# THE USE OF EXERCISES BY THERAPEUTIC METHODS IN THE REHABILITATION OF LOWER LIMBS MUSCLE INJURIES FOR YOUTH VOLLEYBALL PLAYERS

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**Abstract**

This study is significant because of the role of rehabilitation and physical exercises in restoring the functional work of the injured part through natural therapeutic means, especially for chronic injuries in the lower limb muscles. Retrieval of motor work of the lower limb. The research sample was (7) players deliberately chosen from the chronically injured youth volleyball players, and the method used is the one-group experimental method. As for the research tests, they included a test measuring the circumference of the thigh, the strength of the anterior and posterior thigh muscles, the strength stretcher, and the pain score questionnaire. The pre-tests were conducted and the motor exercises were applied after presenting them to the experts, and then we performed the post-tests for the research variables. The study found that the rehabilitation program had increased the muscular strength of the muscles of the lower limbs of the injured volleyball players, and the pre and post-tests of the pain index were statistically significantly different, and the presence of statistically significant differences between the pre and post-tests in increasing the strength of the front and back thigh muscles and the force protractor. The researchers also recommended the use of rehabilitation programs because of their importance in developing muscle strength and the need to appoint a doctor specializing in treatment and rehabilitation in each club.

**Keywords:** Therapeutic means, Muscles of the lower extremities.

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## Introduction and Study Importance

The great progress and development in all fields, and the sports field in particular, led to a high rise in other sciences related to sports, because of these sciences' big relationship with sports activity, causing a direct development of the athlete vital organs based on the effectiveness of practice, in particular in sports medicine and rehabilitation, experiencing a great development to return the injured players to the practicing sporting and to prevent injury again.

These sciences have developed training methods and rationing training loads more suitability to the body's endurance and for benefiting from the positive aspects of the functional body state. Nevertheless, the training curriculum, its constituents, inflicts a great burden on the various organs, joints, ligaments, tissues and muscles of the body, whether it is in sports training or competitions or in sports injuries due to sports stress. In addition, the percentage of injuries increases due to existing sports training. In an unscientific manner or using sports equipment that is not suitable for the age or physical fitness of the individual.

Also, the volleyball player needs a high level of physical fitness because of the specificity of this game, and distinguished performance with different positions and quick responses, as is the case in the performance of the spiking, as it is necessary for them to have strength in the muscles of the legs to be able to jump, and it is also significant that they have motor and transitional speed, speed in response time, etc., in addition to the availability of other physical capabilities. Thus, they must possess high physical abilities and competencies that enable them to perform at the best level.

In order to positively influence some of the physical capabilities that volleyball players need, work should be done to raise the physical level and reach the required physiological development, and this leads to an increase in the burden on the shoulders of the player, because this increase pushes the player to make a greater physical effort, so we find that sports injuries, especially muscle injuries The lower limbs accompany the volleyball player as a result of repeated jumping during training and during the match.

The application of physiotherapy (rehabilitation) helps to accelerate the recovery of volleyball players, because it provides the injured tissues with the appropriate environment for healing, and the blood supply speed to the place of injury after the end of the specified period, which facilitates the nutrition of the injured tissues and raises the temperature of the tissues to get rid of pain and muscle contraction. Physiotherapy helps on muscle relaxation and an increase in the level of metabolic reactions (Riyadh;, 1999, p. 130).

Sports rehabilitation combines physical exercises and other means of treatment to restore the player's high level of performance. Therefore, rehabilitation is an important aspect of treatment, and choosing an inappropriate approach for the kind and how sever the injury can affect the speed of recovery and then return to the field as soon as possible. "It appeared through clinical examinations that the return of the player to engage in sports activity before completing the appropriate rehabilitation course could lead to a recurrence of the injury in the future (Abbott H.G., 1999, p.332.).

Hence, for the contribution of the rehabilitation and returning of the injured players to the field, the study significance, being in avoiding the player's access to examples of chronic muscle injuries or the so-called chronic muscle disability caused by the return of the injured player to the field with no rehabilitation program, which doubles the injury. Then the player will suffer no pain despite the injury, as injury had a form of a new structure, leading to chronic injury, as well as enriching our sports library with such a study.

### The problem of the study

The percentage of injuries among volleyball players increases with the intensity and spread of sports competitions, especially injuries to the muscles of the lower limbs, as sports practice puts pressure on joints, synovial capsules, ligaments, muscle tendons, and muscles, which may cause chronic injury, in addition to injuries resulting from frequent high jumping and jumping with maximum force. And by reviewing the technical types of these injuries, and according to the researchers, most injuries, and by a high percentage, were affecting the muscles of the lower limbs.

These injuries are due to non-compliance with the application of the principles of modern scientific training, in addition to the improper injury diagnosis due to the absence of the specialist doctor, and scientific and technical treatment, and as a result of what was mentioned, and the return of the injured to the field, the diagnosed therapeutic methods and rehabilitative exercises were the greatest influential central approaches of treatment and rehabilitation.

Therefore, the researchers decided to use a rehabilitative therapeutic training approach that includes some different therapeutic means and methods aimed at rehabilitating exercises after injury or surgical intervention, an effort by the researchers for the completion of the player's readiness for achieving the required athletic achievement according to the foundations of the relationship between the sports training physiology and the physical therapy requirements. Through this relationship through, is possible to treat the lower limbs muscle injuries that may lead to an imbalance of the controlling forces if left, which leads to chronic acute injury and then distancing from the field.

### The aims of the study

The study works on:

1. The use of therapeutic methods in the rehabilitation of lower limbs muscle injuries for youth volleyball players.
2. Identifying the effect of using exercises by therapeutic methods in rehabilitating lower limbs muscle injuries for youth volleyball players.

### Research Hypotheses

**1.** The effect of using exercises by therapeutic methods showed statistically significant differences for the pre and post-tests, in favour of the post-test.

**2.** Exercises with therapeutic methods have a positive effect in rehabilitating lower limbs muscle injuries for youth volleyball players.

**Definition of terms**

**Rehabilitation:** It is to restore the injured part to its original state before the injury, and this requires full knowledge of the condition of the injured part before it was exposed to the injury, in addition to knowing its functional capacity and anatomical condition (Mohammed, 1990, p. 13.).

**Methodology and Field Procedures**

**Methodology**

The experimental approach was used for one group with two pre and post- because it suits the study problem.

**The research community and its sample**

The researchers sampled youth volleyball players in an intentional manner, due to the specificity of the study, which requires identifying and treating players' injuries. Therefore, the researchers selected (7) players from the total number of youth players: (4) players from the Amana-Baghdad Club and (3) injured lower limb players from Al-Sinaa Sports Club, and because the study adopted on the injury and its diagnosis regardless of heights, weights, or the training age. The research sample was (5) players, while the other two were randomly chosen for the pilot study.

**Tests and measurements used in the research:** (Al-Najmi, 1998, pg. 78-81)

The tests and measurements were presented to some experts prior to starting the pilot study. Upon this study, all tests and measurements were applied.

**Measurement of muscular strength:** (Hasnain, 1995, p. 66)

**Measuring the thigh affected leg circumference:**

α. Purpose of measurement: Measurement of the thigh circumference of the injured leg.

β. Tools used: A bench of suitable height for the player to stand on.

χ. Performance description: The injured player stands upright, then the length of the thigh is measured "from the greater trochanter of the upper head of the femur to the lateral edge of the middle of the knee joint". Lower section area the total thigh circumference is measured with a tape measure.

**Measuring the strength endurance of the legs muscles**

The measurement aim to measure the front and back thigh muscular strength endurance by testing the full flexion and extension of the legs.

**Tools used:** body weight only.

**The performance:** The tester stands with his hands behind his head intertwined while giving the start signal. The tester bends his legs and extends them fully with the erection of the torso position, and counts the number of times of bending and extending with exhaustion of effort.

**Measuring the strength of the front thigh muscles**

The measurement aims: the strength of the front thigh muscles calculation.

- The tools used to carry out the test: the multigym device.
- Test description: The tester sits on the bench designated for measurement on the multigym device (front squat), sitting position with the legs bent, puts two feet on the lifting levers, then raises the legs from the knee joint, where the weight is placed on this lever according to the methodology set for the test.

**Measuring the strength of the posterior thigh muscles**

The measurement aims: (Measuring the strength of the muscles of the back thighs).

- **The tools:** the multigym device.
- **The test:** Leaning on the bench designated for measurement on the multigym device Back pulling on the multigym Raising the lever loaded with weight from the back up several times according to the methodology set for the test.

**Pilot study**

In the pilot study, the necessity of having the same conditions and circumstances for the main experiment, as far as possible, so the results are considered was taken into account (Issawi; 1994, p. 58).

As the researchers conducted their pilot study on 9/19/2021 on a sample of two players selected randomly from the study sample, then they re-conducted experiment after 6 days, i. stability and objectivity) for ensuring the safety of the devices and tools, for avoiding the negative aspects form the main experiment, for training the assistant working team on the exercises by therapeutic methods and giving a correct idea on their use.

There were positive outcomes in applying the exploratory experiment:

1. The devices and tools used were safe.
2. The measurements and tests for the sample were suitable.
3. The exercises by therapeutic methods were completely understandable.
4. The scientific parameters of the tests (validity, reliability and objectivity) were extracted.

The Pearson correlation coefficient revealed correlation between the first and second tests. Its value for testing the strength of the muscles of the lower extremities was (0.83) and for the circumference of the injured leg thigh was (0.88), the value of the strength endurance test for the legs muscles was (0.82), yet the strength of the front thigh muscles was (0.83), and the correlation coefficient of strength of the muscles of the back thighs was (0.85). The test stability degree is high. The closer the stability coefficient is to (+1), and obtaining a test with a high degree of reliability and objective the coefficient. (The high coefficient of reliability was significantly objective) (Kharibt and Shalash, 1992, p. 20).

**Pain score measurement form:** (Hosie, 1996; 35 (suppli): P: 39-43.

**Pain Test (V.A.S) Visual Analogue Scale:** The researchers showed that the pain in the lower limbs area based on specific movements of the injury region, and it was adopted to know the percentage of pain for the pre and post-tests, through a special ruler in which the pain intensity ranges from (0-10) and this ruler is considered (imaginary ruler) that shows how much of change in the pain degree happened. We presented the movements and the imaginary ruler to some experts who agreed on its suitability for the test. The movements are:

1. **Raising the legs outstretched to the top from the supine position:** The ruler is (75) cm which was the highest degree achieved by that the sample divided by (10), so that every (7.5) cm stands for one.
2. **Raising the torso to the top from the prone positions:** The ruler is (50) cm, which was the highest degree achieved divided by (10), and every (5) cm stands foe one degree. A degree (0) means no pain, and a degree (10) means high pain.

**Pre-tests**

Pre-tests on sample on Sunday 10/25/2021 were in the inner hall of the Amana-Baghdad Sports Club. We considered the fixing the conditions for the tests, the conducting method, and the work team to have the same conditions as much possible.

**Suggested therapeutic Exercise Curriculum**

The researchers prepared a kinetic exercises curriculum based on the sources of training science and presented it to experts * in training science, sports physiology, and specialists in sports and therapeutic medicine to develop muscle strength, and their opinions all agree that the use of rehabilitative exercises should not be accompanied by a feeling of pain. We began applying the curriculum the experimental group by the circular training method on 10/1/2022, with (3) training units a week for (4) weeks, and thus all training units became (12), for (30-45) minutes for each training unit. In their supervision of the main section, the researchers took into account the following points:

**Warm up:** Fellow team members warm-up for the players with their pains emphasizing the warm-up on the muscles of the lower limbs for preparation for the major section in the first part (the physical side), through particular therapeutic exercises for the injured players and the usual physical side to the team players. The warm-up consisted of: (Walking, spot jumping and light jogging, upper limb muscle exercises, torso rotation exercises, and lower limb muscle stretching exercises).

**The main section:** This section has:

α. The physical part (particular therapeutic exercises)

β. The skill part (skills - game plans)

χ. The physical aspect (special therapeutic exercises):

The exercises last for (30) minutes from the time is the section physical side. The researchers used a group of moving and static exercises, as well as some different exercises that contain stability and movement within the same exercise. In this section, the focus is on the factors of slowness and accuracy. In these exercises for the completion of stretching the muscle for avoiding any injuries, excessive stretching exercises reduce removal of the pain, so the principle of gradual intensity for removing pain is applied returning to the normal state) (David, 2003). P:7 2.).

The researchers test the maximum repetition every week for finding the development in muscle strength to ensure the functioning of load development and intensity gradient correctly and the extent to which the muscle adapts to this gradient, avoiding error and avoiding a health setback.

The researchers developed a therapeutic approach that precedes the curriculum of rehabilitative exercises to reduce pain and inflammation, and then the growth likelihood and injured tissue activity to the point where the tested can perform its exercises first and second to prevent the severity of the injury and then be final and prevent the athlete for returning to the field. Experts have identified three of the methods used by researchers from the moment of starting the treatment of the injury until the start of the rehabilitative approach, which are:

- Cooling.
- Massaging device (electric).
- Manual massaging.

In the curriculum, these methods have been adopted and their timings have been set according to the doctors' directions. The device used was explained, the time of treatment, the units, and the time of the rehabilitation unit for the injured. The duration of the curriculum was four weeks, starting on 9/21/2021 until 10/21/2021. Its treatment units ranged from 3 units per week.

This is to reduce the intensity obtained from the effect of exercise and to try to get rid of metabolic waste and excrete it

Special exercises were prepared to develop the working muscles by strengthening the muscles of the lower limbs, of the thighs, raising their flexibility and strength endurance, relieving pain, using the means of the scientific references for achieving this.

A group of experts and specialists reviewed these exercises and agreed that therapeutic exercises were appropriate adding some exercises for achieving the study aims.

**Post-tests**

Upon the completion of the training units - all (4) week therapeutic exercises, at the rate of (3) units per week, the post-tests were also on Saturday 11/3/2022 to measure the progress of the sample. The researchers took conducting in the same conditions of place and time in which the pre-tests into consideration.

**Results and Discussion**

This part consists of the results, their analysis and discussion, and the researchers presented them with tables for the purpose of analysing and discussing them according to the research objectives:

**Analysis and discussion of the results of measuring the degree of pain**

To find out the significant differences between the pre and post-tests in calculating the degree of pain, the (T. test) for corresponding samples was used, as table 1 (Table 1).

**Analysis and discussion of the results of strength endurance for the muscles of the legs**

To find the significant differences between the pre and post-tests in the strength endurance test for legs muscles, the T. test for one sample was used as table 2 (Table 2).

Table 2 shows the value of the arithmetic mean (for the strength endurance test for legs muscles) in the pre-test was (26.98) with an Std (1.44), while the arithmetic mean in the post-test was (34.65) an Std (2.65). . The calculated (T) value was (10.86), bigger than the tabular value (2.22), with a degree of freedom (6) lower than the significance (0.05), indicating significant differences in favour of the post-test.

**Analysis and discussion of the results of the strength of the anterior thigh muscles**

To find the significant differences between the pre and post-tests in the strength of the anterior thigh muscles, the (T. test) of samples was used as in table 3 (Table 3).

Table 3 shows the value of the arithmetic mean (anterior thigh muscle strength) in the pre-test was (6.40) with an Std (1.97), and arithmetic mean in the post-test was (12.76) with an Std(2.77). The calculated (t) value (6.70) was greater than the tabular value (2.22) whose degree of freedom (6) was lower than the level of significance (0.05) indicating of significant differences in favour of the post-test.

**Analysis and discussion of the results of the strength of the posterior thigh muscles**

Table 4 shows arithmetic mean (posterior thigh muscle strength) in the pre-test (5.55) with an Std(1.54), while the arithmetic mean in the post-test was (10.54) with an Std( 3.05), and the calculated (T) value (6.55) was bigger than the tabular one (2.22) whose degree of freedom (6) was lower than the significance level (0.05) confirming significant differences in favour of the post-test.

**Results and Discussion**

There were clear the differences in the pre-test and in favour of the post-test upon the use of the rehabilitative exercises for the injuries of the muscles of the lower limbs of the volleyball players (youth). These significant differences in the research sample indicate the rehabilitative exercise effectiveness the used by the researchers, which led to the development of muscle strength, which is an indicator of muscle health and safety. The delayed onset of

**Table 1:** The arithmetic mean, Std, and the value of (T) in the pre and post-tests of the sample pain degree.

| variables | Pre-test | | Post-test | | degree of freedom | tabular (v) value | T value | significance |
|---|---|---|---|---|---|---|---|---|
| | arithmetic mean | Std. | arithmetic mean | Std. | | | | |
| Pain score | **4.67** | **1.58** | **1.88** | **0.75** | **4.00** | **2.22** | **11.09** | significant |
| *The (t) tabular value is (2.22) lower than significance (0.05) having a degree of freedom (4).<br>Table (1) shows the value of the arithmetic mean (to measure the degree of pain) in the pre-test was (4.67) with an Std (1.58), while the arithmetic mean in the post-test was (1.88) with an Std (0.75). Calculated (T) value was (11.09), greater than the tabular value (2.22) and with a degree of freedom (4) lower than the significance (0.05) indicating significant differences in favour of the post-test. | | | | | | | | |

**Table 2:** The arithmetic mean, Std, and the value of (T) in the study pre and post-tests sample in the strength endurance test for legs muscles.

| variables | Pre-test | | Post-test | | degree of freedom | tabular (v) value | T value | significance |
|---|---|---|---|---|---|---|---|---|
| | arithmetic mean | Std. | arithmetic mean | Std. | | | | |
| strength endurance for legs muscles | 22.98 | 1.44 | 34.19 | 2.65 | 7.43 | 2.22 | 10,86 | significant |
| * The tabular value of (t) is (2.22) under the level of significance (0.05) and with a degree of freedom (4). | | | | | | | | |

**Table 3:** The arithmetic mean, Std, and the value of (T) in the pre and post-tests of the rsample in the strength of the anterior thigh muscles.

| variables | Pre-test | | Post-test | | degree of freedom | tabular (v) value | T value | significance |
|---|---|---|---|---|---|---|---|---|
| | arithmetic mean | Std. | arithmetic mean | Std. | | | | |
| **Anterior thigh muscle strength** | **6,40** | **1.97** | **12.76** | **2,77** | **6.80** | **0.55** | **6.70** | **significant** |
| * The tabular value of (t) is (2.22) under the level of significance (0.05) and with a degree of freedom (4). | | | | | | | | |

**Table 4:** The arithmetic mean, Std, and the value of (T) in the pre and post-tests in the strength of the posterior thigh muscles.

| variables | Pre-test | | Post-test | | degree of freedom | tabular (v) value | T value | significance |
|---|---|---|---|---|---|---|---|---|
| | arithmetic mean | Std. | arithmetic mean | Std. | | | | |
| Anterior thigh muscle strength | 5,55 | 1,54 | 10.54 | 3,05 | - 5,86 | 0.66 | 6,55 | significant |
| * The tabular value of (t) is (2.22) under the level of significance (0.05) and with a degree of freedom (4). | | | | | | | | |

fatigue, pain tolerance, and permanence of its continuity, contraction duration and frequency is a prominent indicator of muscle adaptation, increasing its strength and its ability to continue in its functional work resulting from the application of the training curriculum under study, which was able to reach the affected muscle to significant differences.

It works to develop the player's endurance and delay the onset of fatigue. (Allawi, 1997, p. 885).

We attribute the development of the muscle and its strength to the organized training, which made the muscular atrophy and weak muscle strength to the enlargement and development of its strength and the increase in the time the muscle continues to contract with high efficiency, high frequency, and delayed onset of fatigue.

As "muscle strength grows without an increase in muscle size, and this growth is due to the role of the nervous system and this is usually noticed at the beginning of training curricula for muscle strength" (Allawi and Abdel-Fattah, 2000, p. 127) And that the increase in muscle strength as a result of the application of the curriculum (exercises) led to its lengthening and the continuity and duration of muscle contraction, and the increase in contraction strength comes from the participation of the largest number of motor units and the increase in the frequency of the signal through them.

“Rehabilitation exercises can isolate one of the muscles and train them on their own.” “This method can be used to train isolated muscle groups and direct training to them alone, and thus this training is highly suitable for training that leads to rehabilitation after injury (.. Brannon. 2006 . p. 23 .)

The researchers believe that the group of exercises achieved a development in the continuity of the muscle strength being effective, which led to giving significant results in the effect of continuity and contraction frequency. This condition can only be reached through training and performing therapeutic exercises for muscular strength, which in turn activate the reflexive actions of the nervous system to innervate the largest possible number of muscle fibres.

Therapeutic exercises stimulate the weak muscles through the nerves feeding them. When performing the exercises with maximum strength, a strong tension is obtained on the sense organs and muscle spindles (Sharida, 1990, p. 138).

The significant differences in the post-test could be due to – using cooling methods, the massage device (electrical massage), and the manual massage, which performs a therapeutic aspect in repairing the imbalance, preventing pain, maintaining muscle tone, and not muscle atrophy. This method develops muscle strength significantly because the means the therapeutic methods can extend the muscle by inflation and increase the speed of contraction of the fibres. The therapeutic methods depend on the ability of the nerve to send high-frequency nerve signals to produce a strong contraction.

This is what was indicated by (Raisan Khraibet, and Ali Turki, 2002), when they mentioned that “the resulting force in muscle contraction is related to the amount of motor units participating in this contraction, and under the influence of strength training, the ability of the nervous system to recruit a greater number of motor units to participate in the muscle contraction increases, and thus Increase muscular strength.

This was proven by the set of exercises and the reason for the development to the effectiveness of the rehabilitative curriculum, as it was able to develop muscle strength by recruiting the largest number of motor units to activate the muscle, prevent its atrophy, limit its movement, activate the nervous system to increase sensation and neurological compatibility, and increase the frequency and frequency of nerve signals to mobilize the largest possible number of units, as some Motor units do not contract during voluntary action, and this leads to an opportunity to reduce pain.

Therefore, the differences in these indicators in favour of the post-test clearly indicated that the exercises used in the rehabilitation were effective in developing the muscular strength of the legs.

## Conclusions and Recommendations

### Conclusions

1. The prepared rehabilitation program made the muscle stronger in muscle groups working on the lower limbs of the youth volleyball players.

2. There the pre and post-tests for indicators of pain reduction showed statistically significant differences.

3. The pre and post-tests for the indicators of developing the muscular strength of the legs revealed statistically significant differences.

4. There are statistically significant differences between the pre and post-tests of the research sample for the indicators of developing the strength of the anterior thigh muscles

5. There are statistically significant differences between the pre and post-tests of the research sample for the indicators of developing the strength of the posterior thigh muscles.

### Recommendations

1. The necessity of conducting similar studies and preparing rehabilitation programs for the various parts and joints of the other affected body, in addition to the medical aspect.

2. Using rehabilitative programs because of their scientific importance in developing the size and strength of muscles to reach the normal state and in an appropriate standard period.

3. Diagnosing the injury and using the method of treatment must be at the doctor’s command. For this reason, the researchers recommend appointing a doctor who specializes in treatment and rehabilitation in each sports federation or club.

4. Opening educational courses for coaches and players of individual or group games, in order to avoid acute and chronic injuries.

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