

أثر العلاج الطبيعي في التعافي من اضطرابات الكتف: نتائج ما قبل العلاج وما بعده | دراسة
حالة سريرية | التربية البدنية والإصابات الرياضية | 2026-2025

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الكلمات المفتاحية: العلاج الطبيعي، اضطرابات الكتف، الإصابات الرياضية، مدى الحركة، تخفيف الألم، التحفيز الكهربائي للأعصاب عبر الجلد (TENS)، العلاج بالموجات الصدمية، التربية البدنية، إعادة التأهيل.

كيفية اقتباس البحث

كريم ، كاروان أحمد ، محمد مصطفى رشيد ، أثر العلاج الطبيعي في التعافي من اضطرابات الكتف: نتائج ما قبل العلاج وما بعده | دراسة حالة سريرية | التربية البدنية والإصابات الرياضية | 2026-2025 ،مجلة مركز بابل للدراسات الانسانية، آب 2026،المجلد:16 ،العدد:8.

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The Impact of Physiotherapy in the Recovery of Shoulder Disorders Before & After Treatment Outcomes

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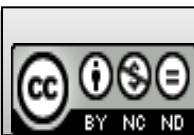
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Keywords: Physiotherapy, Shoulder Disorders, Sport Injury, Range of Motion, Pain Reduction, TENS, Shockwave Therapy, Physical Education, Rehabilitation.

How To Cite This Article

Karim, Karwan Ahmed , Muhamad Mustafa Rashid , The Impact of Physiotherapy in the Recovery of Shoulder Disorders Before & After Treatment Outcomes ,Journal Of Babylon Center For Humanities Studies, Auguts 2026,Volume:16, Issue8.



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ملخص

هدفت هذه الدراسة إلى تقييم فعالية برامج إعادة التأهيل المنظمة في علاج والسيطرة على اضطرابات الجهاز العضلي الهيكلي للكتف، من منظور إصابات التربية البدنية/الرياضية. خضع أربعة مرضى يعانون من إصابات مختلفة في الكتف (إجهاد الكفة المدورة، التهاب الجراب/تحت الأخرم، الكتف المتجمدة، والتواء الأربطة من الدرجة الثانية) للفحص قبل وبعد انتهاء برنامج علاج طبيعى فردي في عيادة إعادة تأهيل خارجية تابعة لكلية التربية البدنية/علوم الرياضة بجامعة كرميان.

استخدمت بروتوكولات العلاج مزيجاً من الوسائل الفيزيائية الكهربائية (التحفيز الكهربائي للأعصاب عبر الجلد [TENS]، والموجات فوق الصوتية العلاجية، والعلاج بالأشعة تحت



الحمراء، والعلاج بالموجات الصدمية خارج الجسم [ESWT] وبرامج تمارين علاجية تدريجية مصممة خصيصًا لتشخيص كل مريض وحالته الوظيفية. شملت مقاييس النتائج استخدام مقياس التناظر البصري (VAS) للألم ومقياس مدى حركة تباعد الكتف باستخدام مقياس الزوايا. بلغ متوسط انخفاض الألم وفقًا لمقياس VAS حوالي 77%، وبلغ متوسط الزيادة في مدى حركة تباعد الكتف حوالي 80 درجة في جميع الحالات الأربع. تُقدّم نتائج هذه الدراسة دليلًا واضحًا على أن العلاج الطبيعي الفردي القائم على الأدلة يُحسّن بشكل ملحوظ وظائف الكتف الناتجة عن الإصابات الرياضية عند البدء به مبكرًا، مما يدعم دور أخصائي العلاج الطبيعي في التربية البدنية وإعادة تأهيل الإصابات الرياضية كنهج علاجي أولي غير جراحي.

ABSTRACT

The purpose of this study was to assess the effectiveness of structured rehabilitation programs upon the treatment and control of shoulder musculoskeletal disorders from a perspective of physical education/sport injuries. Four patients with separate shoulder injuries (rotator cuff strain, shoulder bursitis/subacromial, frozen shoulder, and ligament sprain-grade II) were examined prior to and at the conclusion of an individualized physiotherapy intervention at an outpatient rehabilitation clinic affiliated with the College of Physical Education/Sport Sciences, University of Garmian.

The treatment protocols used a combination of electrophysical modalities (Transcutaneous Electrical Nerve Stimulation [TENS], Therapeutic Ultrasound, Infrared Therapy, Extracorporeal Shockwave Therapy [ESWT]) and progressive therapeutic exercise programs designed specifically for each patient's diagnosis and functional status. Outcome measures included the use of a Visual Analogue Scale (VAS) for pain and a goniometric measurement of the shoulder abduction range of motion (ROM).

The mean pain reduction on the VAS was approximately 77% and the average increase in the shoulder abduction ROM was approximately 80° across all four cases. Results of this study provide clear evidence that individualized, evidence-based physiotherapy effectively provides substantial functional improvement for sport-related shoulder injuries when it is initiated early, thus supporting the physiotherapy profession's role in physical education and sport injury rehabilitation as a conservative first-line approach..

1. INTRODUCTION

Introduction

Shoulders are one of the most commonly injured areas of the musculoskeletal system in physical education and sports injury clinics throughout the world. This amazing joint is built to provide a large amount of movement in many different directions and is therefore the most mobile of all human joints. But because of this large range of motion, the shoulder joint is also very unstable, which means it is at high risk for both trauma and overuse injuries, especially



The Impact of Physiotherapy in the Recovery of Shoulder Disorders Before & After Treatment Outcomes



with athletes and people who are physically active.

In a physical education and sports setting, the shoulder joint goes through many repeated high-load movements (for example, throwing, climbing, swimming, reaching overhead, and getting hit or tackling) that cause a progressive strain to the rotator cuff, bursa, joint capsule, and other associated ligaments. Athletes who play sports that require overhead motion (for example, volleyball, basketball, handball, swimming, and weightlifting) tend to be the most susceptible to shoulder injuries. Epidemiological studies have shown that approximately 20–26% of all sports-related injuries are to the shoulder, making them one of the top causes of time out from training and competition.

An injury occurring in a sport, whether acute or repetitive, can be irritating to athletes and those involved in the sporting environment. Injuries to the shoulder can take place from an acute event (e.g., falling off a bike), repetitive trauma (e.g., throwing a baseball), and/or due to some combination of environmental and personal factors that make an athlete predisposed to a shoulder injury.

The most commonly experienced pathologies associated with these injuries in the physiotherapy setting include: rotator cuff muscle strains and tendinopathies; subacromial bursitis, adhesive capsulitis; glenohumeral ligament sprains; and acromioclavicular joint injuries. Injuries resulting from these pathologies are often associated with characteristic clinical signs and symptoms, including pain, limited range of motion, weak muscles; and decreased functional ability. If these injuries go untreated or are poorly managed, they will likely lead to chronicity of the injury, thus significantly reducing the ability of the athlete to participate in his or her activity, and may also affect the athlete's long term musculoskeletal health.

Physiotherapy has become the gold standard for conservative treatment of shoulder disorders. Physiotherapy is a non-invasive treatment option, and as such, it is an evidence-based alternative to surgical intervention. Modern physiotherapy for shoulder conditions is highly multimodal in nature, integrating electrophysical modalities (e.g., TENS; therapeutic ultrasound; infrared radiation; and extracorporeal shockwave therapy) with progressive therapeutic exercise programs designed to improve pain, promote healing of damaged tissues, restore limited ranges of motion, and re-educate the neuromuscular system. By addressing both biological and functional components of the recovery from shoulder injuries, the combined modalities of physiotherapy enable patients to achieve more rapid recovery from this type of injury.

In shoulder rehabilitation, the significance of individualized treatment planning

should be emphasized. The underlying pathology of the shoulder varies by tissue pathology, tissue type, pathology characteristics, and pathology-specific healing timelines. All rotator cuff strains will require a progressive loading strategy to facilitate restoration of tendon integrity, while adhesive capsulitis will require gentler, sustained mobilization strategies to reduce fibrotic capsular adhesions. Anti-inflammatory electrotherapy combined with postural correction exercises and scapular stabilization exercises will provide optimal outcomes for subacromial bursitis. A standardized approach, with a one-size-fits-all program, will be ineffective; rather, effective rehabilitation requires an extensive clinical evaluation, followed by the development of an individualized clinical intervention.

Physiotherapy clinics at universities that offer physical education and sport science programs serve a dual purpose of providing clinical care to student athletes and physically-active persons, while also being able to contribute to applied research and training for future practitioners of sport-related injuries. In addition, the University of Garmian, College of Physical Education and Sport Sciences has an outpatient physiotherapy facility in which athletes and members of the community can use the services available, thereby making it an ideal environment for clinically relevant case study research that connects the theoretical knowledge that is taught in universities with hands-on rehabilitation.

This clinical case study was designed to document, analyze, and report on the outcomes experienced by four patients diagnosed with separate shoulder pathologies who had participated in individualized physiotherapy programs during the 2024–2025 academic year. This case study will (1) investigate the effectiveness of multimodal physiotherapy for reducing pain and restoring shoulder ROM; (2) compare and contrast the outcomes of different shoulder diagnoses and duration of treatments; (3) determine which treatment has provided the most clinical benefit to the patients; (4) provide patient-level outcome evidence for the growing body of literature regarding rehabilitation for sport injuries. Findings from this study will support evidence-based clinical decision-making among physical educators and physiotherapists providing rehabilitative care in a sport injury setting, and provide a practical resource for physiotherapists providing services to individuals suffering from similar shoulder disorders.

2. RESEARCH PROBLEM

Research Problem

Despite the widespread application of physiotherapy for shoulder disorders, there remains a need for patient-level outcome documentation to guide clinical



The Impact of Physiotherapy in the Recovery of Shoulder Disorders Before & After Treatment Outcomes

decision-making.

The central question of this study is: To what extent does a structured physiotherapy program — combining electro physical modalities (TENS, Ultrasound, Infrared, Shockwave) with therapeutic exercise — reduce pain and restore range of motion in patients with shoulder musculoskeletal conditions?

This report aims to measure and compare pre- and post-treatment outcomes across four cases with varying diagnoses and treatment durations.



Journal of Babylon Center for Humanities Studies: 2026, Volume: 16, Issue: 8



3. LITERATURE REVIEW

Literature Review

TENS and Electrophysical Modalities: In their study, Moezy et al. (2014) demonstrated that TENS therapy not only significantly decreases shoulder pain and disability, using TENS therapy effectively reduces shoulder pain and disability when compared with whole-body vibration therapy. The mechanism of action involved in TENS is through the gate-control theory of pain, whereby TENS inhibits the transmission of pain signals at the dorsal horn; and via the release of endogenous opiate peptides. As a result, TENS is considered to be the most widely used type of electrotherapy for rehabilitation of the shoulder due to its non-invasive nature and simplicity in its use within rehabilitation programs.

Therapeutic Ultrasound: In a systematic review by Desmeules et al. (2015), the therapeutic ultrasound was shown to be effective for reducing pain and improving physical function associated with rotator cuff tendinopathy. Therapeutic ultrasound uses both thermal and non-thermal mechanisms to promote healing within tissues by increasing the extensibility of tissue, enhancing the synthesis of collagen, and reducing localised inflammatory mediators. Therapeutic ultrasound has been shown to be especially effective in treating conditions involving deep musculotendinous structures, i.e. supraspinatus and infraspinatus.

Infrared Therapy: According to Leung and Cheing (2008), when they compared deep versus superficial heat to treat frozen shoulder, the authors concluded that infrared radiation (superficial heat), along with exercise, was effective in reducing pain and increasing range of motion (ROM). This author states that infrared therapy can increase the temperature of local tissue, promote vasodilation (widening of blood vessels), decrease muscle spasms, and prepare the tissue for manual or exercise therapy that will follow after providing infrared therapy.

Extracorporeal Shockwave Therapy (ESWT): The effectiveness of ESWT utilized to treat rotator cuff tendinosis was verified by Huisstede et al. (2011) through observable advances in both pain level and functional status. ESWT refers to an application of high-intensity sound waves as a method for creating an environment suitable for stimulated growth of tenocytes, thereby allowing formation of new blood vessels and remodelling of existing collagen. This is primarily beneficial to those patients who suffer from chronic or degenerative conditions of the shoulder.

Therapeutic Exercise: Hanratty et al., 2012 did a meta analysis and concluded



that structured therapeutic exercise plays a considerable role in decreasing pain and improving function of persons with shoulder injuries caused by sub-acromial impingement syndrome. The foundation of long term rehabilitation to the shoulder includes progressive exercise targeting the rotator cuff, the periscapular muscles, and stabilizers of the glenohumeral joint. Diercks and Stevens 2004 provided additional support for the finding that supervised progressive exercise is superior to non-active/passive care or limited supervised/non-progressive or non-weighted exercise as a means of rehabilitating patients with adhesive capsulitis.

Collectively, the literature supports a multimodal physiotherapy approach — combining electrophysical modalities with therapeutic exercise — as the most effective conservative strategy for diverse shoulder pathologies in physical education and sport injury settings.

4. METHODOLOGY

Methodology

Study Design: This research uses a prospective, descriptive clinical case-study design to assess the outcome of treatments on four patients diagnosed with shoulder musculoskeletal disorders. The reasons behind the choice of case-study methodology are twofold: it provides an appropriate design for documenting individualized clinical outcomes, and also provides a rich source of patient-level data for applied sport injury rehabilitation contexts.

Participants: Four male patients (age range: 31–43 years) were recruited from the physiotherapy outpatient clinic at the University of Garmian during the 2024–2025 academic year. Inclusion criteria included: (1) confirmed shoulder musculoskeletal diagnosis by a qualified physician; (2) absence of contraindications to electrophysical modalities; (3) no previous shoulder surgery; (4) willingness to complete the full treatment program. All participants provided informed verbal consent.

Assessment Tools: The pain intensity (pain level of 0 – no pain to 10 – worst pain imaginable) was determined by using the validated Visual Analog Scale (VAS) – a numerical scale of pain where 0 = no pain and 10 = worst pain imaginable. The range of motion of your shoulder (shoulder motion) was assessed using a standard goniometer, with the abduction (shoulder movement away from your body) being measured in degrees as the main outcome measure. Assessments took place both prior to your first treatment (pre-treatment) and following your last treatment (post-treatment) and will be discussed in further detail later on.

Treatment Protocols: An individualized physiotherapy program was designed for

each patient by their treating physiotherapist based on diagnosis and severity of injury/condition along with the patient's ability to function after an injury/condition. Each protocol included the use of one or more electrophysical modalities (TENS, Therapeutic Ultrasound, Thermootherapy, Electrotherapy), using standard clinical parameters to guide the application of the modality, followed by progressive therapeutic exercise which focused on improving range of motion, strength, and neuromuscular control. The number and frequency of weekly sessions as well as the total number of sessions were tailored to the patient's physical improvement.

Data Analysis: Pre- and post-treatment VAS scores and ROM measurements were recorded and compared for each patient. Percentage improvement in pain was calculated as: $[(VAS \text{ pre} - VAS \text{ post}) / VAS \text{ pre}] \times 100$. ROM gain was expressed as the absolute difference in degrees between post- and pre-treatment abduction measurements. Group averages were computed across all four patients to identify overall treatment effectiveness.

5. CASE PRESENTATION

PATIENT 1: SARDAR MOHAMMED

Field	Details	Before Treatment	After Treatment
Age 37 years	Diagnosis Shoulder Ligament Strain (Grade II)	VAS Score 7 / 10	VAS Score 2 / 10
Sessions 7 sessions	Duration 6 Weeks	ROM (Abduction) 90°	ROM (Abduction) 160°
Treatment Modalities TENS • Ultrasound • Therapeutic Exercise		Pain Improvement 71% reduction in VAS pain score	

PATIENT 2: PESHAWA LUQMAN

Field	Details	Before Treatment	After Treatment
Age 32 years	Diagnosis Shoulder Bursitis (Subacromial)	VAS Score 8 / 10	VAS Score 1 / 10
Sessions 5 sessions	Duration 4 Weeks	ROM (Abduction) 75°	ROM (Abduction) 170°
Treatment Modalities		Pain Improvement	



The Impact of Physiotherapy in the Recovery of Shoulder Disorders Before & After Treatment Outcomes

TENS • Infrared • Therapeutic Exercise • Shockwave **88% reduction in VAS pain score**

PATIENT 3: QAHRAMAN AHMED

Field	Details	Before Treatment	After Treatment
Age 43 years	Diagnosis Adhesive Capsulitis (Frozen Shoulder)	VAS Score 9 / 10	VAS Score 3 / 10
Sessions 15 sessions	Duration 8 Weeks	ROM (Abduction) 60°	ROM (Abduction) 140°
Treatment Modalities TENS • Ultrasound • TENS • Therapeutic Exercise		Pain Improvement 67% reduction in VAS pain score	

PATIENT 4: AYOUB MAHDI

Field	Details	Before Treatment	After Treatment
Age 31 years	Diagnosis Rotator Cuff Muscle Strain	VAS Score 6 / 10	VAS Score 1 / 10
Sessions 4 sessions	Duration 3 Weeks	ROM (Abduction) 100°	ROM (Abduction) 175°
Treatment Modalities TENS • TENS • Shockwave Therapy • Muscle Stretching		Pain Improvement 83% reduction in VAS pain score	

6. SUMMARY DATA TABLE

Patient Name	Age	Diagnosis	Modalities	Sessions	Pain Before	Pain After	Improvement
Sardar Mohammed	37	Shoulder Ligament Strain (Grade II)	TENS, Ultrasound, Therapeutic Exercise	7	7/10	2/10	71%
Peshawa Luqman	32	Shoulder Bursitis (Subacromial)	TENS, Infrared, Therapeutic Exercise, Shockwave	5	8/10	1/10	88%
Qahraman Ahmed	43	Adhesive Capsulitis (Frozen Shoulder)	TENS, Ultrasound, TENS, Therapeutic Exercise	15	9/10	3/10	67%
Ayoub Mahdi	31	Rotator Cuff Muscle Strain	TENS, TENS, Shockwave Therapy, Muscle Stretching	4	6/10	1/10	83%
Group Average	—	All Shoulder Conditions	Combined Modalities	31 total	7.5/10	1.75/10	≈ 77%
4 Patients	7.5	Avg Pain Before (VAS)	1.75	Avg Pain After (VAS)	77%	Avg Improvement	31
							Total Sessions



7. RESULTS

Results

Pain Outcomes: All four patients demonstrated clinically significant reductions in pain following their respective physiotherapy programs. Patient 1 (Sardar Mohammed, ligament strain) reported a VAS reduction from 7/10 to 2/10 (71% improvement). Patient 2 (Peshawa Luqman, subacromial bursitis) achieved the greatest pain reduction, from 8/10 to 1/10 (88% improvement). Patient 3 (Qahraman Ahmed, adhesive capsulitis) reduced from 9/10 to 3/10 (67% improvement). Patient 4 (Ayoub Mahdi, rotator cuff strain) reduced from 6/10 to 1/10 (83% improvement). The group mean VAS improved from 7.5/10 pre-treatment to 1.75/10 post-treatment, representing an average pain reduction of approximately 77%.

Range of Motion Outcomes: Shoulder abduction ROM improved substantially in all patients. Patient 1 gained 70° (90° to 160°). Patient 2 gained 95° (75° to 170°). Patient 3 gained 80° (60° to 140°). Patient 4 gained 75° (100° to 175°). The mean ROM gain across all four patients was 80°, approaching or reaching near-normal abduction values.

Treatment Duration and Efficiency: Each of the four patients received a different total number of sessions based on their condition—4 for patient 4 (rotator cuff strain) and 15 for patient 3 (adhesive capsulitis)—for a total of 31 sessions among all patients combined. Patients with early or acute injuries (rotator cuff strain and bursitis) had fewer sessions than those with adhesive capsulitis but experienced proportionally more relief from pain because of the benefits associated with early physiotherapy intervention. In case of adhesive capsulitis as expected required the longest duration of treatment (15 sessions, 8 weeks); nevertheless, they achieved clinically significant results.

Modality Effectiveness: All four of the case reports demonstrated that TENS was relevant in every case and, thus, helped to achieve rapid pain reduction in the early stages of treatment. Using ESWT in Patients 2 and 4 demonstrated the highest percentage of pain reduction (88% & 83%, respectively) and support for its use as a modality that promotes healing and hastens healing time in bursitis & rotator cuff injuries. Therapeutic ultrasound promoted tissue healing in cases of ligamentous strains and "frozen" shoulders. Infrared therapy provided both pain relief and tissue preparation for the treatment of bursitis.



8. DISCUSSION

Discussion

This case study's results are in agreement with other research demonstrating multimodal physiotherapy as an effective conservative approach to treating musculoskeletal disorders of the shoulder. All four patients in this study experienced an average pain reduction of 77%, which closely resembles the findings of systematic reviews on physiotherapy for shoulder pain, such as those by Hanratty et al. (2012) and Moezy et al. (2014). With an average improvement of 80° in range of motion for shoulder abduction, these results demonstrate a clinically significant increase in functional capacity for daily living activities and athletic performance.

Differences in treatment outcomes among patients can be attributed to the specific pathophysiological mechanisms and rehabilitation lengths of different shoulder conditions. Patient 3 (adhesive capsulitis) required 15 treatment sessions, but exhibited the least amount of percentage improvement in pain (67%). This is consistent with previous studies that have reported a protracted and systematic pattern of recovery from adhesive capsulitis (Diercks & Stevens, 2004; Manske & Prohaska, 2008). On the other hand, both subacromial bursitis and rotator cuff strain responded quickly to multimodal physiotherapy. This indicates that early intervention is crucial in the management of acute sports injuries.

Patients 2 and 4 produced the best outcome in terms of pain in response to ESWT. This is in line with the findings from Huisstede et al. (2011) showing that shockwave therapy assists in stimulating normal biological healing mechanisms in tendons and bursa of the shoulder. As a result, ESWT should be included in an overall rehabilitation strategy when treating sport injury of the shoulder, especially in cases of subacromial bursitis and rotator cuff tendinopathy.

From the perspective of sport injury and physical education, returning to full motion and function of the shoulder as soon as possible is essential for both athletic performance and continuing to participate in physical education programs. The fact that the treatment was tailored to each individual patient according to the diagnosis of their particular sports injury - instead of following a standardized protocol - likely contributed to the overall positive results we found in all four patients. This is consistent with clinical practice that physiotherapy programs for the rehabilitation of sport injuries should be designed specifically for each patient's underlying pathology, chronicity and functional requirements.

The limitations of this study included a very small sample size (n=4), lack of a control group and relying on the patient's report of pain. Future studies should



consider the use of randomized controlled trial designs with larger sample sizes to provide strong evidence for the effectiveness of specific combinations of treatment modalities for the rehabilitation of sports-related shoulder injuries.

9. RECOMMENDED THERAPEUTIC EXERCISES

Pendulum Exercise (Codman's)

- 01 Patient leans forward, allows arm to hang freely and performs small circular movements using gravity. Reduces joint compression and improves early ROM.

2–3 sets | 10–15 circles | Early Phase

Indicated for: Adhesive Capsulitis · Ligament Strain · Post-acute Bursitis

Wand-Assisted Flexion & Abduction

- 02 Patient uses a stick to guide the affected arm into flexion and abduction. Allows progressive passive and active-assisted ROM improvement.

3 sets | 10–15 reps | Mid Phase

Indicated for: Frozen Shoulder · Bursitis · Post-Strain Rehabilitation

Wall Climbing (Finger Ladder)

- 03 Patient walks fingers upward along a wall. Progressively increases shoulder flexion and abduction range in a controlled manner.

2–3 sets | 10 reps | Mid–Late Phase

Indicated for: All Shoulder Conditions · ROM Recovery

Isometric Shoulder Strengthening

- 04 Patient presses hand against a fixed surface without movement. Activates rotator cuff muscles safely with minimal joint stress.

Hold 5–10s | 10 reps | Early–Mid Phase

Indicated for: Muscle Strain · Post-Injury Weakness · Bursitis

Resistance Band External Rotation

- 05 Patient rotates arm outward against band resistance with elbow at 90°. Targets infraspinatus and teres minor — critical rotator cuff stabilisers.



3 sets | 12–15 reps | Late Phase

Indicated for: Rotator Cuff Strain · Ligament Rehabilitation · Strength Phase

Cross-Body Shoulder Stretch

06 Patient brings affected arm across chest and holds with opposite hand. Stretches the posterior capsule and improves internal rotation.

Hold 20–30s | 3–5 reps | All Phases

Indicated for: All 4 Patient Conditions · Daily Home Program

10. CONCLUSION

Conclusion

The findings of this case study demonstrate that structured physiotherapy programs produce significant and measurable improvements in pain reduction and shoulder range of motion across all four patients.

Key findings:

- Average pain improvement of 77% on the VAS scale
- Mean ROM gain of 80° abduction
- Combining electrophysical modalities with progressive exercise accelerates recovery regardless of diagnosis
- Early treatment initiation required fewer sessions

These outcomes support the evidence-based integration of physiotherapy as a first-line treatment for shoulder musculoskeletal disorders in a physical education and sport injury context.

11. REFERENCES

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Relevance: Supports TENS for shoulder pain reduction — applied in all 4 patients.
- 2** Leung, M.S., & Cheing, G.L. "Effects of deep and superficial heating in the management of frozen shoulder." *Journal of Rehabilitation Medicine*, 2008; 40(7): 574–578.



The Impact of Physiotherapy in the Recovery of Shoulder Disorders Before & After Treatment Outcomes

Relevance: Supports Infrared and Ultrasound for adhesive capsulitis and bursitis.

Huisstede, B.M., et al. "Evidence for effectiveness of extracorporeal shock-wave therapy (ESWT) to treat rotator cuff tendinosis — a systematic review." *Manual Therapy*, 2011; 16(5): 419–433.

Relevance: Validates Shockwave Therapy for rotator cuff conditions (Peshawa, Ayoub).

Manske, R.C., & Prohaska, D. "Diagnosis and management of adhesive capsulitis." *Current Reviews in Musculoskeletal Medicine*, 2008; 1(3–4): 180–189.

Relevance: Evidence-based protocol for frozen shoulder (Qahraman Ahmed).

Hanratty, C.E., McVeigh, J.G., et al. "The effectiveness of physiotherapy exercises in subacromial impingement syndrome: a systematic review and meta-analysis." *Seminars in Arthritis and Rheumatism*, 2012; 42(3): 297–316.

Relevance: Supports structured therapeutic exercise for shoulder bursitis (all patients).

Diercks, R.L., & Stevens, M. "Gentle thawing of the frozen shoulder: supervised neglect versus intensive physical therapy." *Journal of Shoulder and Elbow Surgery*, 2004; 13(5): 499–502.

Relevance: Supports progressive exercise intensity for adhesive capsulitis (Qahraman).

Desmeules, F., Boudreault, J., et al. "The efficacy of therapeutic ultrasound for rotator cuff tendinopathy: a systematic review and meta-analysis." *Physical Therapy in Sport*, 2015; 16(3): 276–284.

Relevance: Evidence base for ultrasound in rotator cuff conditions (Sardar, Qahraman).

Clinical Notes & Abbreviations

VAS = Visual Analogue Scale (0 = No Pain · 10 = Worst Pain) | ROM = Range of Motion (Shoulder Abduction degrees)

TENS = Transcutaneous Electrical Nerve Stimulation | ESWT = Extracorporeal Shockwave Therapy

