

Suggested rehabilitation exercises in the treatment of partial rupture of the deltoid muscle in the shoulder joint and its impact on the range of motion of the throwing arm for the effectiveness of discus throw

Feryal Sami Khaleel*

College of Physical Education and Sports Sciences, Al-Mustansiriya University, Baghdad, Iraq.

* Correspondence: Feryal Sami Khaleel; ferval2017@uomustansiriyah.edu.iq

ABSTRACT

The rehabilitation process following injuries is crucial and requires careful attention from rehabilitation specialists. Injuries pose significant challenges for athletes, particularly in activities like discus throwing. This study aimed to develop suggested rehabilitative exercises targeted at rehabilitating partial ruptures of the deltoid muscle within the research sample. The researcher employed the experimental method using a one-group design style. The sample comprised four players from Baghdad clubs who had sustained partial deltoid muscle ruptures. The results indicated that the experimental variable played an effective role in the research sample, as evidenced by significant improvements in joint angle measurements across all tests. The proposed rehabilitative exercises proved highly effective in swiftly restoring the normal ranges and flexibility of the deltoid muscle within the shoulder joint among the research sample. Additionally, these exercises demonstrated a positive influence in significantly reducing the rehabilitation period required for recovery, indicating their efficacy in promoting expedited healing and functional restoration.

KEYWORDS

Suggested Rehabilitation Exercises; Deltoid Muscle; Discus Throwing

1. INTRODUCTION

The rehabilitation process after an injury is one of the most important processes that must be carried out with care by a specialist in the field of injury rehabilitation, so that the athlete can return again to the stadiums, and shoulder joint injuries are among the most prevalent injuries that occur in throwing activities in athletics. The deltoid muscle injury is among these injuries that occur in a discus thrower, which greatly affects the throwing performance. Hence the importance of the research in the preparation of proposed rehabilitative exercises in the treatment of partial rupture of

the deltoid muscle of the shoulder joint, which helps the athlete to speed recovery and restore the mobility of the joint as well as the range of motion of the joint and the ability to return to exercise again.

The effectiveness of discus throwing relies heavily on physical abilities, high kinetic capabilities, and the specific physical specifications of the athlete. External factors, such as increased training loads surpassing the athlete's abilities or undisclosed previous injuries, may contribute to injury. Through a review of treatment centers, it was found that many of these injuries occur in the deltoid muscle, leading to pain and limited shoulder mobility, hindering the athlete's ability to use the joint effectively and resulting in loss of kinetic extension in the muscle. Consequently, the researcher has developed a suggested rehabilitative exercise regimen utilizing various methods to expedite pain relief and restore normal joint function, facilitating the athlete's prompt return to training.

The aim of this study is to prepare suggested rehabilitative exercises aimed at rehabilitating partial ruptures of the deltoid muscle within the research sample, and to determine the impact of these rehabilitation exercises on the motor range of the deltoid muscle in the research sample. The research hypothesis was that there would be statistically significant differences between the pre-tests and the post-tests in the motor range of the research sample.

2. METHODS

2.1. Study design and participants

The experimental method employed in a one-group design style, due to the nature of the problem, involves utilizing a single experimental group system with pre-tests. This approach is deemed most appropriate for the nature of the research as it allows for the observation of players' performance before implementing the experimental variable. Subsequently, it facilitates the measurement of the amount of change that occurs within the research sample (Daoud & Abdel-Hadi, 2018).

The research sample was selected intentionally, comprising 6 players who had experienced ruptures in the deltoid muscle of the shoulder joint. This deliberate sampling method was employed specifically targeting individuals with shoulder pain, particularly those with partial ruptures of the deltoid muscle. The selection process involved a review conducted by hospitals and specialized sports medicine centers in Baghdad. After diagnosis by a specialized doctor and confirmation of the injury type, the sample was finalized. Among the injured players, 4 belonged to clubs in Baghdad, totaling 8 clubs in the area. Upon the sample's agreement to participate in the proposed exercises,

they underwent the qualifying exercises suggested by the assistant work team under the direct supervision of the researcher. Table 1 shows the homogeneity of the research sample members.

The study was conducted between June 8, 2019, and December 10, 2019. The research took place at the Al-Karkh General Hospital (MRI Department), Professional Sports Injury Rehabilitation Center.

Table 1. Homogeneity of the research sample

Variables	Measuring unit	Mean	Standard deviation	Median	Skewness
Height	Cm	181.75	5.377	182.50	0.574-
Weight	Kg	65.25	1.7.8	65.50	0.574-
Biological age	Year	21.50	5.802	21	0.491
Training age	Year	4.25	0.957	4.50	0.855-

Note: As the skew coefficient was used and indicated in all variables, the moderate trend was achieved between (-, +1) (Bahi, 1999).

2.2. Procedures

The main instruments used in this research were: magnetic resonance imaging device, a device to measure the range of motion of the joint, a medical scale for measuring weight, stadiometer for measuring the height, examination bed, a cartoon stopwatch, iron weights, different weights, medical balls and rubber ropes, a hot compress for the purpose of heating the muscle, and a cold compress for the purpose of recovery. The tests used were: bending test; extroversion test; tide up test; internal rotation test; external rotation test.

The researcher conducted an exploratory experiment on Tuesday, June 8, 2019, involving a group of discus throwers, totaling two individuals. They were subsequently excluded after the experiment concluded. The purpose was to identify potential challenges the researcher might encounter during exercise performance, determine the duration of each training session, assess the assistant team's proficiency in conducting tests accurately, and evaluate the suitability of these exercises for the research sample.

The researcher conducted qualifying exercises on Saturdays, corresponding to August 17, 2019, for a period of eight consecutive weeks. This regimen comprised 24 qualifying units, with three units per week, each lasting 30 minutes. The purpose of these exercises was to rehabilitate the deltoid muscle in the shoulder joint and restore the motor range to its previous normal level in all directions.

In the first phase, special resistance exercises were performed with the assistance of a therapist, without any additional weights. The player relied solely on their body weight, with the

guidance of the therapist. The second stage involved exercises using sticks, aids, medical balls, and light weights, as well as standing exercises performed by the player. In the third stage, exercises included the use of rubber ropes and weights such as iron nettles, iron bars, and dumbbells. Before beginning any exercises, hot compresses were applied to heat the muscles, serving as a warm-up. Heating the deltoid muscle before exercise helps prevent injuries. After completing each rehabilitation unit, cold compresses were applied to aid in recovery.

After the completion of the proposed qualifying exercises, post-tests were conducted on the research sample on Saturday, October 12, 2019, at four o'clock in the afternoon, under the same pre-examination conditions.

2.3. Statistical analyses

The statistical analyses were carried out with the Statistical Package for the Social Sciences (SPSS), version 24. With SPSS, the researchers calculated means, standard deviations and t tests. Statistical significance was set at $p < 0.05$.

3. RESULTS AND DISCUSSION

Table 2 presents the arithmetic mean, standard deviation, and the extent of the difference before implementing the qualifying exercises and the valid post-tests.

Table 2. Pre and post-test results

Variables	Pre-test		Post-tests		The difference	Deviation difference	t	p
	Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation				
Bending test	17	1.826	22.75	1.708	5.75	1.258	9.139	Sig
Extroversion test	35	3.955	39.75	3.304	4.75	1.708	5.563	Sig
Tide up test	73.75	7.890	80.75	6.652	7	1.826	7.668	Sig
Internal rotation test	55.75	4.349	61.75	3.403	6	2	6.00	Sig
External rotation test	47.35	5.252	56.25	4.856	9	1.633	11.023	Sig

These results indicate that the experimental variable played an effective role in the research sample, as evidenced by significant improvements in joint angle measurements across all tests.

The researcher attributes this improvement to the enhancement in joint muscular strength, as well as the recovery of muscles and ligaments, facilitated by the rehabilitation exercises proposed. The researcher carefully considered the scientific foundations when developing these exercises,

ensuring they were tailored to the physical and physiological levels of each sample member. This approach, employing the gradual principle of progressing from easy to difficult exercises, aided the sample in improving and adapting to the range of motion of the deltoid muscle in the shoulder joint.

Additionally, the exercises were designed to avoid straining the muscle, ensuring the safety of the joint and facilitating progress in the rehabilitation process. Ultimately, this approach contributed to the return of the injured part to its normal position.

It is important to consider the progression of exercises from easy to difficult, particularly those aimed at improving range of motion (El-Desouky & Mahmoud, 1999).

The exercises were varied to minimize repetition and prevent boredom among the participants. This variation also aimed to increase muscle elasticity by targeting a wide range of muscle groups, consequently enhancing range of motion. This improvement in flexibility indicates increased strength in the working muscles, ultimately impacting the kinetic range. A greater range of motion in the joint corresponds to higher force levels (Abdel-Fattah, 1997).

Additionally, the proposed rehabilitation exercises were introduced gradually at the beginning, starting with bodyweight exercises assisted by the therapist. Subsequently, simple weights and resistance exercises were incorporated. These low-intensity exercises have a direct and positive impact on elasticity, enabling the connective tissue to respond effectively to movement (El-Din, 1994).

All range-of-motion exercises, including flexion, extension, adduction, abduction, and rotation, are designed to assess the repositioning of the natural shoulder. Each exercise targets specific muscles or muscle groups responsible for stabilizing the shoulder joint, ultimately promoting a wide range of motion (Youssef, 1998).

The concept of lengthening involves moving the limb to its maximum range of motion and maintaining that position for a period of time. This fixed position is then followed by maximal muscular contraction, which activates the muscle contraction process. Consistent muscle contraction over time leads to increased lengthening and improved flexibility (Hazaa, 2009).

In summary, all the exercises utilized, whether involving tools or various methods, contributed to enhancing the strength of the muscles involved in the shoulder joint. Consequently, this improvement led to enhanced angles of motor range within the research sample. These enhancements were reflected in the athletes' performance levels and contributed to expediting their recovery and return to play. This observation aligns with scientific studies and research pertaining to the functional effects of flexibility exercises. Such exercises have been shown to increase joint range of motion by influencing changes in muscle tendons, fibers, and connective tissues (Al-Shennawi &

Al-Khawanj, 2005). Rehabilitation exercises serve multiple purposes, one of which is to improve articular range of motion (Al-Rahim, 2011).

4. CONCLUSIONS

The proposed rehabilitative exercises proved highly effective in swiftly restoring the normal ranges and flexibility of the deltoid muscle within the shoulder joint among the research sample. Additionally, these exercises demonstrated a positive influence in significantly reducing the rehabilitation period required for recovery, indicating their efficacy in promoting expedited healing and functional restoration.

Attention to diversity is crucial when implementing rehabilitation exercises, utilizing various means to prevent boredom among players undergoing recovery. Incorporating a range of exercises and techniques ensures engagement and adherence to the rehabilitation program, enhancing its effectiveness. The pursuit of innovative methods is essential for expediting the recovery process and facilitating the return of injured individuals to sports practice. By continuously exploring new approaches and technologies, rehabilitation protocols can be optimized to accelerate healing and restore athletic performance swiftly and safely.

5. REFERENCES

- Abdel-Fattah, A. E. A. (1997). *Athletic Training and Physiological Foundations*. Dar Al-Fikr Al-Arabi.
- Al-Rahim, N. A. A. (2011). *Qualifying exercises for building strength*. Dar Al-Fikr Al-Arabi, publishers and distributors.
- Al-Shennawi, M. H., & Al-Khawanj A. I. (2005). *Principles of Training Science*. Publishing and Distribution House.
- Bahi, M. H. (1999). *Scientific Transactions between Theory and Practice, Constancy, Honesty and Objectivity*. Al-Kitab Center for Publishing.
- Daoud, M., & Abdel-Hadi, M. (2018). *Foundations of Scientific Research*. Dar Safaa for Publishing and Distribution.
- El-Desouky, A., & Mahmoud, M. (1999). *A program of rehabilitation exercises for the back after a herniated disc in the lumbar region*. Faculty of Physical Education, Tanta University, Egypt.
- El-Din, T. H. H. (1994). *The kinetic and functional foundations of sports training*. Arab Thought

House.

Hazaa, H. B. M. (2009). *Physiology of physical exertion, theoretical foundations and laboratory procedures for physiological measurements*. King Saud University for Publishing.

Youssef, M. E. (1998). *Studies on problems of sports medicine*. Radiation Press. Alexandria University.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This research received no external funding.

COPYRIGHT

© Copyright 2023: Publication Service of the University of Murcia, Murcia, Spain.