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Comparison Study between Dry Needling in a Manual Physical Therapy and Therapeutic Exercise Protocol in Treating Musculoskeletal Injury and Chronic Mechanical Shoulder Pain

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Abstract

To treat shoulder and musculoskeletal discomfort, physical therapists use therapeutic exercise protocols and dry needling. These are techniques in which a tiny needle is used to puncture the muscles, subcutaneous tissues, and epidermis to disturb the internal tissues manually. This technique is called dry needling since no substance is injected during the procedure. dry needles. any non-traumatic shoulder problem that is typically unilateral and hurts. The subacromial syndrome is a unilateral shoulder problem that produces pain around the acromion and usually gets worse during or after arm raises. Several types of physical therapy would be a better course of treatment than surgery in this case. The current research used a descriptive method depending on previous studies that involve the same variables. However, the researcher found that there is a lack of literature that covers the whole topic's variables, therefore, the current research aims to answer the main question that reaches the aim.

Keywords: *Dry needling, Therapeutic exercise protocol, Chronic shoulder pain, Musculoskeletal pain, Patients, Physical therapists*

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1. Introduction

Conservative methods of treating shoulder pain and musculoskeletal injury typically include physical therapy, anti-inflammatory medications (NSAIDs), rest, and corticosteroid injections. Current research, however, has demonstrated the advantages of a multimodal approach to treating injuries, which includes exercises at home, manual therapy, stretches, and dry needling (Naseri, 2023).

Prior research has demonstrated that adding manual physical therapy to an exercise regimen is a more effective way to reduce pain and improve functionality, strength, and range of motion than just exercising on its own. The frequent recurrence and durability of symptoms associated with chronic shoulder pain make it challenging to determine the best course of action for this severe and complex disorder, which lacks a clear clinical description. Furthermore, there is evidence linking the high frequency of myofascial trigger points in the shoulder muscles to pain, suggesting that patients with these conditions would benefit from a muscle-focused treatment approach (Azin, 2023; Bachmann, 2014; Barten, 2018).

Physical therapists employ dry needling as a therapeutic technique to address musculoskeletal discomfort. It is a method where the interior tissues are mechanically disrupted by puncturing the epidermis, muscles, and subcutaneous tissues using a tiny needle. Since no material is injected during the process, this technique is known as dry needling. Any non-traumatic, usually unilateral shoulder issue causing pain around the acromion that typically worsens during or after arm

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lifts is referred to as subacromial syndrome. The best course of treatment for it should not involve surgery, but rather various forms of physical therapy (Díaz, 2022).

While a great deal is known about the effects of various forms of exercise on healthy individuals and uninjured tissues, less is known about these impacts on diseased tissues and individuals who are not in excellent condition. Therapeutic exercise refers to the methodical execution of prearranged physical movements, postures, or tasks to help the patient: 1) improve function; 2) prevent or treat impairments; 3) lower risk; 4) optimize general health; and 5) increase fitness and well-being (Azin, 2023).

Unlike conventional exercise regimens, therapeutic exercise programs are created by rehabilitation specialists with quantifiable goals in mind. The process of making decisions about the use of therapeutic exercise in a patient population is comparable to that of prescribing medication or other treatments. All too frequently, those involved in this exchange (therapist, patient, family, and other medical professionals on the team) view the exercise regimen as only a few activities that need to be done a specific number of times a day (Falcón, 2017).

Based on reviewing previous studies centered around the topic of the current research and its variables, it was found that there is a noticeable lack of studies comparing dry needling in physical therapy and the therapeutic exercise protocol in treating musculoskeletal injuries and chronic mechanical shoulder pain. Therefore,

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the current research aims to answer the main question; **"What is the difference between dry needling in physical therapy and the therapeutic exercise protocol in treating musculoskeletal injuries and chronic mechanical shoulder pain?".** And it is divided into four sub questions which are:

1. What is the effect of dry needling in physical therapy in treating musculoskeletal injuries?
2. What is the effect of dry needling in physical therapy in treating chronic mechanical shoulder pain?
3. What is the effect of therapeutic exercise protocol in treating musculoskeletal injuries?
4. What is the effect of therapeutic exercise protocol in treating chronic mechanical shoulder pain?

1.1 Research Objectives

The research aims to investigate the difference between dry needling in physical therapy and the therapeutic exercise protocol in treating musculoskeletal injuries and chronic mechanical shoulder pain.

This main objective is subdivided into the following sub-objectives:

- Investigate the effect of dry needling in physical therapy in treating musculoskeletal injuries.

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- Investigate the effect of dry needling in physical therapy in treating chronic mechanical shoulder pain.
- Investigate the effect of therapeutic exercise protocol in treating musculoskeletal injuries.
- Investigate the effect of therapeutic exercise protocol in treating chronic mechanical shoulder pain.

1.2 Research Significance

- The results of this research can be used to increase knowledge, awareness and understanding of the extent of the effect of therapeutic techniques (dry needling and therapeutic exercise protocols) in relieving muscle pain.
- Moreover, the current research provides sufficient information for physical therapists and their related services to increase their knowledge of the skills needed to deal with people with chronic shoulder pain and musculoskeletal injuries.
- Due to the lack of research and studies centered on the current research topic, our research fills a clear literature gap and provides sufficient information.
- The current research is also considered a sufficient source of information related to dependent and independent research variables for students and academic researchers.

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2. Literature Review

2.1 Dry Needling

Clinical and scientific interest in dry needling has increased dramatically over the past few decades, and DN is being linked to a number of therapy benefits, including reduced pain and tension in the muscles, enhanced range of motion, increased muscle strength, and enhanced coordination. When compared to normal care, there is insufficient evidence from a single study to support the idea that deep needling into myofascial trigger points has a therapeutic impact overall (Dommerholt, 2006).

Dry needling, also known as intramuscular manual therapy, is a method of treating a variety of impairments such as scarring, myofascial pain, motor recruitment, and issues with muscle firing by inserting a solid filament needle into or through the skin without the need for medication. Treatment objectives range from pain alleviation and enhanced scar tissue extensibility to better neuromuscular patterns (Dunning, 2014).

To treat a range of neuromusculoskeletal pain disorders, dry needling is commonly used to treat muscles, ligaments, tendons, subcutaneous fascia, scar tissue, peripheral nerves, and neurovascular bundles. To perform dry needling, tiny monofilament needles similar to those used in acupuncture must be inserted into muscles, ligaments, tendons, subcutaneous fascia, and scar tissue without the use of an injectable (Díaz, 2022).

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The term "dry needling" (DN) refers to the use of sterile, disposable acupuncture needles to treat pain and musculoskeletal dysfunction. DN is a minimally invasive procedure that requires adherence to specific guidelines. The invasive process of dry needling involves inserting an acupuncture needle into the muscle and skin. DN is a clinical treatment used by physical therapists worldwide, and it is often combined with other therapies in physical therapy (Hall, 2018).

Several schools and conceptual models, such as the MTrP model, the spinal segmental sensitization model, and the radiculopathy model, have been created as a result of the empirical development of dry-needling procedures. Other, less popular needling techniques include electrical or automated twitch-obtaining intramuscular stimulation, as well as neural acupuncture. In neural acupuncture, lidocaine is injected into acupuncture points to relieve myofascial pain (Hando, 2019).

2.2 Therapeutic Exercise Protocol

Physical impairments associated with movement disorders brought on by illness, injury, or health-related conditions typically prompt healthcare consumers to seek out physical therapy services because they limit their capacity to carry out or pursue a variety of important or necessary activities. Even those without disabilities who want to get fitter overall or lessen their chance of accident may seek out physical therapy services. Almost always, a key element of the physical therapy treatments offered is a custom-created therapeutic exercise program. This makes sense since the ultimate objective of a therapeutic exercise regimen is to reach the highest

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possible degree of symptom-free mobility while engaging in simple to complex physical activities (Zaldívar, 2023).

A therapist must comprehend how the various types of exercise affect body systems' tissues and how those impacts affect important facets of physical function to design and carry out efficient exercise therapies. Therapists must also utilize and integrate their understanding of anatomy, as well as the behavioral sciences, kinesiology, anatomy, physiology, and pathology. the entire patient care process, starting with the initial assessment and ending with discharge planning (KISNER, 2007).

According to Marinko (2011), therapists need to be aware of the connection between physical function and impairment to provide patients and clients with meaningful functional outcomes. They must also recognize how applying the disablement process to patient management helps to provide effective and efficient healthcare services. Lastly, a therapist needs to understand and use the concepts of motor learning in their role as a patient educator. A patient educator must possess an understanding of motor learning concepts and their application to exercise teaching and functional training.

The methodical, scheduled execution of physical activities, postures, or body motions to assist a patient is known as a therapeutic exercise. A patient is a person receiving physical therapy treatments to support well-being and health but who does

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not have a diagnosed problem. Previous studies have extensively documented and discussed the beneficial effects of therapeutic exercise for patients with a wide range of health disorders and related physical impairments (Zaldívar, 2023).

2.3 Musculoskeletal Injuries

It can be taxing on the body to make, reach, or perform the same motions again. Musculoskeletal injuries, or MSIs, are injuries to the neck, shoulder, arms, wrists, legs, and back caused by wear and tear on the muscles, tissues, ligaments, and joints. Furthermore, a muscular sprain, strain, ligament, joint, nerve, blood vessel, or other similar soft tissue injury or condition that may be brought on by or made worse by exertion is known as a mechanical stress injury (MSI) (Alsheikhly, 2019).

Terms typically used to refer to MSI, repetitive strain injury, musculoskeletal disorder, cumulative trauma disorder, musculoskeletal strain injuries, and repetitive motion injury are included in this classification, according to (Gouttebarge, 2015). Any worker who performs repetitive, unfamiliar, or physically demanding activities could have MSI. When energy (physical stress) is applied to bones, muscles, tendons, joints, ligaments, cartilage, or related tissues surpasses the capability for normal tissue function, musculoskeletal (MSK) injuries result (Barten, 2018). The MSK tissues may be traumatized all at once or over time as less evident "micro-traumas" that build up.

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According to (Blackhawk, 2018; Goswami, 2023; Yoma, 2022), musculoskeletal injuries can result from the demands daily activities place on the body. When there is an imbalance between an employee's physical capabilities and the demands of their profession, musculoskeletal injuries can result. Repetitive motions of a high enough force and length to prevent the damaged muscles from recovering, holding oneself still for extended periods, and neglecting to take regular, brief rest intervals are common causes of MSI.

The most typical sign of MSI is pain. Pain is not always confined to the site of injury but can be conveyed to other sections of the body. For instance, pain may initially originate in the shoulder and neck and then go to the arms and back. By ensuring that the pain is isolated to the affected location, early action and treatment of the injury can facilitate easier identification of the injury and prevent further discomfort (Yoma, 2022).

The body aches and feels fatigued during work but symptoms disappear with time away from work. Early warning indicators, such as neck and shoulder pain, frequently appear after work has stopped. The following morning, the effects might also be felt, such as hand or limb aches and stiffness. If the right precautions are taken, the injury should heal fully and not interfere with one's ability to work. Frequently, there are no obvious symptoms of an issue at this point (Goswami, 2023).

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The sore spot continues to hurt and feel weak long after work is done. Work gets harder to complete. If the damage is treated appropriately, it will still heal fully. When this happens, even when at rest, the affected part aches and feels weak, therefore sleep disturbance is a common complaint for musculoskeletal injuries. Although the damage might not heal entirely, if treated appropriately, its effects can be lessened (Blackhawk, 2018).

2.4 Chronic Mechanical Shoulder Pain

One of the most prevalent issues is shoulder pain, which frequently arises as a side effect of a condition that affects the shoulder muscles. Physical therapy, exercises, and manual therapy manipulating the shoulder joint are common treatments for persistent (chronic) pain. One method that is frequently used to treat pain is dry needling. It includes stimulating specific trigger points in the muscles (called myofascial trigger points) with either hollow-core hypodermic needles or solid filiform needles (used for acupuncture) to reduce pain (Deborah, 2014)

In outpatient medicine, shoulder pain is a typical presenting problem. An individual's capacity to work and perform other daily tasks including driving, dressing, brushing their hair, and even eating can be severely impacted by shoulder issues. The complicated arrangement of bones, muscles, tendons, and nerves that make up "the shoulder" makes it challenging to determine what is causing the pain.

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Shoulder pain may result from problems outside of the shoulder or from structures inside the shoulder (Crookes, 2023).

According to (Deborah, 2014; Herin, 2012), almost 20-50% of all musculoskeletal issues are caused by chronic shoulder pain. Inflammation, degeneration, or painful myofascial trigger points (MTrPs) are common causes of unilateral shoulder pain that do not stem from subacromial disease. Latent MTrPs are currently treated with physiotherapy, acupuncture, dry needling, botulinum toxin injections, steroids, and local anesthetics.

Furthermore, several studies merely used the patient's self-reported symptoms to define shoulder diseases, even though the shoulder is one of the few anatomical regions for which consensus-driven diagnostic criteria have been established. Thus, longitudinal methods combined with standardized clinical exams might help determine and better understand the causes of shoulder pain (Kidd, 2013; MOstMed, 2015)

According to Herin (2012), age, obesity, diabetes, and chronic illnesses including stroke that weaken the shoulder joint are associated with higher rates of persistent shoulder pain. With a few focused questions and examinations, a competent practitioner may typically identify the reason for shoulder pain in their patients. Most of the time, a primary care physician can effectively treat shoulder pain. A physical therapist referral may be necessary to help the patient's strength and

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mechanics. Primary care physicians overuse early imaging investigations and specialist referrals; these should only be used in certain situations.

Patients with shoulder pain are frequently seen in medical settings, and tendinitis, bursitis, rotator cuff strain, and impingement syndrome are among the diagnostic terms that have historically been employed. The etiology of shoulder discomfort is still debatable, though, because most tests have only moderately good diagnostic validity and poor reliability when used to make a diagnosis (MOstMed, 2015).

Conservative treatment is often sought for work-related shoulder disorders of mechanical origin, which manifest as shoulder pain with full or restricted movement after a specific job exposure. It is quite uncommon for severe underlying problems to be linked to acute shoulder discomfort and limitation that is mechanically provoked. Poorer outcomes are linked to older age, female gender, severe or recurring symptoms upon presentation, concurrent neck discomfort, and higher disability ratings (Crookes, 2023).

Falcón (2017) claimed that the association between work and musculoskeletal disorders (MSDs) has traditionally been explained by biomechanical exposures and specific occupational psychological components. Heavy loads, repetitive motions, hunching over, vibration, and especially a mix of these are proven physical risk factors associated with shoulder issues at work.

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When the arm is raised, the scapula of a healthy shoulder rotates upward, posteriorly, and externally (Naseri, 2023). Concurrently, the clavicle rotates posteriorly at the sternoclavicular joint, retracts, and rises somewhat. Combining these motions allows for the best possible abduction of the arms while maintaining the subacromial space during elevation. Numerous experts concur that the synchronized activation of the serratus anterior and the upper, middle, and lower trapezius muscles is the cause of this. Changes to this synchronous motion have been linked to shoulder diseases including impingement syndrome and have the potential to upset kinematic rhythms (Falcón, 2017).

For shoulder abduction, a dysfunctional pattern of muscle activation has been identified; during arm elevation, the dysfunctional side's activation of the trapezius muscle increases, while the activation of the serratus anterior muscle declines. During arm abduction, this abnormal pattern causes the scapula to tilt more anteriorly, internally, and posteriorly. As the pectoralis minor is an opponent of scapulothoracic motion, this pattern shortens its resting length, which may make shoulder issues worse (Pandaya, 2024).

2.5 Previous Studies

In a study entitled **“Dry Needling for the Treatment of Musculoskeletal Ailments with Trigger Points”,** conducted by Padanilam et al (2021), aimed to walk through the current use of dry needling, discuss the rationale and indications

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for dry needling, and perform demonstrations of needling of the tensor fasciae latae, extensor carpi radialis longus, and the gastrocnemius muscles. The study used the experimental method. The results indicated that dry needling may significantly decrease pain and improve functional outcomes in patients with short-term musculoskeletal ailments. As well, dry needling may provide improved long-term analgesia but also result in increased pain during the procedure and increased soreness afterward. Pain relief may not last beyond 6 months, although little research investigating long-term outcomes has been performed.

Another study entitled **"A Systematic Review of the Effectiveness of Dry Needling in Subacromial Syndrome"** conducted by Díaz et al (2022), sought to evaluate the effectiveness of dry needling (DN) combined with conventional physiotherapy in the recovery of patients with subacromial syndrome (SAS). The study used systematic review, and the result was that DN is effective and safe in reducing the pain and disability produced by SAS, with the best combination of treatment turning out to be conventional physiotherapy together with DN, obtaining more stable and longer-lasting benefits than merely implementing the techniques in isolation.

A study conducted by Pai et al (2021) that is **entitled "Dry needling has lasting analgesic effect in shoulder pain: a double-blind, sham-controlled trial"** aimed to evaluate in a randomized, sham-controlled study the pattern of analgesic

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efficacy and local sensory changes of a single session of DN for MPS in patients with chronic shoulder pain. The study used an experimental methodology on randomized two groups (active (n = 20) or sham (n = 21)). The result was indicated that dry needling led to a significantly larger pain intensity reduction.

Another study entitled **"Effects of dry needling trigger point therapy in the shoulder region on patients with upper extremity pain and dysfunction: a systematic review with meta-analysis"** conducted by Hall et al (2018) aimed to investigate the effectiveness and the adverse effects of dry needling trigger point therapy in the shoulder region on patients with upper extremity pain and dysfunction. The researchers used a systematic review to conduct the study and they reached to that needling both active and latent trigger points is more effective than needling an active trigger point alone for pain immediately.

In a study entitled **"The effect of exercise therapy as a tool for preventing and treating musculoskeletal disorders among school-aged children: a randomized controlled trial"** conducted by Shourie et al (2024) sought to investigate the effect of exercise therapy on preventing and treating musculoskeletal disorders among school-aged children. This study used the Teen Nordic Musculoskeletal Screening Questionnaire and the International Physical Activity Questionnaire-Short Form, respectively, at baseline and after the experimental protocol. The researchers found that there was a statistically significant reduction in

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the frequency of MSDs in the treatment group. Also, there was significant improvement in all variables of walking, moderate physical activity, vigorous physical activity, and total in intervention groups spatially in students who received exercise therapy.

Another study entitled **"Effects of a Therapeutic Exercise Protocol for Patients with Chronic Non-Specific Back Pain in Primary Health Care: A Single-Group Retrospective Cohort Study"** conducted by Zaldívar et al (2023), aimed to assess the effectiveness of a therapeutic group exercise protocol in reducing pain intensity and disability in patients with back pain in primary health care setting. The researchers used a retrospective cohort method that is applied on a sample contains 149 patients who suffered from chronic non-specific back pain was selected. The results indicated a statistically significant differences were shown in pain intensity and disability for patients with non-specific neck and low-back pain, with an effect size from moderate to large.

A study entitled **"The effectiveness of therapeutic exercise for painful shoulder conditions: A meta-analysis"** conducted by Marinko et al (2011) sought to to examine the effectiveness of therapeutic exercise as an intervention across all pathoanatomic mechanisms of shoulder pain in terms of range of motion (ROM), pain, and function. The study used a qualitative method, which found that therapeutic exercise has a positive effect on pain and function above all other

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interventions. The findings for ROM were inconclusive. As well, therapeutic exercise is an effective intervention for the treatment of painful shoulder conditions.

Another study entitled **"The Effect of Exercise Therapy Interventions on Shoulder Pain and Musculoskeletal Risk Factors for Shoulder Pain in Competitive Swimmers: A Scoping Review"** conducted by Yoma et al (2022) aimed to describe the evidence base relating to the effectiveness of exercise therapy interventions on shoulder pain and shoulder musculoskeletal risk factors for shoulder pain in swimmers. A scoping review methodology was applied through the search of MEDLINE, PubMed, Scopus, Web of Science, and CINAHL databases. The researchers found that exercise therapy has positive effects on reducing the incidence of shoulder pain, the management of shoulder pain, and improving shoulder musculoskeletal risk factors in competitive swimmers.

3. Methodology

The researcher will use the descriptive approach in the current research through reviewing the previous studies that related to variables.

4. Conclusion and Recommendations

In order to treat shoulder and musculoskeletal discomfort, physical therapists use therapeutic exercise protocols and dry needling. These are techniques that include puncturing the muscles, subcutaneous tissues, and epidermis with a tiny needle in order to manually disturb the internal tissues. Dry needling is the term for this

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treatment because no substance is injected during the procedure. Subacromial syndrome is the term used to describe any non-traumatic, usually unilateral shoulder problem that causes pain around the acromion and usually gets worse during or after arm raises. Several types of physical therapy would be a better course of treatment than surgery in this case.

Furthermore, prior research has demonstrated the effectiveness of manual treatment methods plus therapeutic exercise in treating shoulder discomfort; however, the optimal frequency and dosage remain unclear. Patients with musculoskeletal problems and chronic shoulder pain should consider dry needling. As a result, there is a notable reduction in pain and disability.

Moreover, the advantages of therapeutic exercises for shoulder pain demonstrate the significance of incorporating them into this protocol's implementation at home as well as during treatment sessions. Scapular training is a key component of this protocol's exercises because patients with shoulder pain have been shown to exhibit decreased electromyographic activation in the serratus anterior and lower trapezius, as well as increased activation in the upper trapezius, which is reflected in a scapulohumeral muscle imbalance. manifested as an imbalance in the scapulohumeral muscles.

Therefore, in order to create this intervention protocol, we chose several manual physiotherapies (dry needling) and therapeutic exercise modalities based on prior

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research involving the same factors. Techniques like this, which have similar short-term outcomes to procedures but are less expensive and have less side effects, could be an alternative to medical interventions. Therefore, the researcher recommends the following recommendations:

1. It is essential to identify the early warning signs and symptoms of MSI in order to take preventative action and, if needed, to arrange for rehabilitation therapy. Well-designed occupational assignments that limit physical demands and education can both help lower the likelihood of work-related injuries.
2. Even while some studies have shown encouraging results, there is still insufficient evidence to support the efficacy and usefulness of DN for a number of ailments because to concerns about a lack of precision and a considerable potential of bias in the trials. Large-scale, placebo-controlled clinical trials are necessary to evaluate the clinical utility of this technique.

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