

## THE ROLE OF STRUCTURED PHYSICAL REHABILITATION (STATIC AND DYNAMIC) IN TREATING LUMBAR MUSCLE INJURIES AMONG ATHLETES: A COMPREHENSIVE STUDY

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### ABSTRACT

Sports rehabilitation is one of the branches of modern sports medicine, which works to restore the athlete's motor ability and skill that he may lose as a result of an injury he may have suffered while playing one of the sports he plays. There is a constant fear on the part of the player and the coach alike of the occurrence of an injury to the (muscles of the lumbar region) or the return or aggravation of the previous injury, as the injured player must regain full physical fitness before we allow him to participate in matches or competitions, as his participation in... Competitions before the lower back muscles regain their natural strength and flexibility lead to injury complications. Spinal injury is one of the most common injuries that players are exposed to in various sports, including open football and the effectiveness of weightlifting by increasing weights and increasing the repetition of the exercise, which leads to making some players compete to achieve progress as quickly as possible, and sometimes this rapid progress leads to the occurrence of The injury, especially in the lower back muscles, is due to the increased stress on this important area in most of the exercises that weightlifters need, and thus the results of haste are reversed. Likewise, football events are among the most team sports in which players are exposed to friction with the opponent, which is one of the most important reasons for this injury to occur. It is pushing from behind while going up to hit the ball, as well as bending the torso backwards in an exaggerated manner, falling to the ground, colliding with a solid part as a result of a sudden movement, in addition to a group of other reasons that lead to injuries to the lower back, especially the lumbar region. Hence lies the importance of the research. The researcher noted that This injury was dealt with from the perspective of various physical therapy methods (laser and electrotherapy) and neglected the role of standardized physical and motor rehabilitation. The process of integrated motor rehabilitation is through preparing preparations for rehabilitative exercises (static and dynamic) and their impact on the injury to the muscles of the lumbar region, improving the physical and physiological response, and preventing recurrence. Injury and muscle recovery to their normal state.

**Keywords:** sports rehabilitation, static and dynamic rehabilitation, lumbar muscles.

### INTRODUCTION

#### Importance of the Research

Sports rehabilitation is one of the branches of modern sports medicine that aims to restore an athlete's lost physical ability and skill due to an injury that may occur while practicing a sport. There is always a constant fear among both the player and the coach of the occurrence of an injury in the lumbar muscles or the return and exacerbation of a previous injury. The injured

player must regain full physical fitness before being allowed to participate in matches or competitions, as participating in competitions before recovering the strength and natural flexibility of the lower back muscles can lead to complications. Spinal injury is one of the most common injuries that athletes in various sports, such as open football and weightlifting, may experience due to increasing weights and repetitions in order to achieve progress as quickly as possible. This rapid progress can lead to injury, especially in the lower back muscles, due to the increased stress on this important area in most weightlifting exercises. Therefore, the results of rushing can be counterproductive. Similarly, football activities involve a lot of contact with opponents, and one of the main causes of injury is pushing from behind while

jumping to head the ball, as well as excessive bending of the trunk backward, falling on the ground, and colliding with a solid object due to sudden movement, in addition to other causes that lead to lower back injuries, especially in the lumbar region. Hence, the importance of research lies in the fact that the researcher noticed that this injury has been addressed from the perspective of various physical therapy methods (laser and electrical therapy), while the role of structured physical rehabilitation has been neglected. Therefore, the integrated physical rehabilitation process through the implementation of rehabilitation exercises (static and dynamic) and its effect on lumbar muscle injury and improvement of physical and physiological response, prevention of injury recurrence, and restoration of muscles to their natural state is of great importance.

### **Research Problem:**

Despite the progress in various medical sciences and the adoption of new treatment methods, the use of the latest devices and tools, and the availability of specialists such as doctors and rehabilitation specialists in the field of sports injuries, sports injuries still remain widespread and threaten performance levels. Therefore, the researcher aims to prepare and design rehabilitation exercises that include a set of exercises (static and dynamic) due to their importance in strengthening and flexing the lower back muscles to restore these muscles to their natural state and eliminate pain permanently in the shortest possible time.

### **Research Objectives:**

#### **The research aims to:**

1. Prepare rehabilitation exercises (static and dynamic) for lumbar muscle injury, indicating strength in athletes.
2. Identify the differences between pre-test and post-test measurements for the experimental and control groups.
3. Determine the effect of rehabilitation exercises (static and dynamic) on lumbar muscles.

#### **Research Assumptions:**

Based on the research objectives, the researcher assumes:

The presence of statistically significant differences between pre-test and post-test measurements in the level of strength of the lumbar muscles in the research sample.

### **Research Scope:**

1. Human Scope: Injured athletes in the lumbar spine (lumbar region), with a total of 8 injured individuals.
2. Time Scope: From December 25, 2022, to August 2, 2023.
3. Spatial Scope: Sport Gym Hall for Fitness and Bodybuilding in Najaf Al-Ashraf. Limb Rehabilitation Center / Najaf Al-Ashraf Teaching Hospital.

### **Research Methodology and Field Procedures:**

#### **Research Method:**

The nature of the problem determines the type of methodology used, so the researcher employed the experimental method, which is considered the most accurate and reliable

approach for solving various scientific problems practically and theoretically. (Mohamed Hassan: 1999: 2017)

**Research Population and Sample:**

The research population included athletes from football clubs and weightlifting activities in Al-Najaf province, who were selected intentionally. The researcher decided to study the topic of muscle injury, specifically the injury of the muscles surrounding the cervical region of the spine. The research sample consisted of (8) injured players, who were selected by distributing questionnaires to coaches and players of those clubs, as well as to specialized clinics and private and governmental physiotherapy centers. They were randomly divided into two groups: an experimental group, which underwent rehabilitation through a program prepared by the researcher including fixed and dynamic rehabilitation exercises, and a control group, which received rehabilitation through the physiotherapy unit at Al-Najaf Teaching Hospital/Physiotherapy Department.

**Homogeneity of the Research Sample:**

In order to achieve a uniform level for the research sample and to avoid individual differences that may affect the research results in terms of motor range and strength variables, the researcher conducted homogeneity tests for the individuals in both the control and experimental groups, as shown in Tables (1) and (2).

Table (1) Shows the homogeneity of the sample in the variables related to the research individuals of the control group.

Variables	Measurement Unit	Mean	Deviation	Median	Variability	Significance
Body Flexion	degrees	134.750	4.113	134.500	0.356	Homogeneous
Body Extension	degrees	160.500	4.203	161.000	-0.646	Homogeneous
Body Right Rotation	degrees	152.250	2.630	152.000	0.124	Homogeneous
Body Left Rotation	degrees	153.750	4.787	152.500	0.855	Homogeneous
Body Right Torsion	degrees	65.250	3.686	65.000	0.404	Homogeneous
Body Left Torsion	degrees	66.250	0.957	67.500	-0.855	Homogeneous
Strength	kilograms	4.250	0.957	4.500	-0.855	Homogeneous

Table (2) Shows the homogeneity of the experimental group.

Variables	Measurement Unit	Mean	Deviation	Median	Variability	Significance
Body Flexion	degrees	130.750	3.304	131.000	-0.229	Homogeneous
Body Extension	degrees	162.250	2.630	162.000	0.124	Homogeneous

Body Right Rotation	degrees	150.750	1.708	150.500	0.753	Homogeneous
Body Left Rotation	degrees	152.250	2.630	152.000	0.124	Homogeneous
Body Right Torsion	degrees	64.750	4.787	61.500	0.855	Homogeneous
Body Left Torsion	degrees	63.750	1.708	64.500	0.753	Homogeneous
Strength	kilograms	4.625	0.479	4.750	-0.855	Homogeneous

### Equivalence of Research Sample

One of the important aspects that the researcher should adhere to is attributing differences to the experimental factor. Therefore, the research experimental and control groups must be equivalent. Before commencing the experimental method, the researcher should ensure achieving equivalence between the control and experimental groups.

The table (3) shows the homogeneity of the research sample.

Variables	Control Group		Experimental Group		t-Value	Significance Level
	M	SD	M	SD		
Body Flexion	134.750	4.113	1.516	0.180	1.516	0.180
Body Extension	160.500	4.203	0.706	0.507	0.706	0.507
Body Right Rotation	152.250	2.630	0.957	0.376	0.957	0.376
Body Left Rotation	153.750	4.787	0.549	0.603	0.549	0.603
Body Right Torsion	64.250	3.686	0.497	0.637	0.497	0.637
Body Left Torsion	63.250	0.957	1.532	0.176	1.532	0.176
Strength	4.250	0.957	0.701	0.510	0.701	0.510

### Injury Diagnosis:

The injury was diagnosed by a specialist doctor through a clinical examination. Each injured person was given a specific form, and the clinical signs observed during the examination included:

1. Severe pain in the injured area, especially during movement.
2. Redness in the muscles on one side of the affected area.
3. Difficulty bending the trunk forward and backward.
4. Increased temperature in the injured area due to the tear.

X-rays (A.R.M) were taken, which played an effective role in the accurate diagnosis. Through the clinical examination and MRI, the injury was identified as a moderate tear in the surrounding muscles of the affected area.

Description of Back Muscle Strength Test (Smea Khalil: 2010: 145)

The strength of the trunk muscles (the cotton area) was measured two weeks after the injury occurred, as during this period, the injury had sufficient rest after being presented to the specialist doctor.

- Objective of the test: To measure the strength of the trunk muscles.
- Equipment: Inclined bench (Hak Back device).
- Performance specifications:

The injured person assumes a forward inclined position on the device with the feet secured. From the downward position, an appropriate weight is placed behind the neck, and then the person ascends. The movement is performed once for each weight, pausing when pain is felt. Recording method:

The maximum weight that can be lifted once, until pain is felt, is recorded.

Description of Spinal Range of Motion Test (Jenny Sankleif: 1999: 141)

The range of motion test for the trunk involves two tests to measure the angles of the basic trunk movements (forward flexion, backward flexion, right lateral flexion, left lateral flexion, left trunk rotation, right trunk rotation) in different directions, one week after the injury occurred.

Firstly, Description of Measuring the Angles of Basic Spinal Movements:

- Objective of the test: To measure the range of motion for the angles of basic spinal movements:

Forward flexion - Backward flexion - Right lateral flexion - Left lateral flexion.

Performance specifications:

The injured person performs the test in different directions to measure the range of motion of the trunk in four directions (forward flexion, backward flexion, right lateral flexion, left lateral flexion), as shown in the figure below.

- Recording method:

The angles for the four directions are recorded in the player's form as they perform these movements to the maximum range that the joint can reach before feeling pain. Video recording of the injured player was also conducted.

Secondly, Description of Measuring Trunk Rotation Range of Motion to the Right and Left:

- Objective of the test: To measure the angle of trunk rotation (right and left).

- Equipment: Camera - Kinova software.

- Performance specifications:

The player stands with feet shoulder-width apart. The player rotates the trunk to the right until the first sign of pain is felt, then stops and rotates to the left.

- Recording:

Using the camera and Kinova software, the angles are recorded from the middle of the neck to the arm.

### Main Research Procedures

The researcher relied on the following steps in the research procedures after identifying all the variables and conditions related to the research in order to conduct the field experiment. The researcher determined the days and times for conducting the pre-tests for the research sample.

Pre-test:

The researcher conducted the pre-tests for the research sample from January 17, 2023, to May 1, 2023. The range of motion of the trunk was measured in four directions using a device specifically designed to measure the angles of basic movements, in addition to using Kinova software to measure trunk rotation to the right and left. The strength measurement was done two days after measuring the range of motion, where the strength of the muscles in the cotton area was measured for both the right and left sides separately.

### Rehabilitation Exercises:

The rehabilitation exercises were applied from January 19, 2023, to June 23, 2023. The injured players were not available at the same time, so the rehabilitation exercises were applied to the experimental group, while the control group followed the program prepared in the physiotherapy unit at Al-Najaf Teaching Hospital. The researcher included the following elements in the rehabilitation exercises:

- Static and dynamic exercises.
- The rehabilitation exercises were applied at 9 AM.
- The duration of static exercises was 10 seconds, while the duration of dynamic exercises depended on the repetition.
- The duration of the rehabilitation exercises ranged from 25 to 114 minutes.
- The application of the rehabilitation exercises took 6 weeks, with 4 sessions per week, totaling 24 rehabilitation sessions.
- The researcher considered diversity in the rehabilitation exercises.
- The intensity was distributed gradually between weeks, sessions, and exercises, with a ratio of 1:1.
- The intensity of the rehabilitation exercises ranged from 90% to 35%.
- The intensity for each exercise and each player was individually determined, with weights ranging from body weight to 1 kg to 50 kg.
- The researcher followed a progression from easy to difficult in the exercises.
- At the beginning of the training sessions, the exercises were performed with body weight, then weights were added to ensure proper technique.
- The application of the rehabilitation exercises was done by the researcher and the supervisor for the experimental group in the main department, immediately after warm-up, to ensure that the player was physically prepared and had neuromuscular coordination to achieve the goal of the proposed exercises.

### The post-test

After applying the vocabulary of the rehabilitation exercises over a period of (6) weeks and effectively without delay, the days for conducting the post-tests for the research sample were determined. Following the same procedures as the pre-tests, the post-tests were conducted for the individuals of the research sample from 25/4/2023 to 2/8/2023. The specific test for range of motion and trunk strength for each injured individual was conducted individually upon completion of their rehabilitation program in the "Sport Gym" fitness and bodybuilding hall in Al-Najaf Al-Ashraf Governorate. The researcher ensured that the conditions (location, tools used, assisting team) were the same as those provided in the pre-test.

### Statistical Methods Used:

The researcher utilized the ready-made statistical package (SPSS).

Presentation of Range of Motion Results for the Control Group, Analysis, and Discussion:

Table (4) illustrates the differences between pre-test and post-test values of the range of motion for the control group.

No.	Variables	Measurement Unit	Pre-test		Post-test		t-Value	Significance Level
			M	SD	M	SD		
1	Body Flexion	Degrees	134.750	4.769	106.250	4.113	7.421	0.005
2	Body Extension	Degrees	160.500	4.203	146.250	3.951	9.544	0.002
3	Body Right Rotation	Degrees	152.250	2.630	141.250	2.511	8.124	0.004
4	Body Left Rotation	Degrees	153.750	4.881	141.250	2.500	8.660	0.003
5	Body Right Torsion	Degrees	65.250	2.247	80.250	3.686	11.000	0.002
6	Body Left Torsion	Degrees	66.250	2.380	80.500	3.714	7.400	0.005

There are significant differences in the range of motion between the pre-test and post-test, and the researcher attributes this development to the field of physical therapy. This evolution is attributed to the active role played by physical therapy devices in removing accumulations resulting from injuries, such as salts and some blood clots. These devices also have a deep heating effect through their high frequencies, causing tissue vibration, thereby reducing muscle stiffness and increasing range of motion. Devices such as ultrasound and microwave work through thermal oscillations as they penetrate tissues, reaching the injured area to relax the affected area and stretch the muscle origin, thereby increasing joint range of motion affected by the injured muscle. These waves have high absorbability at tissue interfaces and are selectively absorbed at the synovial fluid, making them useful for treating tendons and muscles, thereby increasing range of motion. The proper use of physical therapy devices in the initial treatment phase, including the number of sessions per device, session duration, and the patient's commitment through continuous attendance, has gradually accelerated injury healing and improved range of motion.

Presenting and analyzing the range of motion values for the experimental group:

Table (5) Shows the differences between pre-test and post-test values in the range of motion for the experimental group.

No.	Variables	Measurement Unit	Pre-test		Post-test		t-Value	Significance Level
			M	SD	M	SD		
1	Body Flexion	Degrees	130.750	5.000	82.500	3.304	21.100	0.000
2	Body Extension	Degrees	162.250	2.885	132.500	2.630	14.466	0.001
3	Body Right Rotation	Degrees	150.750	2.514	131.250	1.708	13.510	0.001
4	Body Left Rotation	Degrees	152.250	2.629	132.500	2.879	9.604	0.002
5	Body Right Torsion	Degrees	64.750	2.698	100.500	4.787	9.139	0.003
6	Body Left Torsion	Degrees	63.750	1.708	95.250	2.517	8.004	0.004

After analyzing the results obtained from the motion range tests of the experimental group, the researcher attributes the improvement and progress of the experimental group to the use of rehabilitative exercises. Additionally, the researcher emphasizes the importance and positive impact of using isotonic rehabilitative exercises in maintaining and repairing the motion range of the affected joints. These exercises facilitate neural communication between muscles due to the length of the opposing muscles, and they also increase blood flow in the blood vessels by 15-20 mm. Furthermore, they improve neuromuscular coordination and increase the speed of muscle contractions and muscle fibers. The rehabilitative exercises activated the muscles, tendons, and ligaments after a period of limited movement and disuse due to injury. The researcher believes that rehabilitative exercises stimulate the muscles and restore them to their natural state, resulting in a rapid recovery rate. These exercises are used to increase speed, quality, and strength, as well as to alleviate pain. The use of rehabilitative exercises yielded better results compared to other treatment methods, leading to a noticeable improvement in the range of motion for the experimental group. Moreover, the injured muscle gained sufficient strength and flexibility, which in turn improved the joint angle. The researcher also believes that the exercises used played a role in developing the range of motion for each specific movement in the affected area. Additionally, following the periodization in load during the week was an important factor that contributed to the improvement, as the intensity and volume used led to good and noticeable growth in the injured area. "Any increase in training load through intensity and volume is met with an increase in the functional capacity of the organic systems, ensuring their growth and development" (Hayat Rofail: 2019: 171).

### CONCLUSIONS

1. The rehabilitative exercises prepared by the researcher effectively contributed to improving the motion range of the cervical region muscles.
2. Both static and dynamic exercises have a positive role in rehabilitating the cervical region muscles by improving the strength and motion range of the surrounding muscles.
3. The used rehabilitative exercises effectively contributed to pain relief.
4. The surrounding muscles of the cervical region that were injured returned to their natural state after clinical and laboratory examinations.

### RECOMMENDATIONS

Based on the research findings, the researcher recommends the following:

1. Continuously perform rehabilitative exercises periodically, especially for the injured area and the surrounding muscles, in order to maintain the strength and flexibility of those muscles.
2. It is necessary to use the rehabilitative exercises prepared by the researcher in physical therapy centers due to their importance in rehabilitating the cervical region muscles.
3. It is essential to hold intensive seminars in the field of sports medicine, involving athletes to raise awareness about how to avoid the risks of injury.

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