

VILNIUS UNIVERSITY
MEDICAL FACULTY

The Final Thesis

Shoulder Pain Problem in Scope of Physical and Rehabilitation Medicine

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2023

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1. Aims and objectives

This thesis is concerned with shoulder pain problems in the scope of physical and rehabilitation medicine. The focus lies on direct treatments of different shoulder pain problems. Furthermore, the thesis is intended to give an overview about basic principles of shoulder structure and shoulder girdle as well as basic instructions regarding anamnesis and diagnosis of shoulder pain problems. The gathered information are taken from several studies around the globe.

2. Keywords

Shoulder pain, adhesive capsulitis, painful arc, rotator cuff disease, subacromial impingement syndrome, Tendon inflammation, Shoulder instability, Arthritis, Bursitis tendinitis, tendon rupture, hemiplegic shoulder pain, stroke, risk factors

3. Methods

In this paper, an overview was performed about “shoulder pain problems in rehabilitation medicine”. Its etiology, pathogenetic and therapeutic aspects were considered. The search included google scholar, PubMed, Springer, Elsevir, academic books both in German and English language. The majority of papers were published in between 1990 and 2020. All subjects were adults, both male and female sex. The search yielded a variety of studies, which were then critically evaluated for their relevance to the topic. The data collected was systematically organized, analyzed, and interpreted to establish the etiology, pathogenesis, and therapeutic aspects of shoulder pain in rehabilitation medicine. Results were then compared and contrasted to provide an authoritative overview of current knowledge in this field.

4. Introduction

No human being moves perfectly, and this lack of perfect movement can have detrimental consequences. These detrimental effects can be seen in the form of restricted movement and musculoskeletal pains, which greatly detract from quality of life. Of all the joints, the shoulder is especially prone to injury due to its wide range of motion, and can be particularly vulnerable to acute tendon ruptures, avulsions, and small tears which can build up over time and lead to shoulder pain. While there are a large number of potential pathologies associated with shoulder

pain, it is often possible to identify the cause of the pain with a combination of anamnesis, physical examination, and instrumental diagnostics, and thus initiate a targeted and successful treatment. Shoulder pain is the third most common problem presented in musculoskeletal primary care, with around 50% of patients still having problems even after six months.(1) Around 50% of patients with shoulder pain problems tend to still have problems after half a year. (2) Depending on the country of origin, the prevalence of chronic shoulder pain can vary slightly, with the Netherlands population showing a prevalence of 15.1 percent in comparison to the 20.2, 20 and 19 percent prevalence in Norway, the UK and Sweden, respectively.(3)

5. Overview

Shoulder pain is a condition caused by a wide range of potential injuries to the shoulder girdle, which is composed of two joints, the acromioclavicular joint and the glenohumeral joint, and the surrounding musculature, including the rotator cuff muscles. The acromioclavicular joint connects the acromion, the scapula and the clavicle, while the glenohumeral joint is a ball-socket joint connecting the humeral head and the glenoid. The rotator cuff muscles, which comprise the supraspinatus, infraspinatus, teres minor and the subscapularis, provide rigidity and stability to the joint by connecting the scapula and the humerus through tendons. Furthermore, the joint is surrounded by a joint capsule filled with synovial fluid and the glenoid is rimmed with the labrum, a type of soft tissue. Consequently, due to the various structures involved, shoulder pain can manifest itself in a variety of ways and may be caused by a wide range of injuries.(4)

Shoulder pain is a common complaint experienced by many people, and its fundamental causes are varied. In general, shoulder problems can be categorized into four major categories: tendon inflammation, shoulder instability, arthritis, and bone fractures. Tendon inflammation, or tendinitis, is one of the most common causes of shoulder pain, and is a result of overuse or strain on the tendon. Shoulder instability occurs when the shoulder joint is not properly stabilized, resulting in a dislocation or subluxation of the shoulder. Arthritis is an inflammatory condition that affects the joints, including the shoulder joint, and is one of the most common causes of shoulder pain. Bone fractures in the shoulder can occur due to trauma or overuse, and can lead to severe shoulder pain. Other, less common, causes of shoulder pain include tumors, infection, and nerve-related problems. It is important to seek medical attention for any shoulder pain in order to determine the underlying cause and receive suitable treatment.(5)

5.1. Tendon inflammation

Shoulder problems due to tendon inflammation can manifest in various forms and can have a range of causes. Bursitis, tendinitis, and rupture of tendon are the three major types of tendon inflammation. Bursitis is caused by an inflammation of the bursa, which is a small sac filled with lubricating fluid located near a joint. Tendinitis is an inflammation of a tendon, which is the fibrous tissue that connects muscle to bone. Rupture of tendon is the tearing or breaking of a tendon. Another common cause of shoulder pain is shoulder impingement, which can be caused by either a bursitis or a tendinitis. In shoulder impingement, the tissues around the shoulder joint become compressed, leading to inflammation, pain, and impaired movement. People can develop shoulder problems due to tendon inflammation due to a variety of reasons, including repetitive motion, overuse, and direct trauma. Treatment of shoulder problems due to tendon inflammation typically involves rest and anti-inflammatory medications, but in some cases, physical therapy or surgery may be necessary. (6)

5.1.1. Bursitis

Bursitis of the shoulder can be an incredibly painful and debilitating condition. It is caused by an inflammation of the bursae, which are small, fluid-filled sacs that act as cushions and lubricants between muscles, tendons, and bones in the shoulder joint. Subacromial bursitis is the most common type of bursitis in the shoulder, and is caused by excessive use and strain on the shoulder joint. This can lead to inflammation and swelling between the shoulder muscles and the acromion. Rotator cuff bursitis is another type of shoulder bursitis that is caused by the same mechanism, and can result in painful difficulties during normal daily activities. (7)

5.1.2. Tendinitis

Tendinitis is a painful condition caused by the inflammation of a tendon, which is a band of tough, fibrous tissue that connects a muscle to a bone. There are two main types of tendinitis. Acute tendinitis is commonly a result of excessive or repetitive physical activity, while chronic tendinitis is typically associated with degenerative diseases such as arthritis. The rotator cuff tendons and biceps tendons are typically the most commonly affected areas when it comes to shoulder tendinitis. If left untreated, tendinitis can lead to significant pain and discomfort, as well as decreased range of motion. (7)

5.1.3. Tendon rupture

The rotator cuff is a network of 4 muscles that stabilize the shoulder and enable the bones to move together. The biceps tendon connects the biceps muscle to the bones in the shoulder. It is responsible for enabling the shoulder to flex and rotate. The tendon can rupture due to an active injury or passive degenerative diseases. Active injuries can be caused by an extreme force or movement of the shoulder joint, such as lifting a heavy object or falling onto the shoulder. Passive degenerative diseases are more common in older people, as the tendons can become weak and brittle due to the natural aging process. These can be caused by poor posture, bad habits or even a medical condition. When a tendon ruptures, it can cause severe pain, swelling and difficulty in moving the affected shoulder. In addition to these symptoms, the patient may experience a loss of strength and range of motion. Treatment of shoulder tendon rupture usually involves rest, ice, physical therapy and possibly surgery. Surgery may be required if the rupture is severe. By following the correct treatment plan, patients can often regain full function of the affected shoulder. (8)

5.1.4. Impingement

Shoulder impingement is a common condition, characterized by bursitis or tendinitis, which is caused by increased pressure on the underlying soft tissues of the shoulder when the arm is raised. This pressure is applied by the acromion, which can impinge the underlying tendons and bursae, leading to pain and limiting one's ability to perform daily tasks and movements. Shoulder impingement is primarily caused by overuse and repetitive motions, such as throwing a ball, swimming strokes, and playing tennis, as well as acute trauma, poor posture, and aging. It is important to note that shoulder impingement can be prevented or managed by properly stretching, strengthening, and resting the shoulder, as well as avoiding any activities which could cause further damage.

5.2. Shoulder instability

Shoulder instability is characterized by the recurrent dislocation or partial dislocation (subluxation) of the humerus head out of its socket (glenoid) in the shoulder joint. It can be caused by either a forceful injury, such as a fall, or by overuse, due to repeated exercises. The disruption of the joint capsule and the surrounding ligaments, tendons and muscles can render the joint susceptible to subsequent instability and dislocations. This can result in pain and decreased range of motion, as well as the development of arthritis in the affected shoulder joint. Additionally, shoulder instability may lead to the formation of labral tears and rotator cuff tears

as well as muscle imbalances, which can further compromise the stability of the shoulder joint. Therefore, it is important to treat shoulder instability promptly and effectively in order to prevent further damage and complications.

5.3. Arthritis

Osteoarthritis is the most commonly encountered type of arthritis in relation to shoulder pain, often referred to as "wear and tear" arthritis. This type of arthritis develops slowly and typically begins in middle age, causing pain, stiffness and swelling which will continue to worsen over time. The onset of this condition may be due to chronic conditions or may occur spontaneously as a result of excessive exercise. In addition, other types of arthritis of the shoulder may be caused by infections, inflammations or rotator cuff tears. (9)

5.4. Fractures

Fractures of the shoulder are a common cause of shoulder pain and can involve the clavicle, humerus and scapula. These fractures can present in people of all ages, however, the underlying cause may vary depending on the age group. Generally, elderly patients are more likely to experience fractures from minor falls due to their weaker bone structures, whereas younger patients are more prone to suffer fractures due to high-energy injuries such as sports-related trauma or motor vehicle collisions. In either case, fractures of the shoulder commonly present with signs and symptoms such as swelling, bruising and intense pain.

6. Assessment methods

The correct clinical assessment of shoulder pain problems is a crucial element for the accurate identification of the underlying cause. The assessment consists of four main components, which include inspecting for specific indications, conducting a physical examination, performing provocative tests and evaluating the stability of the shoulder. During the general inspection, the physician will palpate the shoulder and evaluate the range of motion. Furthermore, several specific maneuvers are used for the provocative tests and instability tests. To ensure a comprehensive evaluation, the assessment should also include the assessment of the surrounding structures, such as the neck and the elbow. This is essential for a successful diagnosis and should not be neglected.(10)

6.1. Key findings

Key Findings in the History and Physical Examination

Finding	Probable diagnosis
Scapular winging, trauma, recent viral illness	Serratus anterior or trapezius dysfunction
Seizure and inability to passively or actively rotate affected arm externally	Posterior shoulder dislocation
Supraspinatus/infraspinatus wasting	Rotator cuff tear; suprascapular nerve entrapment
Pain radiating below elbow; decreased cervical range of motion	Cervical disc disease
Shoulder pain in throwing athletes; anterior glenohumeral joint pain and impingement	Glenohumeral joint instability
Pain or “clunking” sound with overhead motion	Labral disorder
Night-time shoulder pain	Impingement
Generalized ligamentous laxity	Multidirectional instability

(10)

6.2. Physical examination

The assessment of range of motion and strength of the shoulder is performed. The shoulder is tested for abduction, flexion, extension, internal rotation, external rotation, horizontal abduction, and horizontal adduction. Furthermore, the strength of the shoulder is examined by assessing the patient's ability to resist against the physician's pressure.

Provocative shoulder testing is done to determine the possible impingement syndrome and glenohumeral instability. Neer's impingement sign and Hawkins-Kennedy impingement sign are the two tests performed to determine the presence of impingement syndrome. Further, an apprehension test is also done as a part of the glenohumeral instability testing. (11)

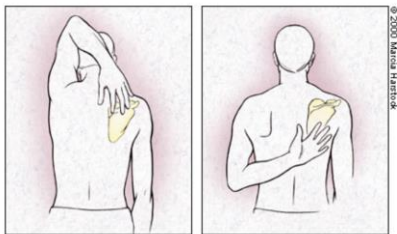
Moreover, neck and elbow examinations should also be conducted to evaluate for any related clinical condition which may be radiating from these joints. This includes assessing the range of motion, strength, and relevant provocative testing as well.

In conclusion, a thorough physical examination of the shoulder should include inspection and palpation, assessment of range of motion and strength, and provocative shoulder testing for

possible impingement syndrome and glenohumeral instability. Furthermore, neck and elbow examinations should be performed in order to exclude any clinical condition radiating from these two joints. Collectively, these physical examinations can be used to diagnose and provide a plan of care to a patient with shoulder pain.

6.2.1. Range of motion testing

Range of motion testing is a common assessment procedure used to evaluate the range of motion of a joint in patients with shoulder pain. It is often used to aid in the diagnosis and management of shoulder pathology. The test is conducted by manually assessing the range of motion of the shoulder joint, comparing it to normative values and assessing for any restrictions or pain associated with the movement. The range of motion testing is typically performed in four planes of motion: flexion, extension, abduction, and internal and external rotation. The results of the range of motion test can help to determine the severity of the shoulder pathology, as well as the need for further assessment or treatment. Additionally, range of motion testing can be used to evaluate the effectiveness of rehabilitation interventions and to monitor progress over time. Range of motion testing is a key component of the shoulder assessment, as it can provide insight into the underlying pathology and guide the clinician in the appropriate treatment of the shoulder condition.



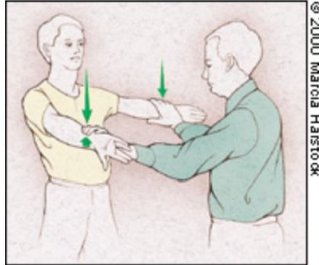
Apley scratch test. The patient attempts to touch the opposite scapula to test range of motion of the shoulder.
(Left) Testing abduction and external rotation. (Right) Testing adduction and internal rotation.

(10)

6.2.2. Testing of elevating the rotator cuff

Testing of elevating the rotator cuff in patients with shoulder pain is a common procedure for assessing the presence of underlying shoulder pathology. Shoulder pain is a common musculoskeletal complaint, and it may be caused by a variety of conditions. Elevation of the rotator cuff is a test used to evaluate shoulder pathology, such as tendonitis, bursitis, or impingement syndrome. During the test, the patient is asked to raise their arm above their head while the examiner applies downward pressure on the arm. If the patient has pain or weakness

while performing the test, it may indicate the presence of shoulder pathology. Elevation of the rotator cuff is a simple, non-invasive procedure that can be used to diagnose shoulder pathology.

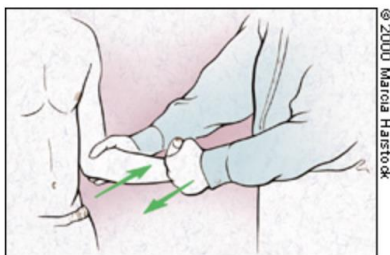


Supraspinatus examination ("empty can" test). The patient attempts to elevate the arms against resistance while the elbows are extended, the arms are abducted and the thumbs are pointing downward.

(10)

6.2.3. External rotation testing

External rotation testing of the shoulder is a physical examination maneuver used to assess the integrity of the rotator cuff muscles and the glenohumeral ligaments. It is performed with the patient in the supine position, with the shoulder in 90 degrees of abduction and the elbow flexed to 90 degrees. The examiner then applies a posteriorly directed force to the distal forearm. A positive test occurs when the patient is unable to externally rotate the shoulder beyond neutral.



Infraspinatus/teres minor examination. The patient attempts to externally rotate the arms against resistance while the arms are at the sides and the elbows are flexed to 90 degrees.

(10)

6.3. Provocative testing

Provocative testing is a commonly used physical examination method to assess shoulder pathology. It involves the application of various external forces to the shoulder joint to elicit pain and other signs of pathology. These tests can be used to diagnose a range of shoulder conditions, including rotator cuff impingement, shoulder instability, and shoulder labral tears. The aim of provocative testing is to reproduce the patient's symptoms and to identify the source of pain. It is important to consider the patient's medical history and physical examination findings when performing provocative testing, as it can help to differentiate between

pathologies. (12) Furthermore, provocative testing should be performed in a systematic fashion in order to ensure that all relevant tests are performed. The results of provocative testing should be interpreted in light of the patient's history and physical examination findings, and the results should be documented for future reference. (10)

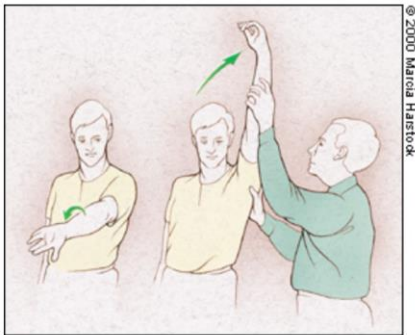
Tests Used in Shoulder Evaluation and Significance of Positive Findings

Test	Maneuver	Diagnosis suggested by positive result
Apley scratch test	Patient touches superior and inferior aspects of opposite scapula	Loss of range of motion: rotator cuff problem
Neer's sign	Arm in full flexion	Subacromial impingement
Hawkins' test	Forward flexion of the shoulder to 90 degrees and internal rotation	Supraspinatus tendon impingement
Drop-arm test	Arm lowered slowly to waist	Rotator cuff tear
Cross-arm test	Forward elevation to 90 degrees and active adduction	Acromioclavicular joint arthritis
Spurling's test	Spine extended with head rotated to affected shoulder while axially loaded	Cervical nerve root disorder
Apprehension test	Anterior pressure on the humerus with external rotation	Anterior glenohumeral instability
Relocation test	Posterior force on humerus while externally rotating the arm	Anterior glenohumeral instability
Sulcus sign	Pulling downward on elbow or wrist	Inferior glenohumeral instability
Yergason test	Elbow flexed to 90 degrees with forearm pronated	Biceps tendon instability or tendonitis
Speed's maneuver	Elbow flexed 20 to 30 degrees and forearm supinated	Biceps tendon instability or tendonitis
“Clunk” sign	Rotation of loaded shoulder from extension to forward flexion	Labral disorder

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6.3.1. Neer's test

The Neer's test is a standard clinical test for the assessment of shoulder impingement. It is used to diagnose conditions such as rotator cuff tendonitis, bursitis, or labral tears. The patient is placed in a supine position with their shoulder at 90° flexion and the arm passively abducted to 90°. The examiner then applies an axial load to the patient's shoulder and the patient is asked to externally rotate their arm. A positive result is defined as the presence of pain felt with the test. This test is a reliable and widely accepted method of diagnosing shoulder impingement, although further evidence is needed to support its accuracy.

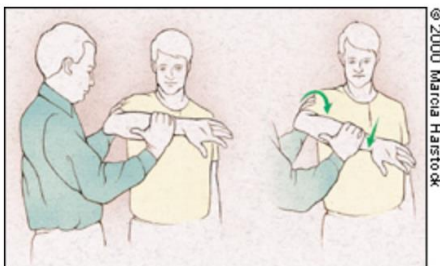


Neer's test for impingement of the rotator cuff tendons under the coracoacromial arch. The arm is fully pronated and placed in forced flexion.

(10)

6.3.2. Hawkins' Test

The Hawkins Test is a physical examination used to assess the integrity of the shoulder joint. The patient stands with their arm abducted to 90 degrees, and then the examiner applies downward pressure. A positive result is indicated by pain in the shoulder joint or an inability of the patient to tolerate any downward pressure. This test is useful in diagnosing shoulder pathology, such as rotator cuff tears, shoulder impingement, labral tears, and shoulder instability.



Hawkins' test for subacromial impingement or rotator cuff tendonitis. The arm is forward elevated to 90 degrees, then forcibly internally rotated.

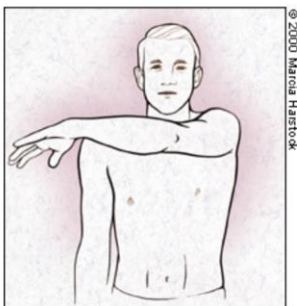
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6.3.3. Drop-arm Test

The drop-arm test is a physical examination that is utilized to assess shoulder pathology. It is performed while the patient is standing, with their arm extended forward at shoulder height. The patient is asked to lower the arm to their side in an extended position while maintaining the arm in that same position. If the patient experiences pain while attempting to lower the arm, it indicates the presence of an underlying shoulder condition. This test is an important element in diagnosing shoulder pain, as it can help to identify the source of the discomfort.

6.3.4. Cross-arm Test

The cross-arm test is a valuable tool for assessing a patient's shoulder pathology. It is important to perform the test with high scientific standards of accuracy, as incorrect assessment of the patient's range of motion and stability can lead to misdiagnosis and incorrect treatment. Furthermore, the cross-arm test is helpful in differentiating between shoulder instability and shoulder impingement syndromes. In order to accurately assess the patient's shoulder pathology, the clinician should obtain a detailed history, evaluate the patient's range of motion and stability, and assess any discomfort the patient may experience during the test. By doing so, the clinician is able to make an accurate diagnosis and guide treatment. Additionally, the cross-arm test can be used to monitor the progress of treatment and determine if further intervention is necessary, making it an invaluable tool for shoulder assessment.



Cross-arm test for acromioclavicular joint disorder. The patient elevates the affected arm to 90 degrees, then actively adducts it.

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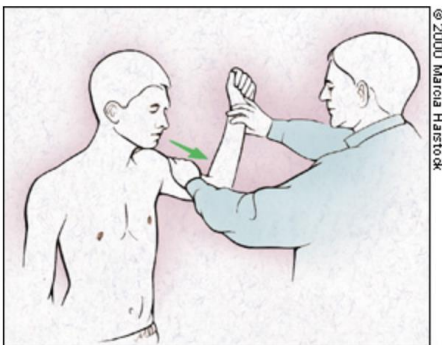
6.4. Instability testing

The Instability testing of the shoulder is an important component of the physical examination of this joint. It involves testing for laxity or excessive mobility of the shoulder joint. Tests such as the apprehension test, relocation test, sulcus sign, and the drawer test are utilized to assess the stability of the shoulder and to identify any associated pathologies. The result of these tests can also help guide treatment decisions for patients with shoulder instability. Additionally,

imaging studies such as X-rays, CT scans, and MRIs can be useful in confirming the diagnosis of shoulder instability and in determining the extent of any associated damage. (13)

6.4.1. Apprehension Test

The Apprehension Test of the shoulder is a diagnostic maneuver used to assess possible instability in the shoulder joint. It is performed by placing the shoulder in a position of maximal laxity and then applying an anterior force to the humerus in an attempt to provoke apprehension. This test can identify whether the patient experiences a feeling of instability that is suggestive of shoulder instability. The test is considered positive if the patient expresses a feeling of apprehension or if the humerus subluxates anteriorly. (13) The Apprehension Test of the shoulder is an important part of the shoulder examination and can provide valuable information about the integrity of the shoulder joint. Furthermore, it can help guide the clinician in determining the need for further assessment or intervention. By performing this test, clinicians can effectively determine if the shoulder joint is unstable and if further diagnostic evaluation or treatment is necessary. (10)

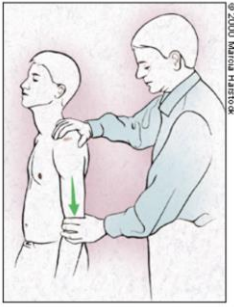


Apprehension test for anterior instability. The patient's arm is abducted to 90 degrees while the examiner externally rotates the arm and applies anterior pressure to the humerus.

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6.4.2. Relocation Test

The Relocation Test of the shoulder is a physical examination that is used to evaluate instability of the shoulder joint. It is an important examination for the diagnosis of shoulder instability. The test involves the application of a downward force to the shoulder while the patient is in a seated position with his or her arm in full abduction and external rotation. The patient is then asked to actively bring the arm back to their side. If the shoulder is found to be unstable, it will relocate to a position of greater external rotation and abduction.



Sulcus test for glenohumeral instability. Downward traction is applied to the humerus, and the examiner watches for a depression lateral or inferior to the acromion.

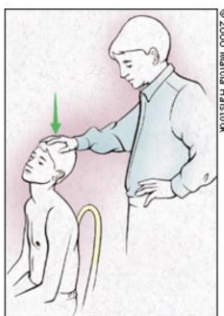
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6.5. Cervical disk disease

A comprehensive physical examination in a patient with shoulder pain should include evaluation for cervical spine disease. Referral or radiating pain from disc disease should be taken into account in patients who experience shoulder pain that is not responsive to conservative treatment methods. It is important to ask the patient about neck pain and past neck traumas, and to note whether pain increases when turning the neck, which could indicate disc disease. Pain originating from the neck or radiating beyond the elbow is often a sign of a neck disorder. Plain film is a useful tool for screening degenerative cervical disc disease. Further imaging studies and diagnostics should be based on the treatment plan and differential diagnosis.

6.5.1. Spurling's Test

Spurling's Test is a diagnostic test used to assess for nerve root impingement of the cervical spine. It involves applying pressure to the head and neck while in a seated position and then turning the head to one side. This test helps to detect nerve compression or irritation caused by a herniated disc, bone spurs, or other conditions. By assessing the presence and intensity of any pain or tenderness experienced during the test, the clinician can effectively diagnose cervical nerve root impingement.



Spurling's test for cervical root disorder. The neck is extended and rotated toward the affected shoulder while an axial load is placed on the spine.

(10)

7. Discussion of rehabilitation methods

Rehabilitation methods for the shoulder are essential for restoring full range of motion and strength after an injury or surgery. Commonly used rehabilitation techniques include stretching, strengthening, and proprioceptive training. Stretching helps to increase flexibility and reduce muscular tension. Strengthening exercises are used to build muscular endurance and stability in the shoulder joint. Lastly, proprioceptive training is employed to improve coordination and joint position awareness. Rehabilitation for shoulder injuries and surgeries should be tailored to the individual to ensure the best possible outcomes. An individualized treatment plan should be developed by a physical therapist in order to assess the patient's condition, establish goals, and create a tailored approach to rehabilitation. A combination of the aforementioned techniques may be used to create a comprehensive treatment program. Overall, rehabilitation is an important part of restoring shoulder strength and mobility after an injury or surgery. An individualized rehabilitation program should be designed by a physical therapist to ensure the best possible outcomes. This program should incorporate stretching, strengthening, proprioceptive training, and other modalities such as ice, heat, electrical stimulation, and ultrasound. With the correct rehabilitation program, individuals can achieve restored strength and mobility in the shoulder joint.

In the Netherlands, a research study was conducted by the Institute for Research in Extramural Medicine, the Department of Epidemiology and Biostatistics, and the Department of Rehabilitation Medicine regarding the incidence and management of intrinsic shoulder disorders. The research was based on the clinical guidelines of the Dutch College of General Practitioners in 1990, which recognized four intrinsic shoulder syndromes: Capsular Syndrome, Acute Bursitis, Acromioclavicular Syndrome, and Subacromial Syndrome.

The guidelines indicated that the first line treatment for all syndromes, except Bursitis, involved the donation of non-steroidal anti-inflammatory drugs (NSAIDs). For Capsular Syndrome, the treatment could include NSAIDs or local infiltration of steroids or anaesthetics, followed by passive mobilisation and exercise therapy. The Acromioclavicular Syndrome was treated with NSAIDs, followed by injection of anaesthetics, and then a combined injection of steroids and anaesthetics. Lastly, treatment for Rotator Cuff Tendinitis, Chronic Bursitis, and Rotator Cuff Tearing involved a combination of NSAIDs and rest, followed by a local injection of a steroid and/or anaesthetic (Bursitis), local injection of anaesthetic (Cuff Tear), or physiotherapy and a local injection of anaesthetics (Tendinitis).

In contrast to the other syndromes, the guideline for Bursitis did not suggest the use of NSAIDs as the first line of treatment, but rather as a second line of treatment following local injections of anaesthetic, steroid, or both. (14)

The study, entitled "Shoulder Disorders in General Practice: Incidence, Patient Characteristics, and Management", established that there is a slightly higher proportion of female patients (56%) compared to male patients (44%) presenting with intrinsic shoulder disorders. (15) Rotator cuff tendinitis was the most frequently reported complaint, accounting for 29% of all shoulder-related issues. The discussion section of the study highlighted the complexity of diagnosing shoulder disorders, in large part due to the lack of consensus regarding the diagnostic criteria of specific disorders, as well as various alternative classification systems in existence around the world, such as the Cyriax shoulder assessment. Consequently, it is of paramount importance that clinicians remain cognizant of this variability in order to ensure accurate diagnosis and effective treatment of shoulder disorders. (16) Patients with intrinsic shoulder disorders are primarily treated with non-steroidal anti-inflammatory drugs (NSAIDs), followed by injections of corticosteroids and/or anaesthetics. However, it is interesting to note that physiotherapy, exercise therapy and mobilisation are considerably less prescribed as compared to the aforementioned treatments, from the perspective of general practitioners. It is of utmost importance to consider the use of these therapeutic modalities to maximize the efficacy of treatment, and to ensure a successful outcome.

The importance of accurate diagnostic and effective treatment of shoulder pain problems is unmistakable. Knowing which specialist conducted the diagnosis and treatment is also of the utmost importance. A study conducted in Sweden aimed to compare the diagnosis and, more specifically, treatment of a patient between general practitioners and physiotherapists. 188 general practitioners and 71 physiotherapists were presented with a fictitious case and the overall response rate amounted to 71.8%. The diagnosis pattern was largely similar for both specialties, with rotator cuff tendinitis being the most probable cause of the shoulder pain, followed by possible subacromial bursitis and biceps tendinitis.

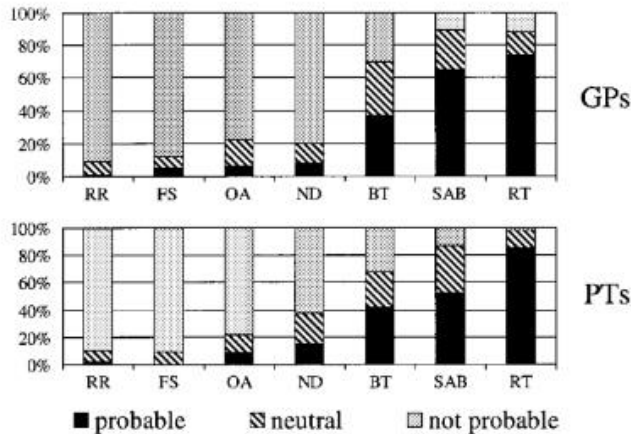


FIGURE 1 Pattern of diagnosing for GPs and PTs

GPs = general practitioners; PTs = physiotherapists; RR = rotator cuff rupture; FS = frozen shoulder; RT = rotator cuff tendinitis; OA = osteoarthritis; ND = neck disorder; BT = biceps tendinitis; SAB = subacromial bursitis

(17)

When questioned regarding their selection of treatment for rotator cuff tendinopathy, the majority of general practitioners (73.4%) opted for non-steroidal anti-inflammatory drugs (NSAIDs), with corticosteroid injections into the subacromial bursa being the second most popular choice. Conversely, physiotherapists tended to prioritize movement exercises and ergonomic modifications as their primary treatment approach.

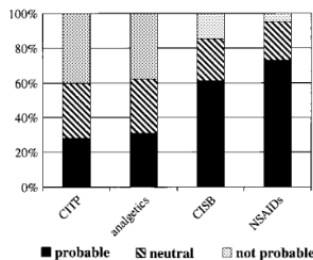


FIGURE 3 GPs' choice of treatment of the case

CITP = corticosteroid injection in tender points; CISB = corticosteroid injection in subacromial bursa

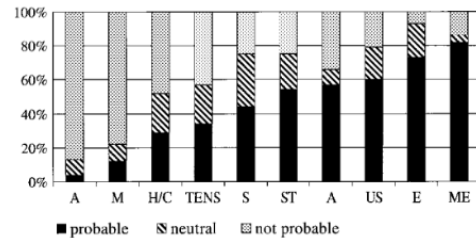


FIGURE 4 PTs' choice of treatment of the case

A = appliance/aid; M = massage therapy; H/C = heat or/and cold therapy; TENS = transcutaneous electronic nerve stimulation; S = stretching; ST = strengthening exercises; A = acupuncture; US = ultrasound therapy; E = ergonomics; ME = movement exercises

(17)

The present investigation has revealed that there is a largely comparable diagnosis between the two specialist groups. However, a discrepancy is apparent in regards to the treatment they recommend. It is crucial to note that, once more, general practitioners typically suggest the prescription of non-steroidal anti-inflammatory drugs (NSAIDs) for possible rotator cuff tendinitis, whereas physiotherapists are more likely to recommend traditional forms of treatment. (17)

The traditional rehabilitation method is based on the theory that when someone experiences pain, the body instinctively attempts to relieve it. Traditional rehabilitation methods such as physical therapy, occupational therapy, massage therapy, acupuncture, and chiropractic care can be used to reduce pain. In addition to these methods, the use of medications, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids, can be used to provide pain relief. When discussing pain relief achieved through traditional rehabilitation methods (fig. 4), there is a wide range of possible outcomes depending on the type of therapy and its clinically relevant benefit. Traditional rehabilitation techniques are based on the premise that when an individual experiences pain, their body will naturally try to alleviate it. Several different forms of rehabilitation, including physical therapy, occupational therapy, massage therapy, acupuncture, and chiropractic care, have all been shown to be effective in reducing levels of pain. Furthermore, medications such as nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids can also be utilized to provide relief from pain. It is important to note that while these methods can be used to provide relief from pain, it is essential to consult a medical professional before beginning any type of treatment, as some of these medications may have potential side effects.

An extensive study concerning the efficacy of various rehabilitation interventions for the alleviation of shoulder pain has been conducted by the Philadelphia Panel Evidence-Based Clinical Practice Guidelines. This panel was composed of criteria pertaining to the outcomes of shoulder pain in 324 practitioners from six professional organisations, resulting in a response rate of 51%. The outcomes of this study were related to pain, function, patient global assessment, quality of life, and return to work. The various rehabilitation interventions that were examined included exercise, therapeutic ultrasound, transcutaneous electrical nerve stimulation (TENS), massage, thermotherapy, EMG biofeedback, electrical stimulation, and combined rehabilitation interventions. (8) The results of this study revealed that therapeutic ultrasound was the only clinically important rehabilitation intervention for the treatment of shoulder pain, as it was able to provide patients with a significant decrease in pain within less than two months. This improvement in pain was observed in patients suffering from particular type of shoulder pain, calcific tendinitis. Conversely, the evidence for the efficacy of the other rehabilitation interventions was found to be lacking.

Multidisciplinary biopsychosocial rehabilitation is a widely utilized form of rehabilitation, yet its efficacy is still subject to scientific inquiry. Despite its widespread application, the veracity of this rehabilitation approach is uncertain, thus requiring further research in order to ascertain its effectiveness. In particular, further investigations are needed to examine the effectiveness

of this form of rehabilitation in relation to long-term outcomes. Furthermore, studies should be conducted to assess the cost-effectiveness of this approach, as well as its ability to improve the quality of life for those undergoing it. Understanding the true effectiveness of multidisciplinary biopsychosocial rehabilitation will be crucial in determining its use and application in the future. (18)

These multidisciplinary biopsychosocial rehabilitation programmes are characterized by a fusion of physical, psychological, educational, and/or work related components, and are typically provided by a multidisciplinary team of healthcare professionals who possess specialized knowledge and expertise in their respective fields. Such programmes have been found to be highly beneficial in improving functional outcomes for a variety of conditions, providing comprehensive, holistic care that addresses the physical, psychological, and social needs of the individual. (19)

In the present study, which was conducted to assess the efficacy of multidisciplinary biopsychosocial rehabilitation for neck and shoulder pain among working age adults, the analysed trials were determined to be multidisciplinary in nature, with each consisting of a physician's consultation combined with either a psychological, social or vocational intervention, or a combination of these. The primary evaluation parameters for the study were pain intensity, global improvement, disease-specific functional status, generic functional status, ability to work, cost-effectiveness, cost-benefit and satisfaction with treatment. Furthermore, it is important to note that the results of the study may have implications for the development of improved treatment protocols and outcomes for the management of neck and shoulder pain in this population.

The two studies that were analysed for the effectiveness of multidisciplinary biopsychosocial rehabilitation are Ekberg et al. 1994 (20) and Jensen et al. 1995 (21).

The Ekberg et al. study examined the effectiveness of an active multidisciplinary rehabilitation programme for working patients aged between 18 to 59 years, compared to traditional care. The effectiveness was evaluated by assessing a range of underlying conditions, such as sick leaves, pain, health-related behaviour, and working conditions, in a two-year follow-up. Ultimately, the results of the study demonstrated that there were no significant differences between the multidisciplinary treatment programme and the traditional care in terms of outcomes at 12 and 24 months.

The study conducted by Jensen et al. evaluated the efficacy of a multidisciplinary approach to rehabilitation among individuals aged between 20 and 55 years. Participants were split into two groups; an intervention group exposed to direct multimodal treatment provided by a psychologist, and a control group supervised by a psychologist. The primary outcome measures of the trial were cost of rehabilitation, pain intensity, disorder-specific functional status at 6-month follow-up, and ability to work (days off in 6 months) at 12-month and 18-month follow-ups. Results showed that there was no significant difference between the two groups in any of the assessed outcomes apart from the cost of the rehabilitation program. Interestingly, the psychologist-executed intervention was even less cost-effective than the control group, where the psychologist only provided supervision. This finding suggests that the multimodal approach taken by the intervention group may not necessarily be the most cost-effective in the long term.

The findings of both the Ekberg and Jensen studies demonstrate that there is no significant improvement in the effectiveness of active multidisciplinary biopsychosocial rehabilitation when compared with traditional rehabilitation methods. Furthermore, the Jensen study suggests that from a cost-effectiveness standpoint, the use of a clinical healthcare professional as a supervisor is preferable to using an executer. The Ekberg study also indicates that the only significant difference between the two groups was the higher proportion of blue-collar workers in the “multidisciplinary intervention” group, which was up to 91 percent. Overall, these two studies have shown that the use of multidisciplinary rehabilitation for working age neck and shoulder patients does not significantly increase the effectiveness of treatment when compared with more traditional methods. Moreover, the Jensen study indicates that the deployment of a clinical psychologist as a supervisor could be more cost-effective than providing individual treatment to patients. Nevertheless, the level of scientific evidence surrounding the efficacy of multidisciplinary rehabilitation for this patient population is still relatively limited.

The research into the efficacy of multidisciplinary biopsychosocial rehabilitation for treating neck and shoulder pain is limited and inconclusive. As a result, there is an urgent need for high-quality, double-blind trials to better evaluate the potential benefits of this approach when compared to other forms of rehabilitation. It is essential that such trials are conducted in a robust and systematic manner, with meaningful outcome measures, and that they involve a large sample size in order to provide reliable evidence. Furthermore, it is important to consider the impact of potential confounding factors, such as age, gender, and co-morbidities, on the results. Only then can we accurately assess the potential effectiveness of multidisciplinary biopsychosocial rehabilitation for neck and shoulder pain. (18)

Asynchronous Remote Telerehabilitation (ART) is an emerging rehabilitation technique which involves a combination of remote exercise guidance, educational materials, and cognitive-behavioral therapy (CBT) over a period of 12 weeks. This remote treatment is administered by a trained physiotherapist with the assistance of a tablet and monitoring device. The primary objective of the related study was to evaluate the effect of ART on the patient's disabilities related to the affected limb over 12 weeks of treatment. The secondary objectives of the study included the reduction of pain, intent to pursue surgery, anxiety disorder symptoms, and work and activity impairment. Furthermore, the study sought to determine whether the ART intervention is a feasible and effective option to improve patient outcomes. In general, telerehabilitation has demonstrated comparable efficacy to in-person care, but with the added benefit of reduced costs associated with the remote nature of the care delivery. Despite being a relatively new approach, this digital care program has yet to be thoroughly studied in the context of treating chronic shoulder pain; however, it may represent a glimpse into the future of care delivery. As such, further research is needed to examine the efficacy of telerehabilitation for treating chronic shoulder pain and to determine its potential role in the larger healthcare landscape. (22)

Shoulder pain is a common issue among upper extremity hemiplegic patients resulting from a stroke. To reduce the likelihood of its development, preventive measures should begin during the initial recovery phase. Range of motion exercises of the affected limb should commence 24 hours after the stroke. Furthermore, the affected arm should be supported in the correct position. During walking, a sling can help prevent the limb from a downward pull, while a trough or board can be attached to a wheelchair. To prevent any problems due to incorrect positioning, the shoulder should be kept in an abducted and externally rotated position. If shoulder pain persists, Nonsteroidal Anti-Inflammatory Drugs (NSAIDs), corticosteroids, and ultrasound therapy can be employed. Additionally, physiotherapy and occupational therapy may be beneficial to ensure optimal positioning, reduce spasticity, and strengthen the affected limb. Through this combined approach, the risk of shoulder pain can be reduced significantly. (23)

As shoulder pain is a frequent side effect of hemiplegia. There are numerous potential causes for this pain, including neurological (24) and non-neurological conditions. Generally, shoulder pain can manifest itself in two ways; either during movement of the limb, or at rest. Patients who experience pain while moving typically present a poor prognosis, while those who suffer pain at rest have a much better outcome with active rehabilitation processes.(25) In many

cases, the source of shoulder pain cannot be determined. Therefore, a combination of ultrasound therapy, range of motion exercises, and occupational therapy has yielded only minimal relief. NSAIDs, however, have been shown to provide significantly more pain relief, ranging from 15% to 91%, while also ameliorating diminished shoulder range of motion and general function. (24)

8. Conclusion

In conclusion, effective rehabilitation methods for shoulder injuries and surgeries play a vital role in restoring full range of motion and strength. Common techniques such as stretching, strengthening, and proprioceptive training are utilized to enhance flexibility, muscular endurance, stability, coordination, and joint position awareness. It is crucial to tailor the rehabilitation program to each individual, with a personalized treatment plan created by a physical therapist to assess the patient's condition, establish goals, and determine the most suitable approach. In the Netherlands, a research study investigated the incidence and management of intrinsic shoulder disorders based on clinical guidelines. Different syndromes were recognized, and treatment options varied, including non-steroidal anti-inflammatory drugs (NSAIDs), local injections of steroids or anaesthetics, passive mobilization, exercise therapy, and physiotherapy. It was observed that female patients presented a slightly higher proportion of shoulder disorders compared to males, with rotator cuff tendinitis being the most common complaint. The diagnosis and treatment of shoulder pain can vary between general practitioners and physiotherapists, as shown in a study conducted in Sweden. General practitioners tend to prescribe NSAIDs and corticosteroid injections, while physiotherapists prioritize movement exercises and ergonomic modifications. It is essential to consider the use of various therapeutic modalities to maximize treatment efficacy and ensure successful outcomes. Traditional rehabilitation methods, including physical therapy, occupational therapy, massage therapy, acupuncture, and chiropractic care, aim to reduce pain through different approaches. These methods, combined with medications like NSAIDs and opioids, can provide pain relief, but consulting a medical professional is necessary due to potential side effects. Research on the efficacy of rehabilitation interventions for shoulder pain highlighted therapeutic ultrasound as the only clinically important intervention for calcific tendinitis. However, evidence for the effectiveness of other interventions was found to be lacking, emphasizing the need for further studies with meaningful outcome measures and larger sample

sizes. The effectiveness of multidisciplinary biopsychosocial rehabilitation for neck and shoulder pain remains uncertain. Studies comparing multidisciplinary approaches to traditional methods demonstrated no significant improvement in outcomes, while cost-effectiveness varied. Additional high-quality trials are needed to evaluate the potential benefits of this approach and its impact on long-term outcomes and quality of life. Asynchronous Remote Telerehabilitation (ART) is an emerging technique that combines remote exercise guidance, educational materials, and cognitive-behavioral therapy. It has shown comparable efficacy to in-person care, with the added benefit of reduced costs. Further research is required to examine its effectiveness in treating chronic shoulder pain and its potential role in healthcare. Preventive measures for shoulder pain in stroke patients include early range of motion exercises, correct limb positioning, and the use of supportive devices. If pain persists, various treatment options such as NSAIDs, corticosteroids, ultrasound therapy, physiotherapy, and occupational therapy can be employed to reduce pain and improve function. In summary, effective rehabilitation methods tailored to individual needs are crucial for restoring shoulder strength and mobility after an injury or surgery. Additional research is needed to further evaluate the effectiveness of different interventions and their long-term outcomes. It is important to consider a multidisciplinary approach, including telerehabilitation, in order to optimize treatment and improve patient outcomes.

9. References

1. Urwin M, Symmons D, Allison T, Brammah T, Busby H, Roxby M, u. a. Estimating the burden of musculoskeletal disorders in the community: the comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation. *Ann Rheum Dis.* 1. November 1998;57(11):649–55.
2. Kuijpers T, van der Windt DAWM, van der Heijden GJMG, Bouter LM. Systematic review of prognostic cohort studies on shoulder disorders. *PAIN.* Juni 2004;109(3):420.
3. Pribicevic M. The Epidemiology of Shoulder Pain: A Narrative Review of the Literature. In: *Pain in Perspective* [Internet]. IntechOpen; 2012 [zitiert 14. Mai 2023]. Verfügbar unter: <https://www.intechopen.com/chapters/40393>
4. The anatomy of the shoulder [Internet]. Washington University Orthopedics. [zitiert 14. Mai 2023]. Verfügbar unter: <https://www.ortho.wustl.edu/content/patient-care/3127/services/shoulder-elbow/overview/shoulder-arthroscopy-information/the-anatomy-of-the-shoulder.aspx>
5. Shoulder Pain and Common Shoulder Problems - OrthoInfo - AAOS [Internet]. [zitiert 14. Mai 2023]. Verfügbar unter: <https://www.orthoinfo.org/en/diseases--conditions/shoulder-pain-and-common-shoulder-problems/>
6. Hanchard NCA, Lenza M, Handoll HHG, Takwoingi Y. Physical tests for shoulder impingements and local lesions of bursa, tendon or labrum that may accompany impingement. *Cochrane Database Syst Rev.* 30. April 2013;2013(4):CD007427.
7. Aaron DL, Patel A, Kayiaros S, Calfee R. Four common types of bursitis: diagnosis and management. *J Am Acad Orthop Surg.* Juni 2011;19(6):359–67.
8. Philadelphia Panel Evidence-Based Clinical Practice Guidelines on Selected Rehabilitation Interventions for Shoulder Pain | Physical Therapy | Oxford Academic [Internet]. [zitiert 14. Mai 2023]. Verfügbar unter: <https://academic.oup.com/ptj/article/81/10/1719/2888387>
9. Stanborough RO, Bestic JM, Peterson JJ. Shoulder Osteoarthritis. *Radiol Clin North Am.* Juli 2022;60(4):593–603.
10. The Painful Shoulder: Part I. Clinical Evaluation | AAFP [Internet]. [zitiert 14. Mai 2023]. Verfügbar unter: <https://www.aafp.org/pubs/afp/issues/2000/0515/p3079.html>
11. Burbank KM, Stevenson JH, Czarnecki GR, Dorfman J. Chronic shoulder pain: part I. Evaluation and diagnosis. *Am Fam Physician.* 15. Februar 2008;77(4):453–60.
12. Doxey R, These MS, Hegmann KT. Reliability of Common Provocative Tests for Shoulder Tendinitis. *J Occup Environ Med.* Dezember 2018;60(12):1063–6.
13. Watson L, Balster S, Lensen R, Hoy G, Pizzari T. The effects of a conservative rehabilitation program for multidirectional instability of the shoulder. *J Shoulder Elbow Surg.* Januar 2018;27(1):104–11.

14. Crowcroft NS, Strachan DP. The social origins of infantile colic: questionnaire study covering 76,747 infants. *BMJ*. 3. Mai 1997;314(7090):1325–8.
15. Van Der Windt DA, Koes BW, De Jong BA, Bouter LM. Shoulder disorders in general practice: incidence, patient characteristics, and management. *Ann Rheum Dis*. 1. Dezember 1995;54(12):959–64.
16. Kuo YC, Hsieh LF. Validity of Cyriax’s Functional Examination for Diagnosing Shoulder Pain: A Diagnostic Accuracy Study. *J Manipulative Physiol Ther*. 1. Juli 2019;42(6):407–15.
17. Johansson K, Adolfsson L, Foldevi M. Attitudes toward management of patients with subacromial pain in Swedish primary care. *Fam Pract*. 1. Juni 1999;16(3):233–7.
18. Karjalainen KA, Malmivaara A, van Tulder MW, Roine R, Jauhiainen M, Hurri H, u. a. Multidisciplinary biopsychosocial rehabilitation for neck and shoulder pain among working age adults. *Cochrane Database Syst Rev*. 22. April 2003;2003(2):CD002194.
19. Kamper SJ, Apeldoorn AT, Chiarotto A, Smeets RJE, Ostelo RWJG, Guzman J, u. a. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane systematic review and meta-analysis. *BMJ*. 18. Februar 2015;350:h444.
20. Ekberg K, Björkqvist B, Malm P, Bjerre-Kiely B, Axelson O. Controlled two year follow up of rehabilitation for disorders in the neck and shoulders. *Occup Environ Med*. Dezember 1994;51(12):833–8.
21. Jensen I, Nygren A, Gamberale F, Goldie I, Westerholm P, Jonsson E. The role of the psychologist in multidisciplinary treatments for chronic neck and shoulder pain: a controlled cost-effectiveness study. *Scand J Rehabil Med*. März 1995;27(1):19–26.
22. Janela D, Costa F, Molinos M, Moulder RG, Lains J, Francisco GE, u. a. Asynchronous and Tailored Digital Rehabilitation of Chronic Shoulder Pain: A Prospective Longitudinal Cohort Study. *J Pain Res*. 31. Dezember 2022;15:53–66.
23. Kaplan MC. Hemiplegic shoulder pain--early prevention and rehabilitation. *West J Med*. Februar 1995;162(2):151–2.
24. Poduri KR. Shoulder pain in stroke patients and its effects on rehabilitation. *J Stroke Cerebrovasc Dis*. 1. Januar 1993;3(4):261–6.
25. Walsh K. Management of shoulder pain in patients with stroke. *Postgrad Med J*. Oktober 2001;77(912):645–9.