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EFFECT OF A REHABILITATION PROGRAM ON SOME PHYSICAL VARIABLES AND SHOULDER JOINT PAIN LEVEL IN INJURED WEIGHTLIFTERS

Ahmed Hatem Ahmed Jassim¹,

¹Faculty of Science, University of Basrah, Iraq

<p>Keywords: Rehabilitation exercises, Physical therapy equipment, Injury, Shoulder injuries, Rotator cuff, Weightlifting.</p>	<p>ABSTRACT</p> <p>Shoulder joint is one of the most commonly injured joints among weightlifters due to nature of movement, which requires lifting heavy loads and repetitive motions. This leads to a decrease in functional efficiency and an increase pain level and decline in physical abilities. This research aims to identify effect of a standardized rehabilitation program on some physical variables and pain level of shoulder joint in injured weightlifters. The researcher used experimental method with a pre- and post-design for one group, sample included (10) weightlifters who had mild to moderate injuries to shoulder joint. An eight-week rehabilitation program was implemented, consisting of three weekly sessions. It included specific exercises to strengthen rotator cuff muscles, improve joint flexibility, and increase muscle balance. Pain levels were closely monitored using Visual Acuity Scale (VAS), and physical variables such as muscle strength, range of motion, and flexibility were measured. Results showed a statistically significant improvement in physical variables in experimental group compared to control group, and a significant decrease in pain levels after implementation of rehabilitation program. In addition, there was an inverse correlation between decrease in pain levels and improvement in muscle strength and flexibility. The study recommends adopting proposed rehabilitation program as an effective means of rehabilitating shoulder joint injuries in weightlifters, and paying attention to integrating physical and functional measurements with pain assessment to accurately monitor the progression of the condition.</p>		
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<p>Author Correspondence: Ahmed Hatem Ahmed Jassim* Email: lec.ahmed.hatem@uobasrah.edu.iq</p>			

INTRODUCTION

Weightlifting is a sport that requires high levels of muscular strength and the ability to control high loads, making it one of the activities that most exposes the muscular and joint system to frequent injuries, especially the shoulder joint, due to the pivotal role it plays in all stages of lifting, whether in the snatch or clean and jerk movements (Hermassi et al., 2019; Suchomel et al., 2022). Weightlifting is a sport that demands high muscular strength and great physical endurance. Athletes perform movements characterized by explosive muscle contractions and intense stress on the body's joints and soft tissues, especially the shoulder joint, which is one of the most frequently injured joints due to its wide anatomical structure and broad range of motion (Pirruccio & Kelly, 2019). Among the common injuries in this sport is rotator cuff injury, which involves a partial or complete tear of the tendons surrounding the head of the humerus. These tendons are responsible for stabilizing the joint and regulating its movement during weightlifting.

Sports rehabilitation and physical therapy specialists work to eliminate the injury and rehabilitate the injured person to return to practicing his sports activity (Mahesvi et al., 2024). Pain is a real-world warning sign of an injury; it plays a fundamental and important role. In a person's life, the moment of injury and Which serves as a warning sign It is important to address the problem early on, and it is directly observed that the physical aspect is also affected, leading to a decline in the physical level of the injured player (Mahesvi et al., 2023; Simplicio et al., 2024). In general (Nath & Somasundaram, 2021; Pirruccio & Kelly, 2019), and given the possibility of rehabilitation exercises to have a positive effect on physical variables, which increases the speed of recovery and restores the injured part to its normal state before the injury, so that the player becomes able to return to practicing sports and give more in the type of sports activity practiced with high efficiency.

This injury causes a range of functional problems for the player, most notably decreased muscle strength, restricted range of motion in the shoulder joint, and increased pain during physical activity or even daily activities (Pirruccio & Kelly, 2019). Repeated training and premature return to activity without proper rehabilitation can exacerbate the injury, leading to a decline in athletic performance and potentially complete absence from tournaments and competitions (Reeves et al., 1998). Despite the advancements in rehabilitation and physiotherapy programs in the sports and medical fields, it is observed in practice that many weightlifters resort to Traditional treatment methods or general, unregulated rehabilitation programs do not take into account the specific physical and physiological characteristics of this group, and often focus only on pain relief without paying attention to developing the physical variables that affect the restoration of full joint function, such as muscle strength, flexibility, muscular endurance, and muscular balance (Maclennan et al., 2023; Summitt et al., 2016).

From here, the research problem is defined as the existence of a clear lack of scientifically standardized rehabilitation programs specifically designed to treat rotator cuff injuries in weightlifters, combining movement therapy and physical therapy, and aiming to improve the physical variables associated with athletic performance, in addition to reducing the level of pain and improving the functional efficiency of the shoulder joint (Dewantara et al., 2024). Therefore, this research aims to study the effect of a standardized rehabilitation program on some physical variables and the level of pain resulting from rotator cuff injury of the shoulder joint in weightlifters, in order to verify the effectiveness of this program in accelerating the recovery process, restoring motor strength, and reducing pain associated with this injury.

Research objectives are developing a rehabilitation program for weightlifters suffering from rotator cuff injuries. Measuring the pain level of weightlifters suffering from rotator cuff injuries before and after the program. Measuring the range of motion of weightlifters with rotator cuff injuries before and after the rehabilitation program. Research Hypotheses are statistically

significant hypotheses between the pre- and post-measurements in shoulder joint muscle strength, in favor of the post-measurement. There are statistically significant differences between the pre- and post-tests in measuring the degree of pain, in favor of the post-test. There are statistically significant hypotheses between the pre- and post-tests in measuring motor range, in favor of the post-test.

Injury is defined as the exposure of different body tissues to external or internal influences and factors that lead to anatomical and physiological changes in the injured part, which disrupts the function of that tissue temporarily or permanently, according to the severity of the injury. Motor rehabilitation an organized and planned process aimed at restoring lost or affected motor functions as a result of injury or disease through therapeutic training programs based on movement and physical exercises directed to restore the injured limb to the maximum possible functional efficiency safely (Daher et al., 2025). Tendons they are strong cords, like ligaments, with a white tissue that connects muscles to bones. Because of the limited blood that reaches these tendons, their ability to heal is limited. It is treatment by the power of nature and means the use of multiple means and techniques from natural sources developed to suit the structural and functional defect resulting from injury, illness or disability, where natural means such as heat, water, electricity and movement are used after regulating them to suit the injury that has occurred. A disorder of the tendons or muscles surrounding the head of the humerus, leading to pain, weakness, and difficulty in performing rotational movements and forward lifting of the arm, and is often observed in athletes who use the shoulder intensively, such as weightlifters and throwers (Grymel-Kulesza et al., 2007; Nct, 2011).

METHOD

The researcher used experimental method because it was suitable for nature of problem to be investigated, relying on pre- and post-testing. The research community consisted of weightlifters from Basra Governorate clubs who suffered rotator cuff injuries and whose condition did not require surgery. For ages (17-20) and their number is (10) players, as (2) of them were excluded due to the presence of other injuries accompanying the injury under investigation, and this affects the results of the investigation.

Table 1. Homogeneity among research sample members is evident in morphological variables

No.	Variables	Measurement unit	Mean	Standard deviation	Coefficient of variation
1	height	cm.	170.500	3.99	2.34
2	Mass	Kg.	79.130	4.02	5.08
3	Age	year	18.13	1.46	8.04
4	Training age	year	3,300	0.13	3.97

Measurements and special tests

Measuring height: The test subject stands upright, barefoot, in front of the measuring ruler marked in centimeters and fixed to the wall. Then we try to touch the highest point of the ruler facing from the highest point of the head and measure the height to the nearest centimeter. Weight measurement: Weight is measured using a medical scale, where the (laboratory) stands upright on the scale without wearing athletic shoes, and then the reading given by the indicator is taken to the nearest one kilogram gram.

Measurement of shoulder joint muscle strength

Seated Shot Put Test (SSPT) This is an important test in sports and research for measuring the explosive power of the upper body, particularly the shoulder joint. The test involves performing a pushing motion similar to throwing a shot put, but using a light medicine ball (usually weighing 2–3 kg) from a seated position with back support to minimize torso involvement and focus on the shoulder and chest muscles. The athlete sits on a bench or the floor and pushes the ball forward with as much force as possible. The horizontal distance traveled by the ball is measured with a tape measure, and the best performance from several attempts is recorded. The test is characterized by its ease of administration, low cost, high reliability, and validity, as demonstrated by studies. It is also relatively safe for rotator cuff injuries if a light ball is used and pain levels are monitored. One of its advantages is that it measures explosive power without the need for heavy weights, making it suitable as an assessment tool before and after rehabilitation programs. It also provides quantitative data that can be statistically analyzed to determine the extent of improvement in muscle performance.

Pain Level Measurement (VAS)

Visual Analogue Scale (VAS) is a subjective quantitative tool used to assess the perceived intensity of pain in an injured patient or athlete. It is considered one of the most common and reliable tools in clinical and rehabilitation research for measuring pain, particularly in cases of musculoskeletal injuries. For example, a rotator cuff injury to the shoulder joint.

Exploratory Experiment

In order to ensure that all conditions are suitable for conducting the research, to observe the safety of the tools and equipment, to overcome any difficulties that may exist, and to train the assistants on how to apply the tests and how to record the scores, the researcher conducted a pilot experiment on a sample of (2) From the injured football players - for Thursday, 3/7/2025. The exploratory experiment means " The exploratory experiment represents a necessary preliminary step in experimental research, which contributes to identifying potential obstacles during the implementation of the main experiment, and increases the accuracy of the results and the validity of the measurement tools.

Pre-measurements

After identifying the research sample of injured weightlifters By injuring the rotator cuff, the researcher Pre -tests were conducted on a sample of (8) players, where the range of motion of the shoulder joint was measured, as well as the muscle strength of the shoulder joint and the degree of pain was measured to determine the severity of the injury.

Rehabilitative curriculum

The researcher prepared a proposed rehabilitative plan for development. Physical capabilities and movement limitations of the injured shoulder joint This is based on scientific research and studies, books and international references, as well as taking into account the opinions of specialists and experts. In the field of physical rehabilitation and sports medicine, noting that the injury was accurately diagnosed by a specialist physician. The rehabilitation program was implemented on the research sample in one group after the pre-test, as the duration of the rehabilitation program It lasted (8) weeks and included (24) rehabilitation units, with three rehabilitation units per week. The duration of each rehabilitation unit ranged between (40-60) minutes. The rehabilitation program included physiotherapy equipment, where cryotherapy, Faradic & TENS were used, as well as the use of electrical pulses (TENS) for pain treatment,

(Faradic), and Therapeutic Ultrasound. To reduce inflammation and stimulate the healing process , as well as a diverse and varied set of rehabilitation exercises that are appropriate for each stage of rehabilitation. The treatment using " Therapeutic ultrasound uses high-frequency sound waves (typically 1–3 MHz) to produce thermal and non-thermal effects within deep tissues, with the aim of accelerating healing, reducing pain, and improving tissue elasticity.

Dimensional Measurements

After research sample completed rehabilitation program post-test measurements were carried out in the same manner and under the same conditions as the pre-test measurements for each injured player.

Statistical Methods

The researcher used statistical package (SPSS version 26) To process research statistics.

RESULTS AND DISCUSSION

Table (2) shows the values of the coefficients of variation for the variables Age, training age , height and weight, where the values of the coefficient of variation range (± 30), which indicates the normality of the data among the research sample before the experiment.

Table 2. Show mean, standard deviation, calculated T-value in variable of muscle strength of shoulder joint of research sample

Variables	Measurement unit	Pre-test		Post-test		standard error	Calculated (t) value	Probability value	Sig.
		Mean	St.d	Mean	St.d				
Throwing medicine ball over head	Meter	2,800	0.200	4.050	0.160	0.019	66.14	0.000	Sig.

Table (3) shows the percentage of improvement in the muscle strength variable of the shoulder joint muscles for the research sample group, where there are statistically significant differences between pre and post mean for the research sample group, in favor of the post measurement in the muscle strength variable of shoulder muscles, where the value of the pre measure for the shoulder muscles was (2.800) with a standard deviation of (0.200), and the value of the post measure for the twin muscles was (4.050) with a standard deviation of (0.160), and the calculated T value for the twin muscles was (66.140) at a significance level of (0.000), which is less than the statistical significance level of (0.05), with a percentage of development for the shoulder muscles of (44.6 %).

Table 3. Shows mean, standard deviation, and calculated T-value in pain variable of research sample

Variables	Measurement unit	Pre-test		Post-test		standard error	Calculated (t) value	Probability value	Sig.
		Mean	St.d	Mean	St.d				
Pain during external	Degree	6.125	0.226	1.375	0.517	0.250	19,000	0.000	Sig.

rotation (ER)									
Pain during internal circulation (IR)	Degree	5.875	0.834	1.375	0.517	0.534	23.812	0.000	Sig.

Table 4. Shows mean, standard deviation, and calculated T-value in the range of motion of shoulder joint of research sample

Variables	Measurement unit	Pre-test		Post-test		standard error	Calculated (t) value	Probability value	Sig.
		Mean	St.d	Mean	St.d				
Internal rotation (IR)	Degree	39,875	3.603	70,500	4.105	1.302	66.505	0.000	Sig.
External rotation (ER)	Degree	25,500	3.464	67.125	3.464	2.948	56.989	0.000	Sig.

Table (4) shows the percentage of development in measuring the level of pain. It is clear that the percentage of development is in favor of the post-test measurement, as there are statistically significant differences between the pre-test and post-test measurements. The arithmetic mean value of the pre-test measurement for the pain variable at external rotation was (6.125) with a standard deviation of (0.226), and the arithmetic mean value of the post-test was (1.375) with a standard deviation of (0.517). The calculated T value was (19.000) at a significance level of (0.000), which is less than the statistical significance level of (0.05), with a percentage of development of (80.43 %). The arithmetic mean of the pre-test measurement for the pain variable during internal rotation was (5.875) with a standard deviation of (0.834), and the arithmetic mean of the post-test was (1.375) with a standard deviation of (0.517). The calculated T- value was (23.812) at a significance level of (0.000), which is less than the statistical significance level of (0.05), and the percentage of development was (80.43 %).

The progress achieved in the rotator cuff muscle strength test and the reason for the significant differences in the variable and in favor of the post-curriculum, where the researcher attributes this to the therapeutic rehabilitation exercises in the rehabilitation program, which contributed significantly to reaching sufficient training for the aforementioned muscles, and to the contractions it produced, which increased the ability of the nervous system to direct the largest possible number of muscle fibers, i.e., an increase in the nervous supply to the muscles to participate in muscle contraction, due to the simple adaptation of the nervous system in muscle work. This is consistent with what (Feros et al., 2018, 2018) indicated: The ability of a person to recruit muscle fibers to participate in muscle contraction is due to the training factor. A trained individual can recruit (85%) of muscle fibers to contribute to muscle contraction, while an untrained person can recruit (55-60%) of muscle fibers.

The researcher attributes the development in the pain variable of the shoulder joint to the nature of the rehabilitation program on the rotator cuff muscles through increasing the blood supply to them and accelerating the recovery process (Gi On et al., 2019; Goldstein et al., 2016). This in turn leads to an increase in the blood supply to the muscles, and this helped to reduce the spasm resulting from the injury. The injury in its first stage leads to spasms in the muscles and elasticity

in the ligaments, and thus affects the flexibility of the muscle and the joints associated with it. It is known that many of the body's joints do not allow the individual more than a certain degree of flexibility in accordance with their anatomical structure, through the ligaments that connect the joints (Arkin & Budak, 2021; Görner & Reineke, 2020).

CONCLUSION

The rehabilitation program designed for rotator cuff injury may latest a change and positive effect in the level of pain and a significant increase in the strength of the shoulder muscles, especially the rotator cuff muscles. The preparatory program The one that was applied qualifies The injured athlete is able to return to performing training sessions in the type of sport practiced in a normal and safe manner. The use of physical therapy equipment in the program, along with rehabilitation exercises, has brought about a significant and remarkable development in the treatment and rehabilitation of the injury. Emphasis is placed on using the curriculum developed by the researcher , which plays a role in treating and rehabilitating injuries and returning players to their normal level. specialized therapeutic and rehabilitative exercises tailored to the type of injury and the fitness level of the injured individual. It is essential to develop and strengthen the shoulder muscles in general, and the rotator cuff muscles in particular, to reduce the chances of injury.

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