The effect of rehabilitation on the amount of pain, strength, and range of motion of the shoulder joint in athletes with trapped shoulder syndrome

Soraya Azimiah ,Sahar Johari[2]

1-Master of Rehabilitation from Tehran University of Welfare and Rehabilitation, Iran

2-Master of Rehabilitation from Tehran University of Welfare and Rehabilitation, Iran

sazimian@yahoo.com

Abstract:

Introduction: Among all shoulder injuries, shoulder impingement syndrome is more common, there are various methods to control pain and increase range of motion and shoulder strength in shoulder impingement syndrome in the research literature. This study was also conducted with the aim of the rehabilitation effect on the amount of pain and strength and range of motion of the shoulder joint in athletes with shoulder impingement syndrome.

Methodology: The current research method was experimental and the research design was pre-test and post-test with a positive control group. For this purpose, 30 athletes with shoulder impingement syndrome were selected as a sample (sampling was available) and randomly assigned to two groups for rehabilitation sessions (15 people in each group); rehabilitation group for six weeks every week Two sessions (each session 1 hour) received rehabilitation exercises. Both groups filled out questionnaires related to pain (spade, vase, cms) before and after the treatment, and the amount of strength and range of motion before and after the treatment protocol of each the subject was taken by the examiner.

Findings: The results of this study showed that a course of rehabilitation sessions and a rehabilitation exercise program have a significant positive effect on reducing pain, range of motion, and shoulder muscle strength in athletes with shoulder impingement syndrome in flexion, abduction, external and internal rotation movements. ; In this way, the amount of pain in the rehabilitation sessions was underestimated; And the amount of range of motion in flexion, turning away, external rotation, and internal rotation was less estimated in rehabilitation sessions, and the strength of shoulder muscles in flexion, turning away, internal rotation, and external rotation were less estimated in rehabilitation sessions.

Conclusion: In general, the results showed that a rehabilitation exercise program can help improve pain and active range of motion and shoulder muscle strength in athletes with shoulder impingement syndrome.

Keywords: rehabilitation sessions, pain, strength, range of motion, shoulder impingement syndrome.

Introduction:

The shoulder joint has the largest range of motion among the joints of the body. The range of motion that requires the proper functioning of this joint as the base of the upper limb; The sacrifice of the role of static elements in the supply of joint stability has been accompanied by the most prominent role of dynamics in providing the strength of this joint. The dynamics of the shoulder are the result of the interaction between static and dynamic stabilizers. This connection is caused by the mediator of the sensory-motor system. The deep sense is the ability to feel or understand the spatial position of the joint and body movements without the use of eyes, and receptors send information about this feeling to the central nervous system. Con joint dynamics is the end point of the deep sensation system, and with this stability, the state fluctuation decreases and excess stress does not apply to the joint. Shoulder syndrome is a term used for adhesive articular capsule, which increases the thickness and dryness of the joint capsule and soft tissues surrounded by the shoulder joint, in which the elasticity of the joint capsule is reduced and between the membrane folds. Synovial adhesion is created.

Since the shoulder joint is inherently unstable, the movements associated with the extra load and the repetition of the upper limb movements above the head cause the risk of negative damage and adaptation in the shoulder in the long run.

There are various methods, including injections of non-steroidal anti-inflammatory drugs, glygocortico steroids, and various physiotherapy methods such as exercise therapy, ultrasound, cryotherapy, and laser use. Exercise therapy as an effective and useful treatment for shoulder tendonitis has been studied in many review articles.

Pain from the English word Pain and the word penal means punishment or the word point means punishment and punishment. Defines. According to McAffry, pain is everything that the person expresses and exists whenever he or she says it. This definition indicates that healthcare providers must trust the patient's pain because pain is an internal sign that only the patient can determine and explain.

The transmission of pain messages is completed in three stages: -1 transfer to the central nervous system -2 processing in the posterior horn of the spinal cord, and -3 transfers to the brain. Two types of nerve fiber are responsible for transmitting pain, which are fiber and A-Delta fiber. A-Delta fibers transmit fast-burning pain and thirty fibers transmit slow-burning pain.

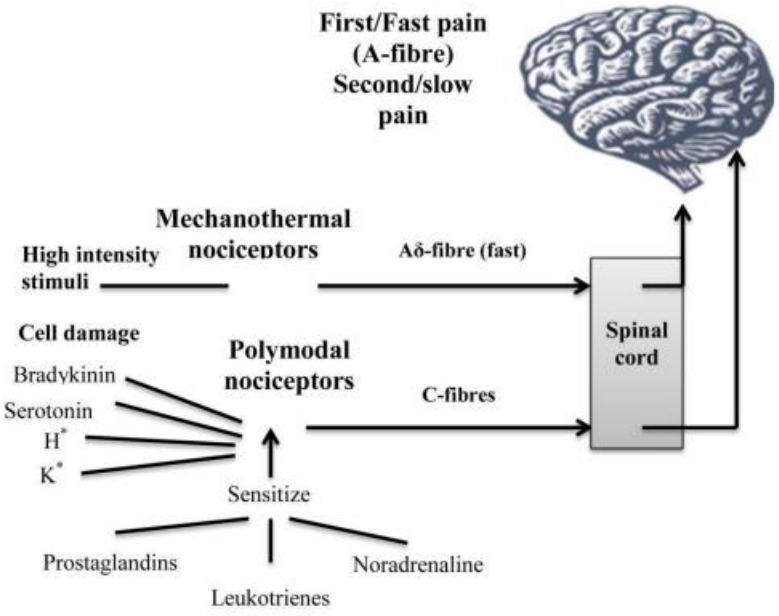


Figure1. Nervous fibers: A-Delta fibers: Milin, thick, high transmission speed (speed of 2 mph), and more sensitive to mechanical and thermal stimuli.

C. Fiber: Thin, non -millennial, low transmission speed (1 mph / h) and chemical, thermal, and mechanical stimuli

Adjustment: The fourth process is how pain is feeling that causes pain or inhibition of pain impulses. There is a route for suppressing internal pain that originates from the gray material around the aqueduct of the Silvius and climbs to the rape nuclei in the al -Naha. Then, from the Rough Impulse nuclei, the posterior horn of the spinal cord is inserted. For this reason, these routes are called downward devices. This path modulates the pain of the pain of the pain. The electrical stimulation of the gray matter around the aqueduct of the Silvius, the posterior or posterior horns in these places causes pain, without creating sensory-motor blocks and automatic. Serotonin, norepinephrine, and gamma aminobutyric acid are famous along the path that exert analgesic effects. Also, the drugs of 5 internal neurotransmitters such as Enkfalins, beta-endorphins, and dinofine, which are the strongest inhibitors of pain receptors, are involved in pain suppression. Enkfalin is distributed in a dedicated nucleus in the brain stem and spinal cord. Beta endorphins are found in hypothalamic and pituitary nuclei. These internal drug peptides, attaching to specific receptors in the cortex, brain stem, and spinal cord, cause pain. The beta-endorphins are connected to the hair receiver, the enkephalins to the Delta receiver, and the di nor fin receptor to the Kapa receiver. In short, physiological pain has a complex process that helps the nurse's stages better care for the painful patients.

Pain theories

There are many theories to describe the complex phenomenon of pain. There are four theories for noromatrix description, pattern, and specific pain mechanism. Valve control in 1965 to describe the theory of valve control theory: This theory was first raised by the Wall The connection between pain and emotion. The results of the study indicated that pain is not just a physiological response, but psychological variables such as behavioral and emotional responses affect pain. According to this theory, there is a kind of neural mechanism in the gelatin of the back of the spinal cord that is responsible for controlling the passage of pain impulses to the brain areas. Under normal conditions, this valve is closed. Gelatinous material stimulants prevent the transmission of the

flow by closing the valve. The inhibitory messages affect the gelatin material causing the valve and the passing message to pass. Next to the valve mechanism are T -cells. The stimulating currents pass through the gate and reach the T cells. When the intensity of these stimuli reaches the threshold surface, the cells activate the areas located in the central nervous system responsible for the perception and response to pain. The currents originating from the C and A-Delta fibers have an inhibitory effect on the valve mechanism and keep the valve open. Thick A-beta strands) are tactile (large urban strands enter the spinal cord in the back root area and stimulate them by stimulating narrower strands, causing the valve to close to prevent pain flow. It acts. It also releases Enkfaline, which can help further regulate the transmission of pain flow along the spinothalamic roads.

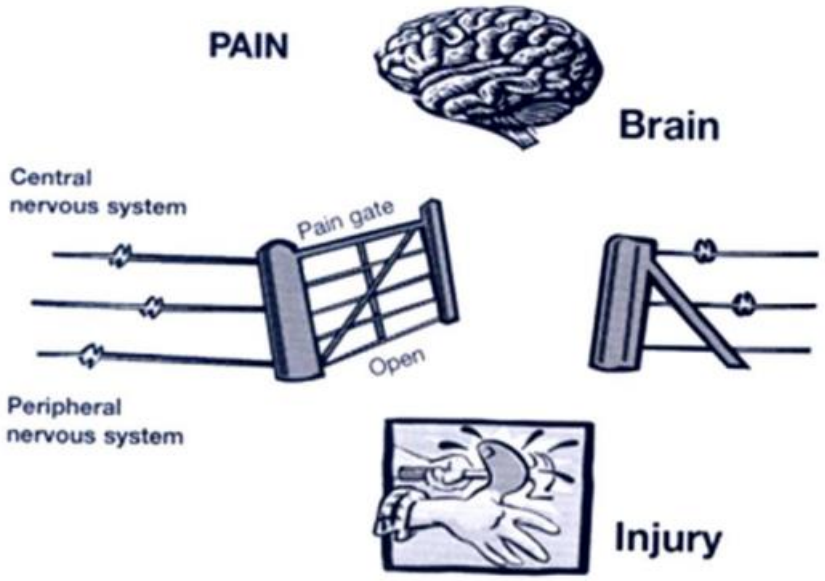


Figure 2. The activity in the daunting fibers due to damage causes pain of the pain and the impulse reaches higher levels of the brain and causes pain.

Dedicated or Special Theory: According to this theory, specific recipients are responsible for the transfer of pain to the pain centers. A-Delleta fibers and non-milky fibers slowly direct the waves through the anterior side of the spinal cord to the center of pain in the pain at the thalamus. The nervous currents are then sent to the actual pain of pain via the Tallam -Cortex system. According to this theory, there is a direct relationship between the intensity of the stimulus and the amount of pain being understood.

Pattern theory: This theory states that stimulation of all nerve terminals creates a specific pattern that is interpreted by the cortex as pain and rejects the presence of specific pain receptors.

According to this theory of pain, it is felt following a specific pattern due to the stimulation of different sensory receptors. Therefore, pain is the result of severe stimulation of receptors and the creation of a certain pattern of nerve stimulation in the central nervous system. One of the key concepts of this theory is that after the injury to the interstitial neurons of the spinal cord, neurological circuits occur that can cause pain. Even without continuing, this mechanism can describe the pain of phantom in members.

Noromatrix theory: Due to the significant prevalence and importance of cancer pain, a variety of models are designed to interpret and control this type of pain, one of which is the traditional model of chemical bio-chemical. The main foundation of the model is that pain is a sense or sign of underlying tissue injury or damage. Pain can be caused by the tumor itself, tissue damage associated with therapeutic procedures such as surgery, chemotherapy radiation, cancer-related infection, immobility, or diagnostic measures. According to this model,

the pain will be treatable by identifying tissue damage and its originality. But according to the results of clinical research, the model has some limitations. Oal, the amount of pain reported by a cancer patient is not properly associated with underlying tissue damage. Some patients with evidence suggesting minimum tissue damage to the overwhelming pain, while some with considerable tissue damage to low pain or do not have pain. Secondly, even in patients with the same pain levels, the severity of pain-related disabilities can be significantly different and some patients are more unable to others. Ultimately, existing treatments to eliminate this type of pain are not effective. Given the limitations of this theory, pain experts focused on examining more complex theories of cancer pain. One of them is the theory of Noromatrix Malzac. In this theory, it is believed that pain is a complex and dynamic experience consisting of sensory, emotional, and cognitive dimensions, and Hallam, cortex, limbic, and visceral sensations are involved in the pain of pain. The key feature of the recent theory is that two neural networks in the brain are responsible for coordinating multiple data to produce pain. Noromatrix theory is of great importance in controlling the pain of cancer because it and the theories derived from it, the theory, and the theory of valve control, provide a conceptual framework that focuses on cognitive, emotional, social, and cultural factors affecting pain. Becomes. Secondly, due to the impact of cognition and affection on pain, more stimulant drugs such as antidepressants are used to control this type of pain. Finally, this theory highlights the importance of psychosocial interventions in controlling cancer pain.

Face scale: In this scale, 6 face modes are used to measure pain intensity. The patient is asked to mark the face which indicates the severity of his pain. The laughing face has a zero score and indicates a lack of pain. This scale is beneficial for children, in conditions of cultural diversity and for patients with mental disorders because it is used in short descriptive photos and phrases and 10 English, Spanish, French, German, Italian, Japanese, Chinese, Vietnamese, novel and Portuguese are available.

Figure 3 A: Facial scale

Face with a score of zero: It's so happy because it has no pain.

Face with a score: 1 has very little pain.

Face with a score: 2 has little pain.

Face with rating: 3 he has more pain.

.Face with rating: 4 has a lot of pain

. Face with a score: 5 has a lot of pain

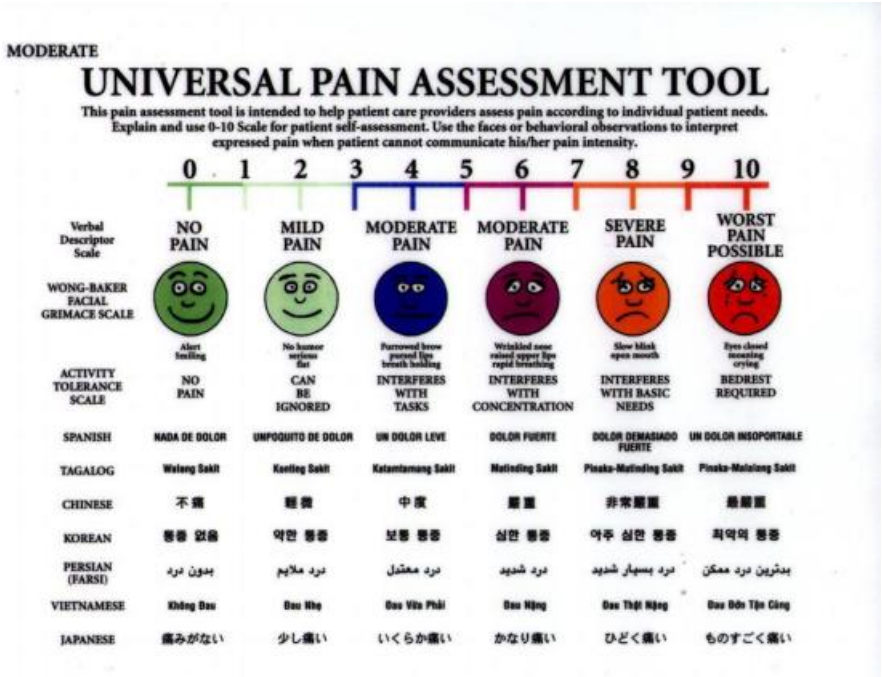


Figure 4. B: Face scale (in different languages)

Verbal Ranking Scale: It is also known as the verbal descriptive scale or the simple descriptive scale. This scale is quick and easy to evaluate acute pain, especially in surgical sectors. On the other hand, it is used because of the simplicity of the elderly or people with moderate cognitive impairment. However, it is difficult to use the visual measurement scale or the numerical scale to measure pain in old people. This scale, unlike the past two scales, is not sensitive to small pain changes. On the other hand, due to limited vocabulary, the pain may not be properly evaluated.

Visual Assessment Scale: A horizontal or vertical line of 10 cm with vocabulary describing pain at an end. Lack of pain at one end and the most severe pain at the other end. The patient determines the severity of his pain by placing a sign on the line. The patient is then measured from the point to the end of the line and the number obtained is reported by cm or mm. This size indicates the degree of pain of the patient. Of course, the use of this scale is for many abstract people, but its use is easy, valid, and stable. In cases such as people with visual and cognitive problems, the elderly, and children who are difficult to use without a score -score visual measurement scale should be used to use sequential scales such as a descriptive scale or a 10 score.

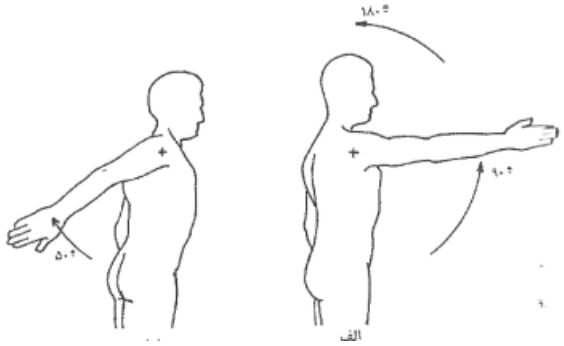
Neuropathic Pain Scale:

This scale provides information on the type and amount of experiences experienced in the patient with neuropathic pain. The usual quantity of neuropathic pain (sharp, ambiguous, hot, cold, sensitive, itching, and deep against a surface) is evaluated with this scale. The patient grade each criterion on a scale from 0 to 10. Zero for a painless state and 10 for the most unimaginable pain.

Pain Classification Scale: One of the most common tools used in the postoperative period that provides a set of reforms (lack of pain, discomfort, mild, moderate, severe, unbearable) to the patient to be with the patient Describe the pain of that pain. It is easy to use in clinical environments. It should be noted, however, that pain evaluation at the time of movement is more important than evaluating it at rest because the severity of the pain at rest is not a valid indicator of effective pain control, especially in the postoperative period.

No pain Discomfort Slight pain Moderate pain Evere Worst pain

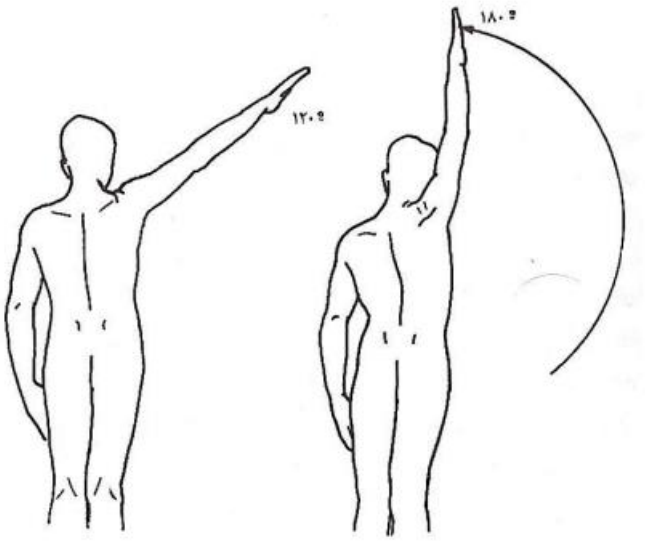
At the end of the first phase of the movement, the fiber of the glorious ligament, as well as the large round muscles, small round, and thorn resist the arm bone movement and prevent it from moving. This phase of movement is performed by the fibers of the anterior segregation of the deltoid, the part of the large chest muscles, and the arm muscle. In the second stage of the movement, the shoulder bone performs the upper rotation and this action is accompanied by the movement of the arm bone upwards. In the upper rotation of the shoulder rotation of the cavity rises up and forward, and this new position of the distant cavity means to place the end of the bone trunk in a position that can continue its movement easier than before. Meanwhile, the last two joints- clavicle and clavicle-clavicle also perform rotational movement around the longitudinal axis of the clavicle. At the end of the second phase of the movement, the large back muscle stretch and the body's large chest muscle prevent bone movement. In the second stage, the muscles in the second stage are the shoulder, trapezoidal, and tooth. The third stage of the movement is also done after the second stage is completed with the help of changing the status of the spine so that with the increased waist curvature, the spine is in a favorable position to continue the movement. In the movement of the shoulder joint, the three-stage functions will be performed in the opposite. The move will continue until the upper limbs reach the anatomical situation. Continuing to open after the anatomical mode is called over-opening. This movement can be done up to 50 degrees after anatomical mode. The effective muscles of the opening movement consist of two muscular groups, which must bring the arm bone on a contribution to the scapular and the muscles that bring the shoulder to the midfield. The first group of these muscles is the large, large round, small round, and posteroidal fibers of the deltoid. The muscles that bring the shoulder to the middle line of the body include large back muscles, large, small, and trapezoidal middle fibers.



Shoulder joint movements on the surface and transverse axis

The movements of the upper limb movement to the outside of the body are called the transverse surface and the axis of the movement. This move can be made anatomically to the top of the head at 180 degrees. Continuing to move after 180 degrees is called excessive movement. The range of motion is not much. Removal moves from the beginning to the end of the steps that must be evaluated and analyzed. The first stage involves the movement of the upper limb at about 60 degrees. This step involves the movement of the arm bone in the remote cavity and is performed by the superb stroke and the middle part of the deltoid muscle. The second stage involves the movement of the upper limbs from about 60 to 120 degrees. At this stage, the remote movement involves the arm bone movement in the distant cavity as well as the external rotation of the shoulder on the chest. In fact, after performing the first stage of the movement, which was performed only in the shoulder joint, the second stage of the scapular bone was also used and the upper bone rotation, which is accompanied

by rising cavity, is used to perform better motion. Becomes. The muscles participating in the second stage movements are also two groups. To move the arm bone in the distant cavity, the first stage muscles, the deltoid and the supernatural, are active. The trapezoidal muscles and large teeth are acting to move the shoulder on the chest. The last joints- claves and clavicle- also act in this movement. If we assume the scapular bone at the beginning of a constant remote movement, the large bone of the arm will hit the upper edge of the distant cavity at an angle of 90 degrees. Given that the movement begins from the angle of 60 degrees to the top of the shoulder, in practice, the collision of two bones at an angle exceeds 90 degrees.



Shoulder joint movements on the transverse surface and the axis

The third stage of movement is between 120 and 150 degrees. At the beginning of this stage, which is the end of the second phase, the large bone of the arm hits the upper edge of the distant cavity, and from then on, the arm bone moves in the distant cavity. Therefore, it is only the shoulder belt that goes into action, so that the scapula performs the external rotation on the chest and the collapsed joints- the classes and the last- also support the scapular movement. If we move the distance at the beginning of the third stage with an external rotation in the arm bone, the large bumps from the upper edge of the distant cavity and the movement in the shoulder joint continues. The continuation of movement in the third stage is the large back muscles and the large breasts that are at the end of the third stage of the move. Effective muscles in the third stage of movement are trapezoidal muscles and large teeth. The fourth stage of motion starts from an angle of 150 degrees and continues until the end of the movement at 180 degrees. To take the fourth step away, it is necessary to change the anatomical status of the spine. This change involves a minor fold movement to the opposite, in which way the effective muscles of the vertebrae act. If the upper organs on both sides are moving away, then the back of the spine should increase the curvature of the lumbar spine. Move away from the angle of 180 degrees, excessive removal

The approaching motion is also the return movement of the remote and includes all the movements that take place in the opposite, compared to the previous motion. Next to the approaching movement, you can move over. It should be noted that this movement will not be done due to the upper limb contact with the lower extremity unless, by a movement of folding, or over-opening with low slopes, the upper limb is removed from the anatomical condition and then moved to Continue to the middle line of the body. The effective muscles of approaching also include two groups. The first group of the bone is brought to the shoulder and the second shoulder group is drawn to the spine. The first group of muscles includes large round muscles, a large chest, and a large back. The second group of muscles also include large and small muscles.

Physiological removal

The scapular bone is not exactly on the transverse plate, but there is an angle between it and the transverse plate equal to 30 degrees) anatomical mode (. In motion of the distance, if the upper limb moves forward), moving fold (, along The shoulder bone is placed. It is much easier to move away in this position and is called physiological discard. Therefore, in the physiological remote movement, the upper limb will also have an angle of 30 degrees(

The movements of internal and external rotation

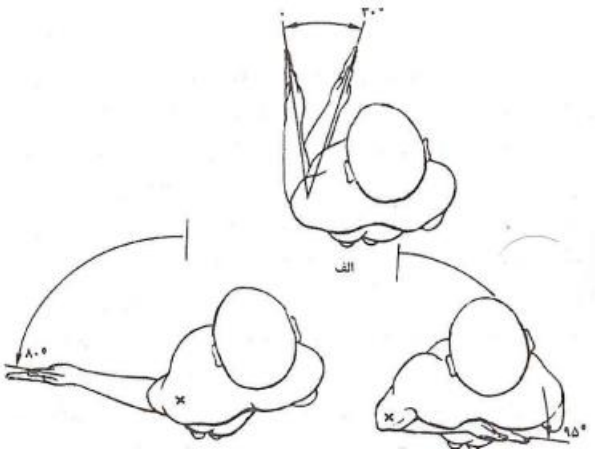
The arm bone can do rotational movements around or outside its longitudinal axis. Rotary movements can be performed while other movements are performed. To better understand the movements of the upper limb, consider the person who has folded his elbow up to 90 degrees.(

Rotary movements are performed on the horizontal surface and vertical axis. In the above case, the shoulder joint can be rotated so that the forearm approaches the middle line of the body. The internal rotation of the arm is about 100 to 110 degrees.

In the inner rotation movement, the scapular bone helps to move by operating. The effective internal rotation muscles include a large back, undercurrent, large round, anterior deltoid, and large chest. Also, the muscles of the large and small teeth are acting to remove the shoulder from the midline of the body that requires movement.

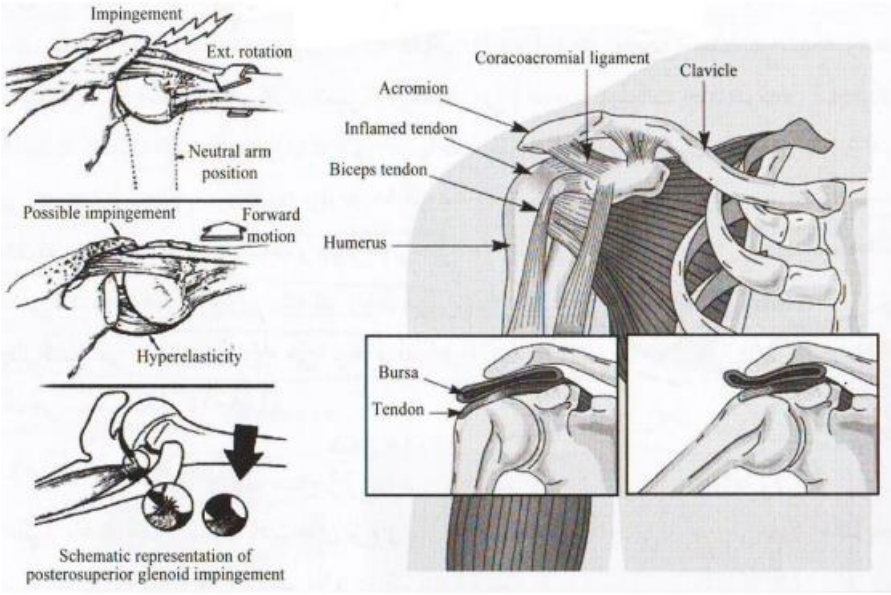
Horizontal fold

These movements, like the internal and external rotation movements, take place on the horizontal surface and the vertical axis. The onset status in these movements is different from the rest of the shoulder joint movements and is a condition in which the upper extremity has been fixed and fixed to 90 degrees. The move of the upper limb from the onset, parallel to the horizontal surface, is called horizontal folding. The range of this movement is 140 degrees. In this movement, the scapular bone also acts and helps move by moving away and placing the distant cavity.



Internal and external rotation movements of the humerus. A: Anatomical and physiological starting position.

The term shoulder impingement syndrome was first used by Neer in 1972 and it remained with the same name due to the many shoulder problems in swimmers. It causes dryness of the joint capsule and soft tissues surrounding the shoulder joint, where the elasticity of the joint capsule is reduced and adhesion is created between the folds of the synovial membrane.



Symptoms of Shoulder Syndrome

The prevalence of shoulder syndrome in the United States suffers from shoulder joint injury 18.5 % of the population 18 to 38 years of age. This is the most common shoulder set disorder and covers 44 to 65 % of cases. In most research, the prevalence is reported to be 65-65 %. In many of the head movements, it is seen in sports or daily lives, and in many jobs.

Using muscle capacity refers to the ability to use a large number of central and environmental muscles. The ability to increase the fair capacity is essentially provided by the use of specific exercises both the nature of conquest and resistance to the gravity of the earth. In addition, the exercise that athletes perform at a faster race, as well as the wise use of static and dynamic contractions are effective in increasing muscle capacity. The muscle that can lift 100 kg in laboratory conditions uses only 30 % of its capacity or 30 kg. As mentioned, out of the total 800kg assumed for the athlete's muscle capacity, the weightlifter can only lift about 240 kg. Applying special exercises aimed at developing muscle capacity as well as techniques for meditation can improve athletes' ability to lift weights by 80 % of their capacity. As a result, the weightlifters should be able to lift 640 kg and jump the jumps to 70.2 to 70.2 meters. It seems that the possibility of achieving this function depends on the ability to participate in the simultaneous participation of the peripheral and central muscle strings in the activity.

Data Collection tools

The tools used in the present study included the SECA balance and height (made in Germany (Japan Japan and 372R Tiger) and the Zemic Dynamometer (Made in the Netherlands) and the Italian CPS Lumix model. Shoulder Pain Measurement and Shoulder Analog Scale and Index Index Questionnaire Spadi Pain and Inability Shoulder, and Score Murley Constant are used. VAS pain measurement scale is a mental examination of the function and pain itself The patient is described in this scale. On this scale, the patient scored his condition from 0 (completely disrupted) to 100 (no disorder). The Spadi questionnaire contains 13 questions each question from zero to ten points answered by the tester and the mean score is recorded for each question. The CMS questionnaire has three sections, which are part of the pain and part of the range of motion and shoulder power, which is answered by the test and the other part by the recipient test. The measurement is rated and recorded according to your formula.

findings

The purpose of the treatment of shoulder drooping is to relieve pain and reduce the joint and increase the range of movement. To control the clinical symptoms of shoulder syndrome, various treatments have been proposed depending on the severity of the disease from conservative treatments to injections and surgeries. Conservative therapies mostly include programs aimed at restoring natural kinematics and paying attention to the role of muscles in the subacromial space. Includes anti-inflammatory referees, oral and muscular corticosteroids, subcutaneous injection filtration, ice therapy in acute cases, massage as frozen and scrubbing, injured organ immobility, flexibility and strength training Motor range exercises and increased performance in athletes (, ultrasound, stimulate nerve electrical transfers, and they aim to reduce pain and restore one's normal motor range and ultimately restore the individual to their ordinary life. Hence, different types of power interventions are used to treat patients with shoulder necklace syndrome.

The results of the research hypotheses showed that a period of rehabilitation sessions on pain reduction in three methods of measurement (SPADI, CMS, VAS), motor range and shoulder muscle strength in athletes with shoulder syndrome in flexion motion, removal, external rotation, And the interior has a significant positive effect. Due to the new study of the impact of rehabilitation sessions on pain reduction, especially in athletes with shoulder syndrome, there has been no research. But studies have shown that rehabilitation sessions have a significant effect on pain relief, for example, Pins 2017) (in his study concluded that rehabilitation sessions on pain reduction and increased power and motor range of patients with shoulder injury it is meaningful. Also Choi et al. Rehabilitation sessions affect pain relief and increased performance in patients with knee osteoarthritis; also Alayat et al.) 2014 (in their study concluded that the long-term effect of high-power rehabilitation sessions in reducing pain and increasing the range of motor patients with back pain Chronic has a significant impact. These researchers in another study in 2016 (concluded that the long-term effect of high-power rehabilitation sessions in reducing pain and motor range of patients with neck pain had positive and meaningful effects.

Further, the results of the study showed that the amount of range of motion in the state of turning away and external rotation was underestimated in the rehabilitation sessions. Also, the results of this study showed that there is a significant difference in the strength of the shoulder muscles in flexion, abduction, and internal rotation in the rehabilitation exercise method; In this way, the strength of the shoulder muscles in flexion, abduction, and internal rotation was underestimated in the rehabilitation sessions.

References

1.Alayat MS, Atya AM, Ali MM, et al. : Long-term effect of high-intensity laser therapy in the treatment of patients with chronic low back pain: a randomized blinded placebocontrolled trial. Lasers Med Sci, 2014, 29: 1065–1073

2.Alayat MS, Atya AM, Ali MM, Shosha TM. (2014). Long-term effect of high-intensity laser therapy in the treatment of patients with chronic low back pain: a randomized blinded placebo-controlled trial. Lasers Med Sci; 29(3): 1065-1073.

3.Alayat, M. S. M., Mohamed, A. A., Helal, O. F., & Khaled, O. A. (2016). Efficacy of high intensity laser therapy in the treatment of chronic neck pain: a randomized double-blind placebo-control trial. Lasers in medical science, 31(4), 687-694.

4.Ali Bakhshi E, Golpayegani M, Kazemipour M, Mollanorouzi K, Parastesh M .(2010) .Comparison of four physical therapy, massage therapy, mechanotherapy and

compound programs on rotator cuff muscles in patients suffered from shoulder

impingement syndrome]. J Mil Med. 12(2):81-8. [Article in Persian.[

5.Alibakhshi E, Sobhani V, Golpaygani M, Hosseini S, Akhavan H. (2010). Effect of 4-week compound treatment protocol on chronic tendonitis of shoulder's rotator cuff muscles. Kowsar Medical Journal; 15: 177-83.[Persian].

6.Almekinders LC. (2001). Impingement syndrome. Clin Sports Med; 20 (3):491–504

7.Alves AC, Vieira R, Leal-Junior E, dos Santos S, Ligeiro AP, Albertini R, et al .(2013) .Effect of low-level laser therapy on the expression of inflammatory mediators and on neutrophils and macrophages in acute joint inflammation. Arthritis Res Ther; 15 :(5)R116.

8.American Academy of Orthopaedic Surgeons (Green WB, Heckman JD eds.): The Clinical Measurement of Joint Motion. 6300 North River Road, Rosemont, IL 60018 ,1994 ,ISBN 0-89203-090-9.

9.American Medical Association: Guide to the Evaluation of Permanent Impairment .AMA, Chicago, 1988.

10 .Amini A. General anatomy. (2000). Tehran: Taghebostan Publication; [Persian].

11 .Archer, R. P., Handel, R. W., Ben-Porath, Y. S., & Tellegen, A. (2016). Minnesota Multiphasic Personality Inventory-Adolescent-Restructured Form (MMPI-A-RF) :Administration, scoring, interpretation, and technical manual.

12 .Ashton B, Pickles B, Roll JW. (1978). Reliability of goniometric mea-surements of hip motion in spastic cerebral palsy. Develop Med Child Neurol. 20:87-94.

1
3
.Babaei-Mobarakeh, M., Letafatkar, A., Barati, A. H., & Khosrokiani, Z .(2018) .Effects of eight-week "gyroscopic device" mediated resistance training exercise on participants with impingement syndrome or tennis elbow. Journal of bodywork and movement therapies, 22(4), 1013-1021.

14 .Bakhshi, A., Golpayegani, M., Kazemipour, M., A. R. Y. A. M., Mollanorouzi, K & ,.Parastesh, M. (2010). Comparison of four physical therapy, massage therapy ,mechanotherapy and compound programs on rotator cuff muscles in patients suffered from shoulder impingement syndrome. Journal Mil Med, 12(2), 81-88.

15 .Baldwin J, Cunningham K. (1974). Goniometry under attack: a clinical study involving physiotherapists. Physiother Can. 26:74-76.

16 .Bang M.D, Delay G.D. (2000). ComParison of supervised exercise with and without manual physical therapy for patients with shoulder impingement syndrome.J Orthop Sport Phys Ther; 30:126-137.

17 .Banks C, Mackrodt K. (2005). "Chronic pain management" Philadelphia, 2005.

18 .Bapna, P. A. K., Mane, P. N., Ganiger, C. R., Pawar, R. L., Phaphe, S. A & ,.Ahammed, Y. A. (2017). A survey of perception of pain and discomfort with elastomeric separators in patients undergoing orthodontic treatment in Western Maharashtra region. Journal of Oral Research and Review, 9(2), 56.