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The Effect of Rehabilitation Exercises Accompanied by A Point-Laser Device on Restoring the Functional Abilities of The Injured Shoulder Joint in Advanced Athletes Participating in Sports Activities

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Abstract

The study aimed to identify the effect of rehabilitation exercises on advanced athletes participating in sports activities who suffer from partial muscle tears in the shoulder joint. The researcher used the experimental method with a one-group design employing pre- and post-measurements, as it suited the nature of the study. The research population was intentionally selected from sports clubs and included athletes aged 20 years and above with partial shoulder muscle tears, while the main sample consisted of five players and an additional two players from the same population were used for the pilot study. The research problem was evident in the high incidence of shoulder injuries among athletes, especially in team sports such as basketball, handball, volleyball, and football goalkeepers, which deprived teams of their participation and affected performance levels. The results revealed statistically significant differences between pre- and post-tests in favor of the post-tests, indicating improvements in muscular strength and shoulder joint range of motion. The rehabilitation exercises combined with the point-laser device contributed to a clear development in shoulder girdle muscle strength and improved range of motion in all directions, leading to the restoration of functional efficiency of the shoulder joint. The researcher recommended prioritizing physical and movement-based rehabilitation before surgical intervention in cases of shoulder tendon tears, emphasizing flexibility exercises due to their significant benefits, training athletes on proper protective movements during sudden injuries—such as correct falling techniques and avoiding landing on fully extended arms by internally rotating the shoulder—and using focused exercises such as anterior and posterior push-ups in their various forms as simple and continuous bodyweight exercises to strengthen the working muscles, given their ease of application at different times and locations.

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Introduction

Sports injuries are a common problem that prevents an athlete from being able to carry on with their training program in an effective manner. The result is a good injury because of the removal from physical activity, so performance (in both physical orientation and skill) drops down. Achieving such predictive capability is very, very difficult, as injuries are often unforewarned events, and even if many studies suggest that the types and locations of some sports activity injuries can be predicted at all. This confirms the importance of the work of the sports specialist who was there at that time since assistance is not always ready during training. Sports medicine is a multilateral approach that requires a combination of the different fields like sports training, physical and motor rehabilitation, physiology, biomechanics, therapeutic massage, morphological (anthropometric) measurements, and anatomy for rendering service to healthy or injured athletes (Al-Ghamri & Bakri 2011; Hassan & Hussein 2021).

Shoulder joint injury is one of the common sports injuries. Given that the shoulder joint involves multiple axes of movement in different directions and wide ranges of motion, this property enhances its susceptibility to injuries compared to other body joints, especially with the execution of complex and demanding motions which load large forces on adjacent musculotendinous units (Agyapong-Badu et al., 2017). Handball, basketball and volleyball have frequented and varied movements, as well as technical offensive and defensive skills. The physical and skillful effort of players during matches and training sessions is necessary for successful performance. The nature of the game creates a lot of pressure on the players that can be found in every direction, sudden movements and fast dynamic changes to realize offensive and defensive actions. During performance of skills, and during defensive-to-offensive and offensive-to-defensive transitions (Hamidi & Jassim, 2025), athletes rely on significant support and propulsion forces from their arms in the forward, lateral, and backward directions. This causes extreme physical stress on muscle and joint, frequently resulting in injury.

As the shoulder joint is one of the most commonly stressed and fatigued joints and, as such, highly susceptible to injury, a vast majority of movements/skills relies on glutening/supporting/pushing through our arms (Khudhair, Jasim, & Hani, 2022). Repeated actions like these may lead to joint instability, and persistent instability can eventually contribute to injury. A study done by Khaled Mahmoud Ezz El-Din (2014) entitled The effectiveness of therapeutic massage and therapeutic exercises on the rehabilitation of the shoulder joint proved that the proposed rehabilitation program positively affected shoulder girdle muscle strength, increased the range of motion of the shoulder joint, and decreased pain intensity. In a similar vein, Struyff, Geraets, and Noten (2016) emphasized that the shoulder joint is essential in a large number of sports—other than swimming, in which the focus is most commonly on the shoulder girdle muscles with their main functions concerning rotation and forward propulsion of an arm—shoulder injuries consequently have an important impact on athletes' practice.

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Therapeutic devices, i.e., the combined use of rehabilitation exercises and therapeutic devices adapted to shoulder joint injury, each session significantly improved the range of motion in the shoulder. Based on this, this study suggests an integrated rehabilitation program of therapeutic exercises with modern methods represented by high-intensity point-laser therapy (laser acupuncture therapy). It uses laser beams that do not penetrate the skin to stimulate these points, allowing for a safe and non-invasive treatment. The combination of scientifically structured rehabilitation exercises with anti-stretching and muscle-fixing processes that focus on shaking blood (non)circle circulation to induce healing processes and pain relief, given that this applies to the patients' medical health and injury conditions. Therefore, the exercise program together with therapeutic interventions may improve muscular and joint flexibility as well as muscle strength, leading to pain relief that supports the efficacy of combining exercise-based and conservative options in shoulder injury rehabilitation.

The problem with existing research is that while playing, players rarely do movements whereby they land heavily on their arms because a lot of effort directed by body weight goes into the arm—mostly the shoulder joint muscles. It was noted that several athletes suffered injuries in the muscles surrounding the shoulder joint, which has certainly had an impact on their skills performance and led to many of them withdrawing from training and competition for long periods of time, with some continuing not to participate. That is once a bad loss for both clubs and national teams. In addition, few sport-specific physical rehabilitation programs exist, and modern therapeutic devices are rarely used to treat shoulder muscle injuries in team-sport athletes. Thus, the researcher designed physical rehabilitation exercises for restoring those injured shoulder joint muscles and to make it easier and faster for injured athletes to return back to participation in sports.

The research aims to design exercises, using a point laser device, supervised in the physical rehabilitation of shoulder joint muscles with partial tears for advanced athletes and to find out the effect of these exercises on rehabilitating injured shoulder joint muscles and developing range of motion and muscular strength in the research sample.

Methodology

To fulfill the purposes of the study, he chose the experimental method because it meets the nature of solving the research problem through evidence that has been tested in laboratories and material sources.

The study considered a sample of five premier league club players in Baghdad, with an age range from 20 to 31 years. The sample needed to experience the same type of injury for all participants in the exercise rehabilitation study, so this outcome was specific to the prevalent condition. Accordingly, players with partial tears only occurring in muscles surrounding the shoulder joint were purposefully selected for this study. It was also confirmed that they had

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never previously completed any rehabilitation programs and they were only treated using exercises devised by the researcher.

Making an accurate diagnosis of the injury was crucial to the integrity of the science but also to ensure that intervention was undertaken precisely. Moreover, this would allow for the possibility of applying these rehabilitation exercises in the future. The injury was diagnosed as a joint muscle injury according to Dr. Ghalib Abbas Al-Mousawi, a specialized doctor in joints, orthopedics, and fractures, on 5/1/2025 by conducting field tests specific for injuries of the shoulder joint muscles. Diagnosis: pain in the muscles of the shoulder joints; partial tears of skeletal muscle in the shoulder joint; clear limitation of motion in the shoulder joint.

Tests Used

1. 10-second anterior pressure test.
2. 2-kg medicine ball throwing test.
3. Shoulder joint range of motion test – flexion.
4. Shoulder joint range of motion test – extension.
5. Shoulder joint range of motion test – abduction.
6. Shoulder joint range of motion test – internal rotation.
7. Shoulder joint range of motion test – external rotation.
8. Hand grip strength test.
9. Upper arm circumference measurement.

Research Instruments

Data collection and assessment forms; a goniometer to measure shoulder joint range of motion; a dynamometer to measure grip strength; and a stopwatch (Casio) to record time in seconds.

High-Intensity Laser Therapy

High-intensity laser therapy uses high-energy beams of light to treat pain and promote healing. It can penetrate more deeply into body tissues than other classes of laser and can be used to treat an array of conditions, including muscle and bone injuries, arthritis, and nerve pain. Shoulder Conditions: Fourth-grade laser therapy is the process of penetrating a high-energy beam into the tissues deep down into the shoulders, thus improving cellular regeneration in this part and reducing inflammation. This ultimately allows for pain reduction, increased range of motion in the target area, and exposure to an optimal healing environment and is particularly useful in treating frozen shoulder. Smoke therapy is usually provided by a specialist team and requires multiple sessions for best results—the total number of sessions depends on individual recommendations. High-energy laser therapy has been increasingly used to treat shoulder conditions, but little is known about the support it provides in treatments—the ability to bring

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relief quickly and promote tissue repair in order for patients to return with minimal pain to their daily routines and sporting activities.

The researcher conducted a pilot study from 9/1/2025 to 12/1/2025 at 4:00 PM in the hall of Haifa Club, Al-Mashtal, Baghdad, on a sample of two players experiencing shoulder joint muscle pain who were not part of the main research sample.

Pre-tests were conducted on 15–16/1/2025. From this point on, the rehabilitation program was applied after a period of two weeks of medical treatment under the supervision of a specialist physician. The rehabilitation physical exercises (in Appendix 1) were prepared by the researcher from Arabic and foreign references. Progression in training intensities and loads was carefully controlled, especially for resistance exercises. The research sample applied the rehabilitation exercises for a period of (6) weeks from 18/1/2025 to 26/2/2025, and the exercises are as follows:

1. The program length was 18 training-units, where three sessions per week (Saturday, Monday, and Wednesday) were conducted.
2. Each rehabilitation session lasted 45–60 minutes, and it gradually increased after each rehabilitation phase.
3. Intensity of training was between 50–60% of the athlete's upper limit.
4. Rehabilitation exercises were performed after a suitable warm-up.
5. Pain ratings were taken into account while performing the exercises.
6. The program consisted of three phases, each lasted two weeks.
7. Every phase consisted of different shoulder joint range-of-motion exercises, stretching for the muscles acting on the injured joint (e.g., rotator cuff), as well as strengthening exercises to improve both static and dynamic muscle strength using movement patterns, starting with simple movements and then progressing to complex ones.

Post-tests were conducted after completing the rehabilitation program on 27–28/2/2025, under the same conditions as the pre-tests.

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Results

Table 1. *Pre-test and post-test results for all research variables*

Variable	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	t (calculated)	Significance
Anterior pressure test (10 s)	4.41	1.15	14.81	1.79	15.27	Significant
2-kg medicine ball throw	3.15	1.59	12.09	1.69	8.55	Significant
Shoulder ROM – Flexion (°)	106.00	6.51	144.00	1.58	15.64	Significant
Shoulder ROM – Extension (°)	32.60	1.14	42.80	1.92	13.88	Significant
Shoulder ROM – Abduction (°)	103.20	3.11	133.40	2.96	13.06	Significant
Shoulder ROM – Internal rotation (°)	55.00	1.00	76.20	2.48	17.08	Significant
Shoulder ROM – External rotation (°)	34.60	1.81	46.00	1.23	7.49	Significant
Hand grip strength (kg)	22.22	1.32	63.22	3.05	39.11	Significant
Upper arm circumference (cm)	15.42	1.42	18.22	0.85	14.02	Significant

Note. *t* critical (df = 4) at $\alpha = .05$. SD = standard deviation; ROM = range of motion. All differences were statistically significant at $p < .05$.

Discussion

In Table 1, statistically significant differences between pre-test and post-tests of all research variables measured in speed–strength (anterior pressure test), explosive strength (medicine ball throw), shoulder joint range of motion (flexion, extension, abduction, internal rotation, and external rotation), hand grip strength, or upper arm circumference are shown to be significantly higher for the post-tests.

According to the researcher, it is demonstrated how in all analyzed variables—most notably, range of motion at the shoulder joint of the injured shoulder—an improvement was obtained with respect to baseline, which he considers a consequence of physical rehabilitation suggested and associated with point-laser therapy. A variety of shoulder mobility exercises were

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included in the program, and progressive regular practice led to a significant improvement of joint range of motion in the study sample (Abed Farhan & Housien 2022).

The researcher goes on to elaborate that better range of motion is believed to be not just due to these exercises but rather the reduction in pain before performing them as well and how it pushed injured players to carry out their rehabilitation sessions (Al-Hilaly & Jameel, 2018). According to Riyadh (2005) and Hussein (2023), it is fundamental that the rehabilitation from injury include stretching and strengthening exercises of muscles surrounding the shoulder. Similarly, Riyadh (1999) and Khlaif, Hussein, and Shnawa (2022) reported that flexibility exercises play a direct role in decreasing pain and adhesions as well as restoring the full range of motion of joints. Abdel-Fattah (1998) also showed the importance of a stretching exercise, as it develops flexibility and decreases injury risk and improves physical abilities and speed in recovery as well as muscular pain relief (Abed Khlaif & Salman, 2022).

The researcher ascribes the results of improvement noted in the post-test to this exercise, which is planned on developing static and dynamic muscular strength using different weights as well as body weight at varying positions (Khlaif & Shnawa, 2022). These exercises helped the players build muscular strength. Riyadh (2005) pointed out the importance of strengthening scapular stability muscles with compensatory, stretching, and resistive exercises. According to Salama (2002), continuous muscular training increases blood flow supply to muscles, helps construct neovascularity (new capillary vessels) within tissues of muscle transmission, and enhances the growth process in muscle tissues or the expansion process, leading to and improving the weight and density of fibers after a certain extent is achieved, which, according to flexural, improves the efficiency of muscular performance. Strength training also helps prevent injury to the joints where an impact occurs by strengthening the muscles around that joint (note, however, that heavy weights should never be used in practicing this routine).

According to Mohammed (2008) and Taha and Khalif (2022), the effectiveness of any rehabilitation program is influenced by a number of components, including the injured player's strict compliance with the physician's orders. The researcher ensured this during implementation of the rehabilitation program with point-laser therapy. In particular, the program was tailored and broken down into loads of training progression, from simple to complex forms of exercises and from static to dynamic contraction phases; also, it kept full dedication towards training the scapular stabilizers and rotator cuff muscles, as these are considered the most active muscle groups for performing any overhead shoulder joint task function (Jasim et al., 2021).

The injured limb must regain some degree of ROM and muscle strength relative to the contralateral limb. Venturing into expanding the range of motion globally, recent findings have revealed an extensive program that covers various exercises targeting the specific muscle groups that facilitate shoulder joint movement and augmenting the total shoulder joint mobility range limitations. Incorporating resistance exercises—both with and without weights—as well as

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flexibility and stretching exercises helped stabilize the joint, practice strength and flexibility training, increase muscle recovery, and improve muscle circumference. According to Riyadh (1999) and Jasim, Abed, & Ibrahim (2023), rehabilitation exercises stimulate and strengthen weak muscles through isometric and dynamic contractions that prevent atrophy due to disuse by reducing pain, enhancing vascular perfusion of muscle tissue, and preserving the elasticity of skeletal muscle fibers.

Additionally, rehabilitation exercises physiologically primarily act to reduce pain through increases in vasodilation and blood flow due to histamine being released into the tissues (Jasim & Ali, 2023), stimulating sensory nerve fibers and decreasing pain perception. According to Al-Kashef (1999), rehabilitation exercises are one of the most natural ways to restore an injured body part or site to its physical and functional abilities, as they promote more rapid removal of blood accumulations while returning muscle and joint functions through the reduction of pain. Shnawa and Jasim (2024) also added that the effectiveness of physical preparation for developing muscular strength and lowering tense muscles increased with reaching a greater joint range of motion, which increases muscle elastic component use at the beginning of movement.

The aforementioned factors resulted in increases in shoulder range of motion, explosive strength, and speed-strength following rehabilitation exercises with point-laser therapy that translated to improved functional, physical, and skill performance of injured players. This decrease in pain levels made it easier and more comfortable for the participants to do the rehabilitation exercises that were a part of the program. As a result, this led to better performance in skills such as the spike and other physical and motor abilities in play so that it was possible to achieve the objectives of the study and get support for its hypotheses regarding rehabilitation of injured shoulder muscles.

Conclusions

1. The employed rehabilitation physical exercises elaborated in this study managed pathology holistically, imitating the property of life, which correspondingly completely eradicated the acute pathologic condition in the pain exam sample.
2. Through this study, we adopted different methodologies with light weights and sandwiches to strengthen the participants in their injured shoulder muscles.
3. The rehabilitation program resulted in a significant increase and improvement in shoulder girdle muscle strength and the range of motion of the shoulder joint, thus restoring its functional performance in all directions.
4. During the skill execution, noticing improvement and development in the level of research sample motor and physical activity appeared.

Recommendations

1. Focusing on the rehabilitation of shoulder muscles as soon as an accurate diagnosis is achieved can facilitate treatment, recovery, and return to activity.

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2. Strengthening of shoulder girdle muscles of team-sport players is very important because it mainly improves skills and physical performance.
3. During immediate rehab after sport activity, ice application is done to constrict blood vessels and reduce the intensity of pain when injury-related feelings occur.
4. General physical preparedness—meaning various kinds of strength—helps to avoid a lot of injuries, including with the shoulder joint.
5. While working in the specific sport and specialization practiced, trainers should develop training plans targeting all parts of the body.
6. The warm-up should also be done properly, and all major muscle groups should be taken into consideration to keep injuries at bay during upcoming exercise sessions.
7. Stretching and flexibility are very beneficial for the body, so this type of exercise should always come first in a workout regime.
8. It would be better if players were instructed on what to do in the event of an acute injury, such as how to properly fall and not land with arms fully extended; instead, they should internally rotate their shoulder at the point of impact.
9. Push-up variations (anterior as well as posterior push-ups, with or without moving into a plank) are some of the best exercises to be completed daily to strengthen the injured rotator cuff and shoulder muscle groups since they are accessible in every single location, and this can additionally be performed at any time.
10. More studies should examine similar and other injury types not examined in this study.

Appendix (1)

Physical Exercises Used in the Rehabilitation Program

1. Static anterior push-up (isometric push-up).
2. Dynamic anterior push-up (moving push-up).
3. Shoulder Press: The athlete starts seated on the bench or standing, holding up two dumbbells (1–2 kg) overhead, then alternates lowering down to shoulder height and back up. Weights are added according to the athlete's condition.
4. The athlete contacts or erects with the limbs down on waist level, holding 2 dumbbells (1–2 kg), then carries out elbow flexion and extension upward & downward. Weight is added according to the state of the athlete.
5. The athlete lies on the side on a bench, supporting the body with one arm while holding a dumbbell in the other arm at hip level and raising it head-high in a pressing motion.
6. The person executing the exercise lies on a bench with the whole body supported and then raises up the arm to elbow level and supports it on top of the bench to achieve external shoulder rotation by driving upwards and downwards with an upper arm weight in hand.
7. The individual is with the side of their body on a bench or the floor, has one arm flexed, and is moved upward and downward against gravity by the dumbbell in their hand while using light weight.

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8. The athlete sits on a bench and has the arm extend laterally while holding a dumbbell, then they raise the straight arm forward and upward as it is lowered again.
9. Forward support position: the athlete drops the body down, holds briefly, then heads up.
10. Seated from the side, the dumbbell hand is raised to 90° and lowered.
11. The athlete is on their stomach on a bench with an arm holding a dumbbell in the vertical position that they are raising and lowering.
12. In a prone position, the athlete lifts and lowers an arm extending from the elbow of the dumbbell horizontally.
13. The lateral cable pull is performed on a multi-gym machine with the leg angled to avoid trunk rotation.
14. Starting from a standing position with both arms extended, holding onto a barbell at thigh level, the athlete lifts up a 10-kg bar from abdominal level to elbow flexed at 90° and then up to shoulder level over several repetitions.

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