit for them under the supervision of their coach .
- 5- The researchers determined the intensity of exercise between (80-90%).
- 6- The researchers used high intensity interval training.

The end date of the experiment was on (Thursday) corresponding to 28/1/2021.

**Post-test:**

The post test was conducted on the research sample on (Sunday) corresponding to (7/2/2021), on the gymnasium, taking into account the same conditions and conditions in the pretest as much as possible.

**Statistical means:** The researchers used the SPSS statistical bag to extract the search results.

**PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS:**

**Presenting and analyzing the results of the tests in the tribal and remote**

measurements of the two research groups and discussing them  
 Presenting the results of the tests in the tribal and remote measurements of the two research groups and their analysis

For the purpose of testing the first hypothesis, the researchers used the (T) test for corresponding samples, as shown in Tables (1, 2).

*Table (1) shows the arithmetic means, standard deviations, the calculated (t) value, the level and type of significance for the first experimental group in the pre and post-tests:*

Variables	Tests	Mean	Std. deviation	means Difference	Std. deviation Difference	T value	Sig level	Sig type
Bench- press	Pre	43.0000	1.60357	-9.750-	.36596	26.642-	0.000	Sig
	post	52.7500	1.66905					
Dubni	Pre	61.7500	1.83225	-7.875-	0.76619	10.278-	0.000	Sig
	post	69.6250	1.50594					
Arms extended	Pre	817.5425	13.52904	742.525-	15.19727	48.859-	0.000	Sig
	post	1560.0675	36.04805					
Legs extend	Pre	1240.5412	34.96463	-617.395-	7.85778	78.571-	0.000	Sig
	post	1857.9363	34.13843					
Defensive confrontation	Pre	1.2887	0.01639	0.25150	0.02182	11.524	0.000	Sig
	post	1.0373	0.04676					

The results showed that the mean values of the variable (defensive interview) were lower in the post test than the pre-test, and there was a significant change between the two tests in favor of the post test because these variables have inverse value, meaning the lower the mean, the better the level, because it deals with the time factor by measure.

As for the two variables (maximum forces and explosive power), the arithmetic mean value was greater in the post-test than the pre-test, and a significant change occurred between the two tests in favor of the post-test, which indicates the existence of significant differences between the two tests.

*Table (2) shows the arithmetic means, standard deviations, the calculated (t) value, the level and type of significance for the second experimental group in the pre and post-tests.*

Variables	Tests	Mean	Std. deviation	Means difference	Std. deviation Difference	T value	Sig level	Sig type
Bench- press	Pre	43.8750	1.35620	-6.625-	.53243	12.443-	0.000	Sig
	post	50.5000	1.19523					
Dubni	Pre	61.0000	1.60357	-5.1250-	.71807	-7.137-	0.000	Sig
	post	66.1250	1.55265					
Arms extended	Pre	822.1513	8.14043	663.802-	9.43043	70.389-	0.000	Sig
	post	1485.9538	31.06303					
Legs extend	Pre	1250.3713	32.70641	521.733-	9.95954	52.385-	0.000	Sig
	post	1772.1050	16.21838					

Defensive confrontation	Pre	1.2736	0.01781	0.16637	0.00573	29.042	0.000	Sig
	post	1.1073	0.01405					

The results showed that the mean values of the variable (defensive confrontation) were lower in the post test than the pre-test, and there was a significant change between the two tests in favor of the posttest because these variables have inverse value, meaning the lower the mean, the better the level, because it deals with the time factor by measure.

As for the two variables (for maximum forces and explosive power), the arithmetic mean value was greater in the post-test than the pre-test, and there was a significant change between the two tests in favor of the post-test, and this was indicated by the significance levels as it was less than the significance level (0.05) and for all search variables This indicates that there are significant differences between the two tests.

#### **Discussing the results of the tests in the tribal and remote measurements of the two research groups.**

The researchers attribute the reason for the development that occurred for the members of the two experimental groups to the regularity in the training process and work according to a method prepared and organized by the researchers, as the directed and regulated exercises in terms of (intensity, volume and intensity) using

exercises using the hierarchical method and electrical stimulation led to the development of maximum forces and explosive power For legs and arms, which helped to adjust the performance of the correct motor paths, in addition to increasing the speed of performance and reducing its time and getting rid of the extra random movements that were present due to the lack of performance control resulting from the presence of weakness in the strength of the muscles of the arms and legs, as “the skill performance of any sports game depends mainly on physical numbers . (Mufti, A , 2002, p. 176)

Also, the use of relative and absolute strength exercises in a hierarchical manner worked to increase the working motor units and a neuromuscular adaptation was obtained, which was reflected in the development of maximum strength, explosive ability, and defensive confrontation.

As one of the main foundations for muscle development and development during training is that the muscles must be carried with a certain resistance in order to develop, as the muscles that work without load even if they exercise for several hours, their strength increases only a little and on the other side the muscles that shrink to more than 50 % of maximum strength develops dramatically even if she

performs contractions only a few times a day, therefore, studies have proven that these contractions for three days a week generate an ideal increase in muscle strength without generating chronic muscle fatigue (Bomba, Theodore (translated by Jamal Sabri), 2010, p. 153). Also, the use of exercises with hierarchical training and electrical stimulation worked to increase the working motor units and a neuromuscular adaptation was obtained, which was reflected in the development of strength and speed in a manner that served the skillful performance, as the development of muscle strength is accompanied by several important

functional aspects, such as an increase in nervous activity during the recruitment of the largest possible number of motor units, in addition to synchronizing the contraction of these units with an increase in the ability to nervous excitation in muscle cells (Khreibet, Raysan, 1997, p. 526). In addition to exerting force in different forms and amounts compatible with the performance skills, and rapid changes in the rhythm of nerve signals, as the muscular activity of any skillful performance is characterized by a high degree of compatibility between the time and size of the nerve signals of the motor units. (Jari, Eman Darwish, 2014, p. 71)

### **Presentation and analysis of the results of the measurement of the post-tests of the two research groups and their discussion:**

#### **Presentation of the measurement results of the post-tests of the two research groups and their analysis:**

*Table (3) Significant differences between the post-test results of the two experimental groups:*

Variables	Tests	Mean	Std. deviation	T value	Sig level	Sig type
Bench- press	First	52.7500	1.66905	3.100	0.008	Sig
	Second	50.5000	1.19523			
Dubni	First	69.6250	1.50594	4.577	0.000	Sig
	Second	66.1250	1.55265			
Arms extended	First	1560.0675	36.04805	4.405	0.001	Sig
	Second	1485.9538	31.06303			
Legs extend	First	1857.9363	34.13843	6.423	0.000	Sig
	Second	1772.1050	16.21838			
Defensive confrontation	First	1.0373	0.04676	-4.055-	0.001	Sig
	Second	1.1073	0.01405			

When reviewing the results of the tests that were reached, it becomes clear to us that there are significant differences between the measurement of the post tests

and in the interest of the experimental group, since the significance level values were less than an error level (0.05), and

this is consistent with what was stated in the second hypothesis of the research.

**Discussing the results of measuring the post-tests of the two research groups:**

The researchers attribute the reason for the superiority of the hierarchical training group over the electrical stimulation training group to the effectiveness of exercises for muscular balance among the working muscles, which contributed to increasing muscle excitability through the effectiveness of the exercises carried out by the players during the training curriculum prepared by the researchers, and this was confirmed by (Mufti Ibrahim Hammad 1998) that the number of aroused fibers determines the muscle force produced by the muscle, as the greater the number of excited muscle fibers, the greater the amount of muscle force produced (Hammad, Mufti Ibrahim, 1998, p. 135). Also, since the coordination within and between the muscles helps to increase the ability, as when the muscles coordinate work, their efforts are united to overcome the external resistance and more quickly” (Arthur C. Guyton, John Y. Hall, (Translated by Sadiq Al-Hilali), (1996, p. 1287). This is also confirmed by Essam Helmy and Muhammad Jaber about Whitney and Smith in “Increasing the strength of the muscles working in a particular performance works to perform this work faster regardless of the type of

exercises used in strengthening, increasing the neuromuscular coordination increases the speed of the special movements because all the muscles involved in the work become better aligned, and thus external resistances can be overcome faster” . (Helmy and Jaber,1997, p. 65)

Continuing to repeat the correct performance of the working muscles and to serve the movement sequence and the performance of the handball player, contributed to strengthening the working muscles in the defensive interview skill by activating and mobilizing the largest number of fast-contracting muscle fibers, improving the auxiliary muscles to contraction and increasing the inhibition of the anti-muscles . (Dirix, A. and others, 1988, pp. 191)

**CONCLUSIONS AND RECOMMENDATIONS:**

**Conclusions:**

- 1- The electrical stimulation and hierarchical exercises have a role in the development of maximum strength, explosive ability and defensive interview skill for young handball players.
- 2- The hierarchical training method has a better return than the electrical stimulation method, which develops the maximum strength, explosive ability and defensive interview skill for young handball players.

**Recommendations:**

- 1- Great interest in using the hierarchical training method for all age groups, especially young handball players.
- 2- Using hierarchical exercises to develop maximum strength, explosive ability, and defensive interview skill.
- 3- Conducting similar studies on different age groups of players and on other sports.

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