



E-ISSN: 2707-7020
P-ISSN: 2707-7012
JSSN 2022; 3(1): 12-15
Received: 05-01-2022
Accepted: 13-02-2022
Published: 27-03-2022

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The use of preventive exercises to improve balance and muscle strength of the deltoid muscle and evaluated with EMG technology for weightlifting athletes with motor disabilities

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Abstract

Preventive exercises are one of the methods used to avoid injuries or weakness in the muscles by protecting the joints, tendons, ligaments and muscles working on them, as some weightlifting players for people with motor disabilities are exposed to injuries to the deltoid muscle of the shoulder joint, and the reason for these injuries is the nature of the effectiveness that depends in a way Head on the muscles of the shoulder joint, around which the quality of performance revolves, so Preventive exercises play a positive role by restoring the level of those muscle groups to their normal state of strength and muscular balance among the muscle groups. If the researchers Preparing exercises to protect the deltoid muscle (front and back) of the shoulder joint and assessing those using EMG technique for female weightlifting players with motor disabilities. And knowing the percentage of muscle strength that it has after the preventive curriculum, where the number of the sample was (6) national team players, and they were chosen in a deliberate way by diagnosing weaknesses by a physiotherapist, as the researchers developed a set of preventive exercises in the manner of performing the installation method, then Relaxation with contraction of the moving muscles (central and eccentric) by static and mobile stretching, weight training and resistance exercises, the duration of the preventive units lasted (8) weeks By (3) units per week, the time of the preventive unit (25-30) minutes, the weekly training days (Saturday, Monday, Wednesday), as the researchers concluded that the application of the preventive exercises used has a positive effect in increasing strength and muscular balance between the deltoid muscle fibers (front). And the background) of the shoulder joint among the players of the research sample, and this was evident through its evaluation with EMG technology for the pre and posttests, the results of which showed that there was a development in the muscular balance between the fibers (front and back) of the deltoid muscle, and in good proportions, which indicates the presence of muscular balance Between them after the end of the period of preventive exercises, the researchers recommend to use preventive exercises to strengthen the muscles working on the shoulder joint, Using rubber bands that perform in a central and eccentric manner.

Keywords: Preventive exercises, muscle strength, deltoid muscle, (EMG), weight lifting, people with disabilities

Introduction

Injury prevention is one of the important basic sciences specialized in the field of sports medicine, in which special exercises are used and applied to prevent sports injuries. That is, the player lies on the bench in a horizontal position so that the player's shoulders, buttocks and legs remain in contact with the bench during the lift, so the player lowers the weight placed on the rack so that it touches her chest and then raises it to the top as much as possible, and allows her to fix her legs with straps that wrap around the bench and her feet, under the supervision of the referee Through this technique, the players may be exposed during the performance to the deltoid muscle to a force of neuromuscular tension and a strong pressure applied to its fibers, which contributes to the possibility of injury. Player to stay away from sports competitions. Where (Medhat Qassem, 2000, p. 75) ^[6] indicates that sports injuries should be taken care of and prevented because this has a significant impact in maintaining the player's progress and continuing his practice of sports activity. Therefore, avoiding injuries should be the main concern and goal of officials in the sports field. Recent years have been characterized by an increase in the volume of sporting achievements, which has led to studies and research on injury prevention gaining special importance, as these

studies aim to reduce the incidence of injury in addition to shortening the time required for the player to return to sports form after being injured. (Schiff and others, 2010, pp. 42-46)^[10] point out the importance of muscular balance training programs in the prevention of injuries, and the results of their studies confirmed the effectiveness of this training, as a preventive measure against sports injuries. And here came the importance of research in the preparation of special preventive exercises to strengthen the front and back deltoid muscle of the shoulder joint and evaluate it with (EMG) technique to know the level of strength and muscular balance through the percentage of improvement, which is the muscles after the preventive exercises for the players selected to lift weights for people with motor disabilities.

Research problem: Through the researchers' work in the field of physical rehabilitation, they noticed the presence of some injuries to some players of the national weightlifting team for people with motor disabilities, so the researchers conducted an exploratory study to identify common injuries, and the study indicated that there are some injuries that weightlifting players are exposed to for people with disabilities. Mobility, especially in the shoulder area, due to the great burden on it, whether during training or tournaments, which prompted the researchers to prepare preventive exercises to avoid injuries to the shoulder joint as much as possible, and to focus on the elements of strength, muscle balance and flexibility within the preventive exercises, and then evaluate them through the technique of (EMG), to determine the scientific and practical level of muscle strength and balance after the end of the protective units.

The purpose of the research was

1. Preparing special exercises to protect the deltoid muscle of the shoulder joint in the research sample.
2. Identifying the effect of special preventive exercises in improving the muscle balance of the fibers (anterior and posterior) of the deltoid muscle through the results of two tests, before and after the research sample.

Previous studies: In (Cavotolis, Fabers, Menidroux, Wayne, 2005) that training with neuromuscular facilities for sensory receptors and its effect on the type of muscle fiber and its cross-sectional area have led to good results in improving muscle strength in a noticeable way. In the study (Boner, Davit, Gold, 2004), the study of the relationship between the duration of isometric contraction during stretching by stabilization- relaxation method and improving the flexibility of the posterior muscles of the thigh led to an improvement in the range of motion of the thigh joint by determining the time of isometric contraction by muscle lengthening.

Method and Tools

The researchers used the experimental method with a one-group design, experimental with two tests, pre- and post-test. The research sample and community are represented by the national team weightlifting players for people with motor disabilities, and their number is (6) players.

Search tests

Electromagnetic activity (EMG) test. (Imad Khalif Jaber Al-Asimi, 2019: 78)^[5].

- **Objective of the test:** To assess the strength and muscular balance of the deltoid muscle (front and back fibers).
- **Unit of measure:** Micro volts.
- **Tools used:** Iron blades weighing (15) kg, iron discs of different weights, electromyography device (EMG), chair for people with motor disabilities.

Performance and Recording Method: The electrical activity of the muscles is measured by means of the electromyography (EMG), by measuring the highest electrical activity of the deltoid muscle (anterior and posterior) of the shoulder joint of the target limb of the player in a test to assess strength and muscle balance through the performance of the front and back pressure tests, which is expressed by the crest of muscle contraction (highest wave), and through the results of the two tests (pre-post) of the deltoid muscle (anterior and posterior fibers), the strength of (the anterior deltoid muscle of the shoulder joint in the pre-test with the same muscle in the post-test) is evaluated and compared. Separately, as well as assessing and comparing the strength of (the posterior deltoid muscle of the shoulder joint in the pre-test with the same muscle in the post- test), also separately.

Measuring the strength of the fist (Abu Al-Ela Ahmed and Muhammad Subhi, 2004: 63)^[8]. The objective of the test: To measure the strength of the arm and shoulder muscles. Tools used: a dynamometer.

Unit of measurement: The kilogram

Performance method: The player is held in the first of the hand (the dynamometer) so that the pointer is facing outward, and the arm is extended aside so that the arm is not resting on the body. The player presses the cylinder with full force, as the force of the arm grip is measured.

Recording method: Measure the first three times and calculate the best one. Tribal tests. The tribal tests were conducted on the female athletes, the research sample, on (27/10/ 2021) in the hall designated for the Weightlifting Federation of the Iraqi National Paralympic Committee.

Preventive exercises

In order to achieve the objectives of the research, the researchers developed a set of preventive exercises through scientific sources (Brad Walker, 2007, p. 11)^[3] "The method of performing stabilization and then relaxation with contraction of the motor muscles in a manner (central and eccentric) with rubber bands, and it is after a lengthening of the rubber band with installation With the other hand, a steady contraction of the working muscle for a period of (8-20 seconds), after which he takes a short rest period of (5-10 seconds) and then performs the exercise with the other hand. Then all muscles relax for a period of (30 seconds) before repeating the exercise again. The preventive program includes exercises that are performed using resistances of gradual intensity, strength and weight exercises, and exercises that are performed using negative resistances include positive components of gradient intensity of the shoulder joint. Also, moving stretching exercises were used, and the speed of performance and rhythm of the exercise during execution is fast from (1-2) seconds, average from (2-4) seconds, and slow from (4-5) seconds, but in most cases the period of contraction by lengthening is greater

than by shortening. With relatively long rest periods, whether between repetitions or between groups or even between exercises, the researchers were dependent on the available scientific sources, and they were used by experts in the field of sports medicine. In choosing ways to use preventive exercises and with the help of rehabilitation methods and tools, the duration of the preventive units took (8) weeks. By (3) Units per week, the time of the preventive unit is (25-30) minutes, weekly training days (Saturday, Monday, Wednesday).

As preventive exercises were applied to the research group of female players, which contains resistance exercises, weights, static and mobile stretching exercises for the muscles, by the coach, or by the player herself, using them. The method (central and decentralized) with rubber bands, with intensity ranging from (60 - 80%), with repetitions

from (4 - 12), in groups (3-4), and with rest periods (30 - 60) seconds. distance tests.

The post-tests were conducted for the players, the research sample, on Wednesday (03/01/ 2022), in the special hall of the Federation of Weightlifting for People with Disabilities in the Iraqi Paralympic Games, as well as the researchers' keenness to provide the conditions and requirements in the tribal tests themselves, in terms of time, place and the auxiliary work team.

Statistical means

The researchers used the statistical bag (SPSS) Ready.

1. Arithmetic mean.
2. Standard deviation (T) test. Improvement coefficient. Results and discussion.

Table 1: Shows the results of the two tests (pre and post) of the electrical activity test (EMG) of the anterior and posterior pressure of the deltoid muscle.

The exams Measuring unit micro volts		Tribal measurement		Telemetry		Mean differences	The standard error of the mean teams	t value	Improvement rate
		s	±	s	±				
Test Electrical activity (EMG) of the deltoid muscle of the shoulder.	Forward pressure	2296.50	367.97	2774.75	966.09	478.25	403.69	3.90	20.82
	Back pressure	2035.50	482.79	2389.75	743.43	354.25	409.13	4.28	17.40

*Tabular value (T) is 1.89 at a significant level of significance ≤ (0.05) and at a degree of freedom (5).

Table 2: It shows the results of the two tests (pre and post) (to test the grip strength of the arm (right and left)).

The exams T		Tribal measurement		telemetry T		Mean M differences	The standard error of the mean teams	t value	Improvement I rate
		s	±	s	±				
grip strength Test	right arm R	34.97	5.06	41.81	6.99	6.84	0.56	11.59	19.56
	left arm L	32.00	3.87	37.95	4.33	5.95	0.41	14.51	18.59

*Table value (T) is 1.89 at a significant level of significance ≤ (0.05) and at a degree of freedom (5).

Discussing the results of the pre and post tests for the research sample

It is clear from the presentation of Table (1), that there are statistically significant differences in the electrical activity test (EMG) by evaluating the strength of the anterior deltoid and posterior deltoid muscle during the performance of the front and back pressure movement, there were statistically significant differences at the level of significance (0.05) between the two measurements before and after and in favor of the post measurement where the tabular (t) value was (1.89) is less than the (T) value calculated for the two tests, which ranged between (3.90: 4.28). It is also evident from Table (2), that there are statistically significant differences at the level of significance (0.05) between the two measurements, tribal and remote, in the research group in the grip strength test in favor of the post measurement, where the tabular (t) value (1.89) is less than the calculated (t) value. For the two tests, which ranged between (11.59: 14.51). It is clear from the same tables that the percentages of improvement in the muscular strength variable of the muscles working on the shoulder joint ranged in Table (1) between (20.82%: 17.40%) and in Table (2) between (19.56%: 18.59%) and from During this development of shoulder muscle strength and muscular balance. The researchers attribute this improvement to the result of improving the range of motion and strength of the muscles of the shoulder joint, and this is evidence that preventive exercises have been built on scientific foundations, and what these exercises include muscular strength by using passive lengthening and isometric contraction, and rubber bands,

which are characterized by diversity, gradation, and accuracy, and specialization, and comprehensiveness, in the use of resistors in terms of (strength and size) so that the player was able to use her maximum strength, through her evaluation in the EMG technology test), This is consistent with what was confirmed by (Mohamed Eid, 2009, p. 68) [7] that muscular strength training using weights and rubber bands works to develop and develop muscular strength in an effective manner, which helps prevent injuries. (Mohammed Al-Rubi, 2006, p. 128) indicates that practicing muscle strength exercises regularly, varied, and gradual, in terms of (size and intensity) helps to gain and grow strength, which helps prevent injuries, as strong muscles enable the athlete to move quickly while avoiding collision. injury, and increases joint stability, This is consistent with what was indicated by (Raysan Khribit, 2017, p. 170) [9], that “ mixing exercises directed to develop strength qualities with effort develops joint movement in one exercise helps to increase flexibility movement in joints, with indicators for effective development of balance and neuromuscular compatibility and some of the characteristics of Strength at the expense of an active preliminary stretching of the working and opposing muscles, which leads to an increase in muscle strength to produce maximum strength. This development in maximum strength can be explained from the researchers’ point of view to the effectiveness of exercises for muscular balance between working and opposing muscles, and that the level of development in the (post-test) test was good and sufficient for the muscles, as they became stronger and effective in performing the tests and the emergence of

significant differences, i.e. the presence of Differences between the arithmetic means of the anterior and posterior shoulder muscles and the closeness of the force ratio between them This is confirmed by the study (Amiri et al., 2005, p. 48) ^[4] of the need to pay attention to the balanced development of working and corresponding muscle strength on the same joint during programs designed to train muscle strength, and this leads to avoiding injuries.

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Appendix (1) Preventive exercises

T	exercise name exercise form	nature of performance		Repetition	Rest between psgrou	Comforts	groups	Tools
		stability	a movement					
1	From sitting, grip and extend the shoulder forward and .steady	s 15	√	6-4	s50	s 10	4-3	rubber band
2	From sitting, grip and extend the shoulder high and .still	s20	√	6-4	s50	s 10	4-3	rubber band
3	From sitting, arm in front, high in front of the chest. Pull the rubber band attached to the wall outward according to the ayer's pl abilities and the .switch		√	6-4	s50	s5	4-3	rubber band
4	From sitting, facing the wall, arms in front of high, -chest width apart, pull the rubber band attached to the wall inward and slowly		√	10-8	s40	s5	4-3	rubber band

	<i>come .back</i>							
5	<i>From ,sitting carrying the weight of the shepherd' next to the body, extending the arms up and for .stability</i>	20 - 10 sec		6-4	s50	s5	4-3	weight
6	<i>From sitting, holding the bar iron Behind the body neck push .up</i>		√	12-8	s40	s 10	4-3	iron bar
7	<i>From ,sitting ng holdi ng holdi the bar iron Top of the chest, in front of the neck, pushing .up</i>		√	15-8	s40	s 10	4-3	iron bar
8	<i>From sitting, holding the bar ,chest bar Raise the bar up in front of the chest and .stability</i>	s 3	√	12-10	s40	s 10	4-3	iron bar
9	<i>From sitting, holding the bar ,chest bar Raise the bar up under the chin with elbows bent and .steady</i>	s2	√	12-6	s40	s 10	4-3	bar iron
10	<i>From sitting, arms</i>	s4	√	8-6	s40	s 10	4-3	dumbbells

	<i>aside at a degree -90 angle, lift the weight of the arms up slightly and .stabilize</i>							
11	<i>om Fr sitting, carrying a weight, raising the arm high in front of the body at shoulder level with stability and switching.</i>	<i>s 3</i>	√	<i>10-6</i>	<i>s40</i>	<i>10</i>	<i>4-3</i>	<i>dumbbells</i>
12	<i>From sitting, carry a weight, elbows at shoulder level, push up, with arm turned .inward</i>		√	<i>12-10</i>	<i>s40</i>	<i>s 10</i>	<i>4-3</i>	<i>dumbbells</i>