# THE EFFECT OF REBOUND FORCE TRAINING FOR THE UPPER EXTREMITIES ON SOME INDICATORS OF ELECTRICAL ACTIVITY (EMG) OF WORKING MUSCLES AND THE ACHIEVEMENT OF JAVELIN THROWING FROM SITTING DISABLED CATEGORY CP34 YOUNG

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**Abstract**

The purpose of this paper is to preparing rebound strength training, and identifying the effect of rebound force exercises on some indicators of the electrical activity device (EMG) for working muscles and the achievement of javelin throwing from sitting disabled cp34 young people and their rate of development. The two researchers used the experimental method and the reality of one group with two tests, pre and post, according to the nature of the problem. The research sample was chosen by the intentional method, and they are the javelin throwers from the sitting class of CP34, and their number is (4) players out of (4) players, as they constituted (100%) of the original community. One of the most important results reached by the researcher is that : The rebound force training worked on developing some electrical activity indicators for the working muscles (peak, rate of peaks, area under the curve) and achievement for young javelin throwers cp34 class , the rebound strength training worked on developing the muscles working in performance, which helped in the development of motor transport, which contributed to the development of the achievement of these young javelin throwers from the seated cp34 category and the rebound strength training develops the explosive power of the upper extremities, which helped to develop the achievement of the seated javelin players of the cp34 category. One of the most important recommendations recommended by the researchers is that: Necessity of adopting the exercises of sports trainers in Iraq and following the scientific method in measuring the development of the electrical activity of the EMG muscles in a sequential manner to show the safety of the training process, and emphasis on the development of regressive strength training that can be used in line with the kinetic path and the desired goal that works to support the training process.

**Keywords:** Sport Psychology**.** Exercise. Sports. Psychology. Training. Muscles

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## Introduction

The development and scientific progress is increasingly invading the world, and the sports side has the best luck in progress in light of modern technology in various games and achieving great achievements in all events, especially the disabled, who practice different types of collective and individual sports activities, whether they are standing or using chairs or devices Compensatory, each type of disability has a sport that suits his abilities, and javelin throwing is one of the important activities practiced by the disabled category of standing and sitting in athletics for the disabled. Therefore, the EMG device, as the device records and analyzes the electrical activity of skeletal muscles, is important for many sports because they need a neuromuscular system to assess the safety and speed of transmission of nerve impulses to the muscles as well. During which to develop some indicators of electrical activity (EMG) of the working muscles and effective achievement Javelin throwing from sitting.

## Research Problem

By observing sports progress at the global level, especially in world championships, this led to the emergence of theories and methods of training for the disabled to advanced methods, both in individual and group games, and that training the effectiveness of javelin throwing for the disabled depends on the strength of the muscles of the upper part working in the performance of the athlete. Throwing is because the handicap in this category is in the lower extremities, through the researchers' frequency to the Athletics Training Center for the Disabled and through the training units of the sitting javelin players who are disabled cp34 category, the researchers noticed that there is a weakness in the motor performance technique in the strength position of the thrower in the drag process And push because it affects the achievement and the rapid contractions of the muscles and the aim is to create strength and speed at the stage of pulling and pushing and there is a weakness in the strength of the muscles working in performance as well as the sample needs a sufficient amount of explosive and rapid force according to the performance technique. Therefore, the researchers decided to work on measuring some indicators of electrical activity (EMG) of the muscles working in the performance of javelin throwing from sitting for the research sample and developing a proposed rebound force training that works to develop these indicators for the strength and speed of the muscular abilities working in javelin throwing and thus developing the achievement

## Research Objective

- Preparing rebound strength training.
- Identifying the effect of rebound force exercises on some indicators of the electrical activity device (EMG) for working muscles and the achievement of javelin throwing from sitting disabled cp34 young people and their rate of development.

## Research Hypotheses

- There are statistically significant differences between the pre and post-tests for some indicators of electrical activity (EMG) for working muscles and the achievement of javelin throwing from sitting disabled cp34 youth category in favor of the post-test.

## Research Fields

- Human field: Javelin throwing players from sitting cp34 youth class
- Time field: (1/1/2021) to (15/6/2022)
- Spatial field: Athletics Training Center for the Disabled, Baghdad

## Research Methodology and Field Procedures

### Research methodology

The two researchers used the experimental method and the reality of one group with two tests, pre and post, according to the nature of the problem, which imposed the use of the appropriate method that suits the nature of the problem, and the experimental method is known (represents the most honest approach to solving many scientific problems in a practical and theoretical way). (Allawi and Osama Kamel Ratib. 1999).

### Community and sample research

The research sample was chosen by the intentional method, and they are the javelin throwers from the sitting class of CP34, and their number is (4) players out of (4) players, as they constituted (100%) of the original community, and they were homogenized through the torsion coefficient in the variables (mass, Age, training age, torso length, arm length) It was found in Table No. (1) that the values of the skewness coefficient for all variables were between (±3) in the normal distribution curve, and thus, the sample was distributed naturally and the researcher made sure of the homogeneity of the sample (Table 1).

### Means of Collecting Information, Devices and Tools Used in the Research

### Means of collecting information

- Arab and foreign sources and references.
- Internet international information network.
- Personal interviews, telephone contact and social media programs with specialists.

**Table 1:** Shows the homogeneity of the sample.

| Variables | Measuring unit | Mean | Standard error | Standard deviation | Median | Skewness |
|---|---|---|---|---|---|---|
| age | Year | 18.5 | 0.28868 | 0.57735 | 18.5 | 0 |
| mass | Kg | 65.25 | 0.47871 | 0.95743 | 65.5 | -0.855 |
| training age | Year | 2.5 | 0.28868 | 0.57735 | 2.5 | 0 |
| torso length | Cm | 56.75 | 0.25 | 0.5 | 57 | -2 |
| arm length | Cm | 85.25 | 0.47871 | 0.95743 | 85.5 | -0.855 |

- Information dump form.

**Devices and tools used in the research**

- Stopwatch, whistle, tape measure.
- Camera (NIKON) size (5200).
- An electronic calculator (no laptop), three (3) of them (hp) and one (Lenovo).
- Electromagnetic activity device (EMG) with four poles (Myotrace 400) from the American company (nor axon) number (2) and programming applications model (Mr. 3.14).
- Receivers from the US company (nor axon) one time use for EMG measurement.
- Razor blades, cotton, scissors, spiritto (wound disinfectant), medical tape (plaster). 7. Throwing chair.
- Shaft weight (600) count 8.
- Medical balls of different weights, rubber ropes, staplers, punching bag, weights.

**Determine the working muscles**

The most important muscles working in the effectiveness of javelin throwing from sitting were determined after the researchers reviewed Arab and foreign scientific sources and previous studies, and conducted personal interviews with experts and specialists in the field of biomechanics, physiology and athletics, including the assistant work team. Where 4 muscles used in the research were selected: (Snell Anatomy. 2003).

1. Middle deltoid muscle: It is a thick muscle that covers the shoulder joint, and gives the shoulder a circular circumference. Fusion: its fibers converge to rest on the deltoid tuberosity located on the middle of the lateral surface of the body of the humerus. Action: It works to distend the upper limb at the shoulder joint, the main effort falls on the shoulders of the strong medium fibers of many-feathered shape.
2. Biceps brachii muscle: This muscle is located in the anterior aspect of the upper arm and consists mainly of two muscles, one long head and the other short. Fusion: on the back of the radial tuberosity, by means of an aponeurotic strip called the aponeurosis of the basic structures in the cubital fossa. Action: It is a strong extensor muscle of the forearm, and it is considered one of the basic muscles of the process of pulling, flexing and rotating the elbow outward and swinging the arm forward.
3. The triceps brachii: It is a large muscle that forms the largest part of the components of the spiral section of the humerus. Origin: the long head of the subglenoid tubercle of the scapula, the lateral head from the upper half of the posterior surface of the body of the humerus above the spiral groove, the medial head from the posterior surface of the lower half of the body of the humerus under the spiral groove. The fused: the common tendon rests on the upper surface of the ulna ulna. Action: This muscle is a strong extensor of the elbow joint, adducting the arm.
4. The pectoralis major muscle: Origin: From the medial half of the clavicle and from the sternum, and from the upper six muscular cartilages. The dimple: its fibers converge and rest on the lateral lip of the biceps groove on the humerus. Function: the arm converges and rotates medially, and its clavicular fibers flex the arm.

**Determining the indicators of electrical activity of the EMG muscle**

Indicators of the electrical activity (EMG) of the target muscles were determined in the effectiveness of javelin throwing from sitting after the researchers reviewed the scientific sources and previous studies, and the experience of the specialized assistant work team represented by (Dr. Safaa Abdel-Wahab, Dr. Osama Ahmed Hussein and Dr. Muhammad Mutlak), and (3) Indicators for each muscle are (maximum peak, average peaks, area under the curve), and these indicators were measured by EMG muscle activity measurement device.

Where the researchers defined these indicators as follows:

- Peak, uv: It is the highest peak that the muscle reaches during performance, according to the EMG reading, and it is measured in microvolts.
- Mean, uv peaks: It is the sum of the peaks that the muscle reaches during performance on their number according to the EMG reading, and it is measured in microvolts.
- Area, uv's: It is the real calculated area that lies under the crest curve. It is determined by the number of sectors produced by the force curve during a unit time according to the EMG reading, and it is measured in microvolts/time.

**Measures of electrical muscle activity (EMG)**

The researchers used the Myotrace 400 device produced by the American company Noraxon to record the electrical activity of the skeletal muscles with four poles (4 Channel) with an application program (Mr3.14), which is one of the latest portable laboratory technologies, through which it is possible to examine and record the electrical activity of four muscle groups simultaneously and through Bluetooth signals within a distance of 20 meters from the computer (Ismail. 2012), and it consists of the signal receiver and transmission by means of the Bluetooth signal, which weighs (370) g, and the Bluetooth that connects the signal from the device to the computer and connecting wires between the device and between the surface and surface receivers An application program for the device, as it is installed on a laptop computer, through which the EMG signal can be displayed and stored, the signal of each muscle separately.

**How EMG device works**

- Before starting the process of opening the (EMG) program, we shave the location of the muscles targeted by the researcher to measure the indicators of electrical activity represented by (4) muscles represented by (the middle deltoid muscle, biceps brachii, triceps brachii, pectoralis muscle) to remove hair from The areas of these muscles, and then we work on cleaning the place of the clamps with a medical alcohol solution and the need to ensure the importance of cleaning because this affects the electrical signal.
- Fixing the pickup: After cleaning the area where the pickup is installed on the target muscle and feeding the signal source to the computer to regulate the work of the device for each muscle, a double plug is fixed on the two poles of the pickup, except for the main plug, which contains a third pole to reduce interference signals caused by skin resistance. (8:84)
- Securing the connection: After the installation link and ensuring freedom of movement, the device is carried on the body by a belt. The signal connection between the device and the computer is secured and examined for the last time before testing according to the specific muscles. (8:84)
- Recording and analysis: After ensuring that the connection is secured and the player is ready to perform, the electrical activity is recorded in the computer during the performance (6) attempts for each player for the muscles (4) during the performance and the signal arrives in raw form. .

**Completion Procedures**

After attaching the EMG device to the four muscles by the clamps of the tested player in their correct place and the player performs the javelin throw, the achievement data is recorded for performing the javelin throw through the data dump form and the electrical signals of the muscles are recorded through the customized program in the computer and 6 attempts are given to each player After that, the best (3) attempts are selected for each player, and thus the statistic depends on the set of sample readings.

**Experimental Experiment**

The two researchers conducted the exploratory experiment on Sunday, February 9, 2022, at exactly three o'clock in the evening, accompanied by the

assistant work team at the Athletics Training Center for the Disabled, on the same sample of the research key to avoid it. (Al-Mandalawi. 1989)

**Pre-test:**

The two researchers conducted the pre-test on Sunday, February 13, 2022 at 3:00 pm in the Athletics Training Center for the Disabled. After installing the EMG muscular activity device on the player, he performs the javelin throw from sitting, under the supervision of the supervisor and the assistant work team experts in measuring the muscular activity device EMG.

**Exercises used:**

The researchers prepared rebound force exercises that work on developing the EMG indicators for the working muscles and the completion of the spear, and setting repetitions, stress and appropriate rest periods, relying on scientific sources in the field of specialization and reviewing the opinions of some experts and specialists. For the players and the training periods and times, and the application of the rebound strength exercises was as follows: Starting the exercises on Wednesday 19/2/2022 and ending on Monday 18/5/2022, and the duration of the trainings is three months divided into two units per week on (Saturday and Wednesday) for a total of (24) units Training is the duration of the main experience and the exercises were applied during the main part in the special section, taking into account the individual differences between the players in terms of physical abilities, physical measurements and training age, and the training method used by the researchers was (period), (repetitive) appropriate with the special preparation stage, the researchers set his exercises and closed the general curriculum of the trainer by entering the special preparation stage, taking into account the fluctuation and gradualness of the load, the training intensity has started (75%) and incrementally until it reaches (100%) taking into account the number of repetitions and the period of rest and maintaining that the player does not reach the overload.

**Post-test:**

The post-test was conducted on the research sample after the end of the training curriculum on Saturday 25/5/2022 at the completion of four o'clock in the evening at the Athletics Training Center for the Disabled, and the researcher followed the same steps that the pretest did in terms of installing the EMG device for each player during the throwing performance And with the same measurement procedures and in the presence of the same work team and the supervisor.

**Statistical methods:** The search data was processed through the Statistical Package for the Social Sciences (SPSS).

**Results and Discussion**

Presentation and discussion of the results of the tests (pre-, post-test) of the EMG indicators and achievement (Tables 2-5).

**Discussion of the results of tests (pre and post) for indicators of electrical muscle activity (EMG) and achievement:**

It is evident from the tables (5,4,3,2) that there are significant differences between the tribal and remote tests and in favor of the post tests in the indicators of electrical activity for the first and second muscle groups. The rebound force training that was used had an effective effect in stimulating the working muscle groups positively in performing the movements as quickly as possible, which raised the intensity of the training load to a high degree and for a short period, and this was reflected in the improvement of performance and the electrical muscles of the muscles.

Many scientific sources confirm that rebound strength training causes an increase in the size and strength of muscles, ligaments and tendons as a kind of adaptation to protect them from damage caused to them as a result of increased tensile strength. A number of motor units, as mentions that "the physiological reason for the increase in electrical activity when the force of muscle contraction is increased is the increase in the number of motor units involved in this contraction, as well as the increase in their synchronization in work during contraction." (Abdel-Fattah and Hassanein. 1997). And mentions that "strength training affects the central nervous system and the processes of braking and increasing the ability to recruit muscle fibers" (Hossam El Din. 1994). The method on a regular basis helps to strengthen the muscles and control the kinetic weight, and moreover, this type of training during the special preparation phase reduces the risk of injuries (Lamy. 2011). Reflexive strength training stimulates changes in the neuromuscular system and increases the ability of the muscle group to respond quickly and powerfully to rapid changes to recruit motor units. (Kelve and Robert Versions. 2006).

As confirms that "the ability to stretch in the muscles contributes to increasing the speed of the motor performance of the exercises used" (Allawi and Ahmed Abdel-Fattah. 1984), as the regressive strength training works effectively as a result of the harmonious contractions of the working muscles from During the process of effective exchange in performance, it also works to improve the compatibility between the nerves feeding it in terms of increasing the frequency of the nerve signals of the working muscles. The coordination within the muscle includes the number of motor units, the frequency and speed of the nerve signals, increasing the activation of motor units and other neural adaptation processes. (Abdel Fattah. 1997).

**Table 2:** Shows the values of the arithmetic means, deviations, standard errors and the rate of evolution of the EMG indicators for the pre and post-tests.

| Variables | | Tests | Measuring unit | Mean | Std. Deviations | standard error | percentage of development |
|---|---|---|---|---|---|---|---|
| Middle deltoid muscle | peak rate | pre-test | microvolt | 604.0833 | 45.24772 | 13.06189 | 18.347 |
| | | post-test | | 714.9167 | 57.18146 | 16.50687 | |
| | highest peak | pre-test | microvolt | 1596.0833 | 72.44742 | 20.91377 | 18.759 |
| | | post-test | | 1895.5000 | 98.23117 | 28.35690 | |
| | area under the curve | pre-test | microvolt x sec | 3517.6667 | 130.22731 | 37.59339 | 23.403 |
| | | post-test | | 4340.9167 | 279.18728 | 80.59443 | |
| Biceps brachii muscle | peak rate | pre-test | microvolt | 77.1083 | 9.63294 | 2.78079 | 43.348 |
| | | post-test | | 110.5333 | 10.60337 | 3.06093 | |
| | highest peak | pre-test | microvolt | 395.8333 | 50.80056 | 14.66486 | 24.989 |
| | | post-test | | 494.7500 | 38.10303 | 10.99940 | |
| | area under the curve | pre-test | microvolt x sec | 427.1667 | 53.57719 | 15.46640 | 31.174 |
| | | post-test | | 560.3333 | 90.83485 | 26.22176 | |
| triceps brachii | peak rate | pre-test | microvolt | 153.1667 | 7.63763 | 2.20479 | 23.395 |
| | | post-test | | 189.0000 | 7.72246 | 2.22928 | |
| | highest peak | pre-test | microvolt | 1210.7500 | 51.46601 | 14.85696 | 12.733 |
| | | post-test | | 1364.9167 | 21.55103 | 6.22125 | |
| | area under the curve | pre-test | microvolt x sec | 1102.7500 | 69.89229 | 20.17617 | 21.325 |
| | | post-test | | 1337.9167 | 75.40009 | 21.76613 | |
| pectoralis major muscle | peak rate | pre-test | microvolt | 14.8833 | 1.31137 | .37856 | 69.978 |
| | | post-test | | 25.2983 | 2.73629 | .78990 | |
| | highest peak | pre-test | microvolt | 118.3333 | 9.33550 | 2.69493 | 14.647 |
| | | post-test | | 135.6667 | 7.83156 | 2.26078 | |
| | area under the curve | pre-test | microvolt x sec | 126.3333 | 7.94679 | 2.29404 | 14.485 |

**Table 3:** Shows the arithmetic means, deviations, standard errors of differences, the calculated (T) value, and the error rate of the EMG indicators for the pre and post-tests.

| Variables | | arithmetic mean of difference | standard deviation of differences | standard error of the mean difference | T value | Level sig | Type sig |
|---|---|---|---|---|---|---|---|
| Middle deltoid muscle | peak rate | 110.83333 | 62.62418 | 18.07804 | 6.131 | .000 | sig |
| | highest peak | -299.41667 | 114.83542 | 33.15013 | 9.032 | .000 | sig |
| | area under the curve | -823.25000 | 255.87004 | 73.86332 | 11.146 | .000 | sig |
| Biceps brachii muscle | peak rate | -33.42500 | 14.06085 | 4.05902 | 8.235 | .000 | sig |
| | highest peak | -98.91667 | 46.56659 | 13.44262 | 7.358 | .000 | sig |
| | area under the curve | -133.16667 | 62.14767 | 17.94049 | 7.423 | .000 | sig |
| triceps brachii | peak rate | -35.83333 | 10.41706 | 3.00715 | 11.916 | .000 | sig |
| | highest peak | -154.16667 | 60.66725 | 17.51313 | 8.803 | .000 | sig |
| | area under the curve | -235.16667 | 90.22682 | 26.04624 | 9.029 | .000 | sig |
| pectoralis major muscle | peak rate | -10.41500 | 2.48672 | .71786 | 14.508 | .000 | sig |
| | highest peak | -17.33333 | 11.91892 | 3.44070 | 5.038 | .000 | sig |
| | area under the curve | -18.30000 | 9.88985 | 2.85495 | 5.038 | .000 | sig |

**Table 4:** Shows the values of the arithmetic means, deviations, standard errors, and the percentage of development of achievement.

| Variables | Tests | Measuring unit | Mean | Std. Deviations | standard error | Percentage of development |
|---|---|---|---|---|---|---|
| Achievement | Pre-test | m | 11.9967 | 1.15567 | .33361 | 29.619 |
| | Post-test | | 15.5500 | 1.62649 | .46953 | |

**Table 5:** Shows the arithmetic means and standard deviations of the differences, the standard error, and the (T) value of favoritism for achievement.

| Variables | Arithmetic mean of difference | Standard deviation of differences | Standard error of the mean difference | T value | Level sig | Type sig |
|---|---|---|---|---|---|---|
| Achievement | 3.55333 | .80911 | .23357 | 15.213 | .000 | sig |

And that the rapid eccentric movement in regressive strength training generates a loop (extend-shortening) that precedes a larger central muscular action by the muscles themselves. This mechanism is the muscle spindle in relation to the amount and time of extension (the time taken for the muscle to change its action from the form of sympathetic lengthening to transcendental shortness). The movement causes the muscle that was previously stretched to shrink, and this process represents a protection for the muscle from being stretched more than its capacity. (Ibrahim. 2014). states that "reflexive force training improves the level of motor coordination to a large degree, and the functional ability of the central nervous system is one of the important factors determining the level of regressive force, and this is due to the fact that the performance of regressive force movements is allowed only for a short period of time. To expand the use of force, as it is performed in a very short period of time during which it must reach the use of the maximum possible level of strength, and regular proper training leads to reducing the time required for contraction of fast muscle fibers, as well as improving the coordination between working and opposite muscles, which leads to a decrease From the effect of braking the opposite muscles or completely eliminating them, and their level also depends on the speed of contraction of the muscle fibers. (Abdel Maqsoud. 1997). (Hussein Ali and Amer Fakher, 2006) states: "Rebound strength training depends on the stretching and shortening cycle using the muscle spindle reaction for the potential energy. Pulsating loops that line up a chain in the myofilament (actin, myosin, and tendon), and it is believed that focusing training on accelerating the stretch-shortening cycle will enhance the muscle group to move faster and with greater strength in response to changes in muscle length and tension, and improve stored elastic energy capacity during eccentric action of movement. This only happens when it is quickly exhausted, the energy is not used to perform a mechanical function but rather is dissipated in the form of heat (4:19). In addition, points out, "The regressive strength training works physiologically to lengthen the muscle fibers through the eccentric muscle contraction, followed immediately by the central contraction, where the muscle fibers are lengthened and shortened for working muscles. (Ahmed. 1996) . And (Talha Hossam El-Din and others, 1997) explains that "plyometric training is a directed method with the aim of developing explosive capacity more powerful,

added that the exercises that depend on the energy of the rubber bands and the work of the reflex sensory receptors achieve the greatest benefit by reducing the time period between lengthening and shortening, as this period was calculated and was about 0.85 milliseconds .Also, the energy stored in the muscles as a result of the stretching is released at a rapid rate during the phase of the shortened contraction and participates in the first ten moments of the second" (El Din and et al,. 1997).

## Conclusions and Recommendations

**Conclusions:**

- The rebound force training worked on developing some electrical activity indicators for the working muscles (peak, rate of peaks, area under the curve) and achievement for young javelin throwers cp34 class.
- The rebound strength training worked on developing the muscles working in performance, which helped in the development of motor transport, which contributed to the development of the achievement of these young javelin throwers from the seated cp34 category.
- The rebound strength training develops the explosive power of the upper extremities, which helped to develop the achievement of the seated javelin players of the cp34 category.

**Recommendations:**

- Necessity of adopting the exercises of sports trainers in Iraq and following the scientific method in measuring the development of the electrical activity of the EMG muscles in a sequential manner to show the safety of the training process.
- Emphasis on the development of regressive strength training that can be used in line with the kinetic path and the desired goal that works to support the training process.

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