T.C.

YEDİTEPE UNIVERSITY

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DEPARTMENT OF SPORTS PHYSIOTHERAPY

THE INVESTIGATION OF THE EFFECTS OF ATTENTIONAL FOCUS STRATEGIES ON PAIN, DISABILITY, POSTURE, QUALITY OF LIFE, AND DEPRESSION IN PATIENTS WITH MYOFASCIAL PAIN SYNDROME

MASTER OF SPORTS PHYSIOTHERAPY THESIS

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İSTANBUL- 2025

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APPROVAL

This thesis has been deemed by the jury in accordance with the relevant articles of Yeditepe University Graduate Education and Examinations Regulation and has been approved by Administrative Board of Institute with decision dated .... and numbered ....

Prof. Dr. Burcu Gemici Başol
Director of Institute of Health Sciences

DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

Yağmur BARLAS, PT

DEDICATION

I dedicate this thesis to my beloved family, who have always supported me and given me the opportunity to pursue my education under the best possible conditions.

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I want to express my gratitude to my thesis advisor, Assist. Prof. Dr. Elif Tuğçe ÇİL, for her patience, support, and guidance throughout each stage of my thesis.

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TABLE OF CONTENTS

LIST OF TABLES AND GRAPHS

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

Ach	Acetylcholine
AF	Attentional Focus
ATP	Adenosine Triphosphate
BDI	Beck Depression Inventory
BMI	Body Mass Index
Ca	Calcium
CG	Control Group
DN	Dry Needling
DTM	Deep Tissue Massage
EFA	External Focus of Attention
EFG	External Focus Group
EMG	Electromyography
ESWT	Extracorporeal Shock Wave Therapy
FM	Fibromyalgia
HP	Hotpack
IC	Ischemic Compression
IFA	Internal Focus of Attention
IFG	Internal Focus Group
LLLT	Low Level Laser Therapy
MCS	Mental Health Composite Score
MPS	Myofascial Pain Syndrome
MRT	Myofascial Release Therapy
MTrP	Myofascial Trigger Point

NDI	Neck Disability Index
NPRS	Numeric Pain Rating Scale
NSAID	Nonsteroidal Anti-inflammatory Drugs
NYPRC	NewYork Posture Rating Chart
PCS	Physical Health Composite Score
PPT	Pressure Pain Threshold
QOL	Quality of Life
ROM	Range of Motion
SF-12	Short Form 12
SPSS	Statistical Package for the Social Sciences
SR	Sarcoplasmic Reticulum
TCA	Tricyclic antidepressants
TENS	Transcutaneous Electrical Nerve Stimulation
US	Ultrasound

ABSTRACT

Barlas, Y. (2025), The Investigatıon Of The Effects Of Attentional Focus Strategies On Pain, Disability, Posture, Quality Of Life, And Depression In Patients With Myofascial Pain Syndrome, Yeditepe University, Institute of Health Sciences, Department of Sport Physiotherapy, Master Thesis. Istanbul.

The study aims to investigate the effects of different attentional focus strategies—internal, external, and no attentional focus—on pain, pressure pain threshold (PPT), disability, posture, quality of life (QOL), and depression in patients with neck and upper back Myofascial Pain Syndrome (MPS). This study was conducted at Istanbul Kadıköy Florence Nightingale Hospital between February 2024 and March 2025. A total of 36 participants aged between 18-65 were included voluntarily. Patients with a physician-confirmed diagnosis of MPS in the neck and upper back, who have experienced pain lasting over 3 months with an intensity rating of 3 or higher on the Numeric Pain Rating Scale (NPRS), were included. Participants were randomly divided into three groups: External Focus Group (EFG), Internal Focus Group (IFG), and Control Group (CG). All groups followed the same exercise program, differing only in verbal instructions that directed attention to the internal, external, or no instructions.The exercise program included strengthening and stretching exercises during six weeks, twice a week (12 sessions total). Each session lasted approximately 45 minutes in the same environment and with the same physiotherapist. Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS), and PPT was measured with a digital algometer. Disability was assessed using the Neck Disability Index (NDI), postural assessment was conducted using the New York Posture Rating Chart (NYPRC), QOL was measured with the SF-12 questionnaire, and depression levels were evaluated using the Beck Depression Inventory (BDI). Our main results demonstrate improvements in pain, PPT, disability, posture, physical component score of QOL, and depression parameters in all three groups ($p<0.05$). The mental component of QOL showed a statistically significant difference only in the attentional focus groups ($p<0.05$). Between-group analysis showed that EFG demonstrated a significantly greater improvement in PPT compared to IFG ($p < 0.05$). No significant differences were found between the groups in the other parameters.

Key Words: Myofascial Pain Syndrome, Attentional Focus, Exercise

ÖZET

Barlas, Y. (2025), Miyofasyal Ağrı Sendromlu Hastalarda Dikkat Odağı Stratejilerinin Ağrı, Engellilik, Postür, Yaşam Kalitesi ve Depresyon Üzerindeki Etkilerinin Araştırılması, Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü, Spor Fizyoterapisi Anabilim Dalı, Yüksek Lisans Tezi. İstanbul.

Çalışmanın amacı, boyun ve üst sırt Miyofasyal Ağrı Sendromu (MAS) olan hastalarda farklı dikkat odağı stratejilerinin —iç odak, dış odak ve dikkat odağı olmayan—ağrı, basınç ağrı eşiği, engellilik, postür, yaşam kalitesi ve depresyon üzerindeki etkilerini araştırmaktır. Bu çalışma Şubat 2024 ile Mart 2025 tarihleri arasında İstanbul Kadıköy Florence Nightingale Hastanesi'nde gerçekleştirildi. 18-65 yaş arası toplam 36 katılımcı gönüllü olarak çalışmaya alındı. Hekim tarafından boyun ve üst sırt bölgesinde MAS tanısı doğrulanmış, ve Sayısal Ağrı Derecelendirme Ölçeği'ne göre 3 veya daha yüksek şiddette ve 3 aydan uzun süreli ağrı yaşayan hastalar çalışmaya dahil edilmiştir. Katılımcılar rastgele üç gruba ayrıldı: Dış Odak Grubu (DOG), İç Odak Grubu (İOG) ve Kontrol Grubu (KG). Tüm gruplar aynı egzersiz programını izledi, yalnızca dikkati içsel, dışsal veya hiç talimat verilmeyen alanlara yönlendiren sözel talimatlar farklılık gösterdi. Egzersiz programı, altı hafta boyunca haftada iki kez (toplam 12 seans) güçlendirme ve germe egzersizlerini içeriyordu. Her seans aynı ortamda ve aynı fizyoterapist ile yaklaşık 45 dakika sürdü. Ağrı şiddeti, Sayısal Ağrı Derecelendirme Ölçeği kullanılarak değerlendirildi ve basınç ağrı eşiği dijital bir algometre ile ölçüldü. Engellilik, Boyun Engellilik İndeksi kullanılarak değerlendirildi, postür değerlendirmesi New York Postür Derecelendirme Ölçeği kullanılarak yapıldı, yaşam kalitesi SF-12 anketi ile ölçüldü ve depresyon seviyeleri Beck Depresyon Envanteri kullanılarak değerlendirildi. Ana sonuçlarımız, üç grupta da ağrı, basınç ağrı eşiği, engellilik, postür, yaşam kalitesinin fiziksel bileşen puanı ve depresyon parametrelerinde iyileşmeler olduğunu göstermektedir ($p<0,05$). Yaşam Kalitesinin zihinsel bileşeni yalnızca dikkat odağı ile çalıştırılan gruplarda istatistiksel olarak anlamlı bir fark göstermiştir ($p<0,05$). Gruplararası değerlendirmede, basınç ağrı eşiği parametresinde DOG, İOG'ye kıyasla anlamlı düzeyde daha fazla gelişme göstermiştir ($p<0.05$). Diğer parametrelerde ise gruplar arasında anlamlı bir fark saptanmamıştır.

Anahtar Kelimeler: Miyofasyal Ağrı Sendromu, Dikkat Odağı, Egzersiz

1. INTRODUCTION

Myofascial pain syndrome (MPS) is a type of musculoskeletal pain commonly found in muscles and their surrounding fascia, particularly prevalent among patients with chronic pain [1]. MPS originates from myofascial trigger points (MTrPs), which are hyperirritable spots located within the taut bands of skeletal muscles. When stimulated, these points can cause pain and lead to referred pain, motor dysfunctions, and autonomic responses. MPS can further result in increased tension, muscle shortening, limited range of motion, altered muscle activation patterns, weakness, and greater muscle fatigue [2].

Although the mechanism of the development of trigger points for MPS is still not well understood, several risk factors contribute to this painful condition which include traumatic events, ergonomic factors or poor ergonomics in daily life, also psychological stress, sleep disorders, structural factors, and systemic factors [3].

In the treatment options, various methods such as eliminating perpetuating factors, manual therapy, physical therapy modalities, invasive methods, pharmacologic management, and psychotherapy are available [4,5]. Due to the numerous available treatment options for MPS, treatment plans must be tailored to the patient's situation [4].

Additionally, exercise for treating musculoskeletal problems related to MTrPs has increasingly been recommended [6,7]. It was found that exercise is an effective approach to treating pain intensity, increasing pressure pain thresholds, and improving range of motion, and is a preferred method due to its non-invasive, non-pharmacological, cost-effective, and safe [2,8]. A systematic review reported that a combination of stretching and strengthening exercises produces more significant short-term benefits on pain intensity for those suffering from MPS [9]. This combined exercise can alleviate myofascial pain symptoms by enhancing blood circulation and energy metabolism in muscles, while also effectively orienting the myofascial elements [5,10].

When arranging an exercise program, the international guidelines focus on different parameters (intensity, volume, frequency, load, rest periods, etc.) to enhance wellness and performance [11]. However, verbal instructions during the performance also play a big role by influencing the individuals' direction of focus attention and it may affect the task outcome [12].

Two primary verbal instructions direct attention to a particular attention source: Internal Focus of Attention (IFA) or External Focus of Attention (EFA). IFA indicates focus on the body and its parts, whereas EFA directs attention to the effects of movement or the specific instrument used for a task [13,14].

Evidence indicates that attentional focus affects multiple motor performance outcomes, including postural control, muscle strength, and speed [15]. Specifically, many studies have shown that using external focus instructions on the intended movement effect typically results in more effective and efficient movements than those using an internal focus on the movements themselves, or no specific focus (control conditions) [16].

In recent years, the evidence from healthy individuals has caused discussions in the rehabilitation community regarding the clinical significance of attentional focus [17]. Some studies have been conducted on neurological conditions, such as Parkinson's disease, stroke, cerebral palsy, and multiple sclerosis, and some included other health conditions such as cancer and obesity [18-23].

Although evidence shows that cortical processes influence the rehabilitation of musculoskeletal dysfunction and pain, and that cortical changes in patients with musculoskeletal pain can be positively influenced by certain methods—such as attentional focus—that promote central nervous system changes [17], studies examining the effects of attentional focus instructions on pain and functionality in musculoskeletal disorders remain limited and yield inconsistent results [13,14].

To the best of our knowledge, no previous research has examined the role of attentional focus strategies in exercise for neck and upper back MPS, a prevalent musculoskeletal problem

Thus, this study's aim is to investigate the effects of different attentional focus strategies, which are internal, external, and no attentional focus that are used in exercise on pain, pressure pain threshold, quality of life, depression, disability, and posture among patients with neck and upper back MPS.

Two hypotheses were identified in the study:

H0: There is no difference between attentional focus strategies (internal, external focus, and no particular focus) used in exercise regarding pain, pressure pain threshold, disability, posture, quality of life, and depression parameters in patients suffering from neck and upper back MPS.

H1: There is a difference between attentional focus strategies (internal, external focus, and no particular focus) used in exercise regarding pain, pressure pain threshold, disability, posture, quality of life, and depression parameters in patients suffering from neck and upper back MPS.

2. GENERAL INFORMATION

2.1.Myofascial Pain Syndrome

Myofascial pain syndrome (MPS) is caused by trigger points (TrPs) in the muscle(s) or their fascia and is a common pain condition that is encountered widely among the general population. [24]. Today, the definitions initially proposed by Simons still stand as the most accurate descriptions of MPS and TrPs. Simons (1990) defined an MPS as a complex of sensory, motor, and autonomic symptoms resulting from myofascial TrPs (MTrPs) [25].

TrPs are identified as hyperirritable areas within skeletal muscles and their fascia, found in taut, palpable bands. These areas are tender to the touch and can lead to characteristic pain and discomfort, motor dysfunction, and autonomic symptoms in areas typically distant from their source [24,26].

MTrPs are classified into active and latent types. Active TrPs cause clinical pain symptoms; they are always tender, restrict full muscle lengthening, weaken the muscle, cause pain during direct compression, induce a local twitch response in muscle fibers when sufficiently stimulated, and may lead to referred motor and often autonomic phenomena within the patient's pain tolerance, usually in the pain reference zone [26]. In contrast, latent TrPs share all characteristics of active TrPs but remain clinically silent regarding active pain, becoming painful only upon palpation [26].

MTrPS is a very common source of musculoskeletal pain, however, the diagnosis of this condition is not always certain. This is because its symptoms and signs can be similar to those of other conditions like fibromyalgia (FM) [27]. Although there is limited consensus among clinicians and researchers on the diagnosis of MPS, the most commonly used diagnostic criteria are to identify a tender spot in a taut band of muscle and the pain symptom when the sensitive area is palpated [27].

The mechanism behind MPS remains poorly understood, but it is commonly attributed to either excessive use or insufficient muscle activity. Additionally, systemic and structural risk factors may also contribute to the development of MPS [3].

The treatment of MPS focuses on MTrPs and correcting the structural and mechanical imbalances that cause MTrP. Additionally, treatment should focus on sympathetic dysfunction, recognizing emotional stressors, and manage late complications. Therapeutic interventions for MPS typically involve education, medication, injection therapy, and exercise. Usually, these treatments are combined or used in a different order, and the decision of treatment procedure depends on the patient and healthcare provider [28].

2.2.Diagnostic Criteria

To diagnose MPS, carefully checking the history of the pain and doing a consistent physical exam is the best way [29]. The most commonly used diagnostic criteria are established by Simons and Travell (1999) which rely on eight clinical features of MTrPs [26].

According to these criteria, at least one minor criterion and five major criteria are needed for the diagnosis [26].

The major criteria;

- Localized acute pain
- Spontaneous pain or changes in sensation in the typical referred area for a specific TrP,
- A taut, palpable band in a muscle,
- Intense, localized tenderness at a specific point along the taut band.
- Decreased range of motion when measurable

The minor criteria;

- Reproducing spontaneously perceived pain and altered sensations through pressure on the TrP
- Localized twitch responses in muscle fibers can be induced by transverse ‘snapping’ palpation or needle insertion into the TrP
- Reducing pain through muscle stretching or TrP injections

Currently, numerous clinicians diagnose MPS based on the minimum acceptable criteria, which involves identifying a taut band and triggering spontaneous pain by pressing on a tender point within that taut band of muscle [30].

2.3. Epidemiology

The prevalence of MPS can be difficult to determine because there are no universally accepted diagnostic criteria. Thus, the reported prevalence of MPS varies significantly across different values [31].

Numerous studies indicate that the lifetime prevalence of MPS among the general population can be as high as 85%. For the general orthopedic population, prevalence rates of around 21% have been noted, whereas pain clinics report rates ranging from 85% to 93% [32].

MPS is the primary cause of chronic pain, which includes shoulder pain, chronic back pain, tension-type headaches, and facial pain [33]. Studies indicate that MPS accounts for 85% of back pain and 54.6% of chronic head and neck pain [3]. In a recent cross-sectional study investigating MPS prevalence among patients with non-specific neck pain, all 224 patients were diagnosed with MPS [34]. Similarly, in a study of 164 patients referred to a pain clinic for chronic head and neck pain lasting at least 6 months revealed that 55% had myofascial pain as a primary diagnosis [35]. A study also found that patients with shoulder impingement syndrome had active TrPs in shoulder muscles which were the infraspinatus, subscapularis, supraspinatus, and pectoralis major muscles, that reproduced their pain symptoms [36].

MPS is more commonly seen in individuals who spend prolonged periods in static positions such as office workers, dentists, and musicians [37]. Furthermore, Skootsky et al. found that it was more common in the upper body than in other regions, with the levator scapulae and trapezius muscles being the most commonly affected [38].

While it can affect all ages, adults are affected the most, with a higher frequency among those who are between the ages of 27 and 50 [39].

The gender incidence of MPS remains uncertain. Some researches suggest that men and women are equally affected [40]; however, some indicate a higher prevalence in women compared to men [41,32] and it has been demonstrated that this phenomenon may also be associated with factors such as hormonal differences and differences in body size and muscle composition and psychosocial differences [42].

2.4. Etiology

Knowing the potential causes of TrPs is crucial for eliminating existing TrPs, preventing latent TrPs from becoming active, and preventing their recurrence. However, there is still no exact mechanism for the etiology of MPS. Despite this, some factors that precipitate and perpetuate MPS are generally categorized into various categories, such as traumatic, structural, ergonomic, and systemic factors [43,3].

Exposure of muscle tissue to sudden impact injury or trauma such as falls and accidents, can lead to the formation of TrPs [44]. Among structural or mechanical causes, factors such as scoliosis, spondylosis, spinal degenerative conditions, localized joint hypomobility, local or generalized joint laxity, and chronic disease states can be included [43,32]. Prolonged and abnormal postures while doing activities of daily living, or lifting heavy objects repeatedly, can contribute to myofascial pain as ergonomic factors [32]. Systemic factors can also lead to the development of MPS, including hypothyroidism and various vitamin deficiencies such as vitamin D, B1 (Thiamine), B6 (Pyridoxine), B12 (Cyanocobalamin), folic acid, vitamin C, and mineral deficiencies like iron, calcium, potassium, and magnesium [32,45].

In addition to these factors, psychological stress also potentially contributes to or aggravates the MPS symptoms. In this context, one study showed that increased sympathetic output results in elevated muscle tension, fatigue, and a lowered pain threshold for myofascial pain [46], and another study by Schmitter et al. demonstrated that patients with MPS exhibit elevated levels of chronic social stress in comparison to a pain-free control group [47].

Likewise, a study found that patients with insomnia, a sleep disorder, have a higher risk of developing MPS compared to the control group [48].

2.5. Pathophysiology of MPS

2.5.1.Energy Crisis Hypothesis

One of the most accepted hypotheses proposed by many researchers is the muscle energy crisis theory suggested by Simon and Mense [26,49]. According to this theory; microtrauma or macro trauma to the muscle cell membrane (sarcolemma) or sarcoplasmic reticulum (SR) causes calcium (Ca) release from near the lesion [50]. When Ca within the SR is released, this free Ca binds to adenosine triphosphate (ATP), leading to the binding of actin and myosin filaments, thus causing continuous muscle contraction that increases energy demand. This uncontrolled physiological contraction results in short and taut bundles of muscle fibers. The maximum and sustained contractile activity of the sarcomeres increases metabolic needs. The continuation of metabolic activity leads to the release of chemical substances such as bradykinin, prostaglandin, potassium, serotonin, substance P, and leukotrienes which sensitize the injured area causing pain [51]. This prolonged muscle contraction provokes ischemia and hypoxia. As a result of hypoxia in the muscle, the ATP levels decrease, and Ca ions cannot be reabsorbed into the SR without ATP, leading to continuous contraction in the sarcomere. Thus, characterizing the activation and formation of MTrPs to combat local pain, muscle creates a defense mechanism in which there is a loss of flexibility for changing physiological mechanical joints and leaving the structures easily exposed to other injuries [50].

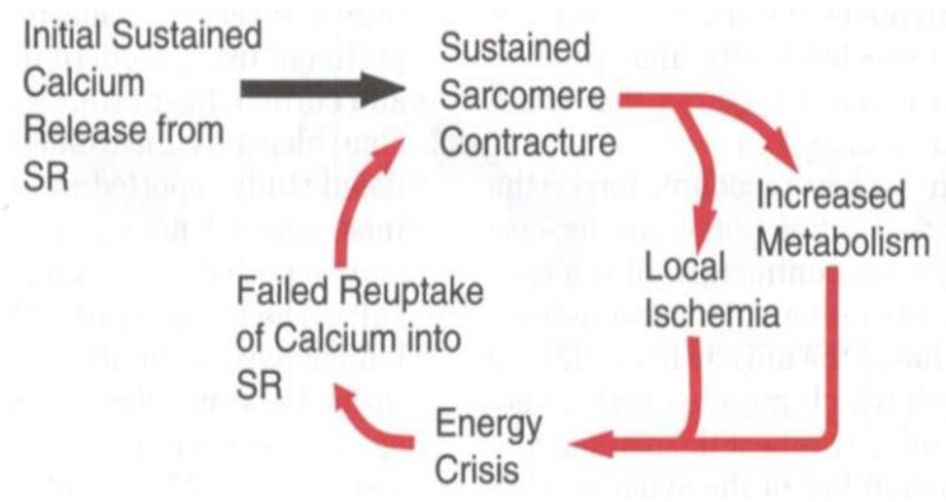


Figure 2.1. Energy Crisis Hypothesis [49]

2.5.2.Motor End Plate Theory

The energy crisis theory could complement the motor end plate hypothesis well. At the motor endplate, the motor nerve synapses with muscle cells. EMG studies have revealed that each TrP contains small loci located at the motor endplate zone, producing electrical activity. The endplate noise detected on EMG is believed to indicate an increased release of acetylcholine (ACh) from the nerve terminal.

While a minimal level of activity at the motor endplate alone cannot trigger muscle contraction, it can initiate action potentials that propagate a short distance along the muscle cell membrane. This limited activation might activate a few contractile elements, thereby contributing somewhat to muscle shortening [52]. Furthermore, this theory helps explain the effectiveness of botulinum toxin injections, one of treatment for TrPsgger muscle contraction, it can initiate action potentials that propagate a short distance along the muscle cell membrane. This limited activation might activate a few contractile elements, thereby contributing somewhat to muscle shortening [52]. Furthermore, this theory helps explain the effectiveness of botulinum toxin injections, one of treatment for TrPs [53].

2.5.3. Radiculopathic Model for Muscular Pain

This model emerged as a contrasting theory to Travel and Simons' theories. This model indicates that the primary stimuli for muscle pain are caused by neurological reasons. According to this theory; sensory, motor, and autonomic changes observed in MPS do not stem from pathology in the muscles if there is neural injury, compression, or partial denervation [53]. In 1997, Gunn stated that abnormal nerve functions lead to heightened sensitivity in the structures they supply, causing them to behave in unusual ways. These oversensitive muscle cells can produce spontaneous electrical impulses that stimulate false pain signals or involuntary muscle movements [54].

If muscle pain is not treated, it can create a sensitive area that transmits continual pain signals through a sensory neuron to the spinal cord. When these pathways are stimulated with constant painful signals, pain sustains and the threshold levels for neurotransmitter substances decrease. As a result, spinal segmental sensitization may occur [55].

2.5.4.Muscle Spindle Theory

Hubbard and Berkoff (1993) state that prolonged or chronic muscle spindle tension is involved in the pathophysiology of TrPs. This theory assumes that chronic muscle pain arises from repeated injuries or TrPs originating from the initial trauma, and it becomes chronic through sympathetic hyperactivity. [56]. This theory is further supported by muscle biopsy findings indicating the presence of a muscle spindle near the TrPs. Additionally, the majority of data support the idea that sympathetic fibers primarily affect the muscle spindle [57].

2.6.Clinical Symptoms

2.6.1.Pain

The characteristic symptoms of active TrPs are pain can arise following a specific trauma or injury or develop gradually. Patients often experience localized or regional deep aching sensations, ranging in severity from mild to severe [58].

The pain often spreads to a location distant from the TrP in a specific pattern for each muscle. According to Simons et al. there are three patterns of pain which are peripheral, mostly central, and local. Some TrPs create pain patterns that are combinations of these three [26]. In addition, sometimes, patients feel numbness or tingling sensation instead of pain [49]. Thus, it may mimic the symptoms of radiculopathy [59].

Thus, it is important to identify the patient's pattern of referred pain and tenderness to find the muscle(s) responsible for an MPS [26].

Active trigger points are often found in the neck, shoulder, and pelvic postural muscles, alongside the masticatory muscles. Frequently impacted muscles consist of the upper trapezius, scalene, sternocleidomastoid, levator scapulae, and quadratus lumborum [49].

The pain can worsen due to the use of the affected muscle(s), psychological stress and anxiety, cold, and postural imbalance [59].

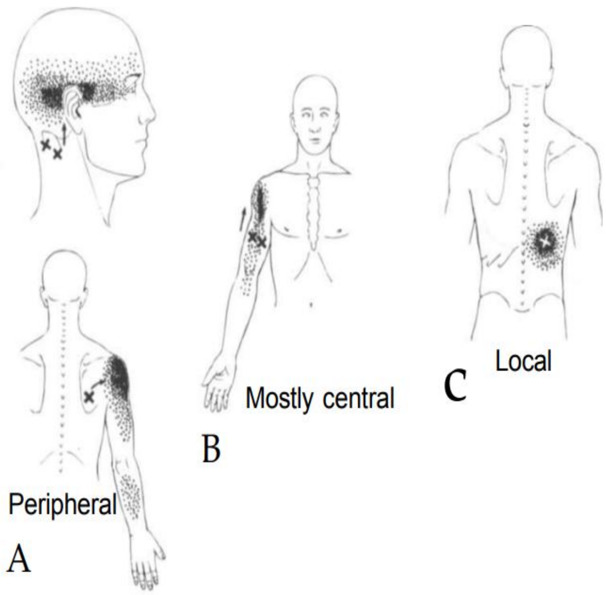


Figure 2.2. Trigger Point Referral Pain Patterns [26]

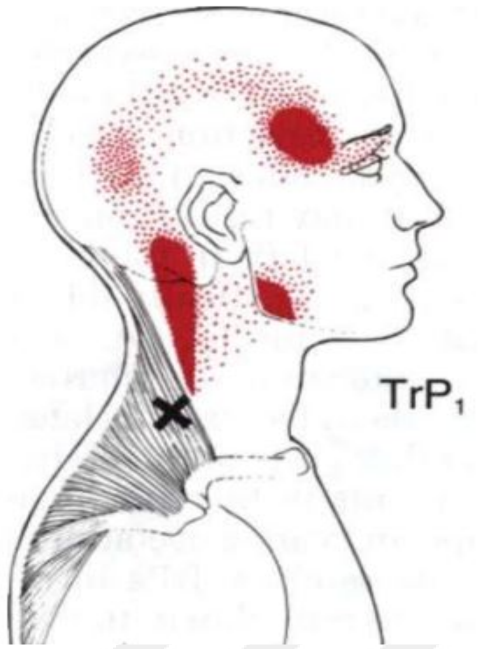


Figure 2.3. Example of Upper Trapezius Trigger Point Referred Pain Pattern [26]

2.6.2. Limited Range of Motion

A restricted range of motion (ROM) can arise from pain during muscle stretching that involves a TrP and from limitations imposed by a shortened taut band. It's important to note that ROM assessment could be deceptive, as various pathologies can limit joint movement, and normal ROM can differ based on individual factors like hypermobility [60].

For instance, a restricted ability to rotate the neck to the left could suggest that the left sternocleidomastoid and/or trapezius muscles, as well as the oblique capitis inferior and right splenius cervicis muscles, require lengthening to enable this movement. Additionally, if there is a limitation in bending the neck to the right, it might be due to the left sternocleidomastoid and trapezius muscles [60].

2.6.3. Muscle Weakness

Motor function issues caused by TrPs include weakened muscle strength, coordination loss in the affected muscle, and reduced ability to work in the affected muscle. This weakness is believed to be caused by reflexive motor inhibition that inhibits the painful muscle and typically occurs without muscle atrophy in the affected area [49] or secondary to the disuse of the involved muscle [59]. However, as the TrP is deactivated, weakness in the affected muscle rapidly disappears. [60].

2.6.4.Autonomic Changes

In patients with MPS, autonomic nervous system activation may lead to vascular dilation and constriction, causing redness, paleness, and warmth or coolness typically in the area where the nerve supplies an affected muscle [59]. Patients also may feel postural dizziness, spatial disorientation, and disturbed weight perception and they may report alterations in lacrimation, nasal secretion, pilomotor activity, and sweating patterns [26].

2.6.5. Depression and Anxiety

Although MPS is not classified as a psychological disorder, it is associated with psychological disruptions. Several psychological factors can play a role in the persistence of TrPs. Research by Okumus et al. indicated that patients with MPS demonstrate increased levels of depression when compared to a control group including healthy individuals. Additionally, a study found a positive correlation between pain intensity and depression levels [61].

2.6.6. Sleep Disturbances

In patients with MPS, painful muscles disrupt sleep, and sleep problems increase pain sensitivity. Sleep disturbances appear to be more common in MPS patients with high levels of pain intensity [26].

2.7.Clinical Signs

2.7.1.Taut Band

In muscles that can be palpated, a TrP is consistently found within a palpable taut band. This group of tense muscle fibers extends from a TrP to the muscle attachments. The clinician should palpate along the taut band to identify the nodule corresponding to a slightly enlarged area of decreased compliance. This nodular region is also where the TrP is located [26].

Three techniques for palpation can be used to locate the taut band: flat palpation, pincer palpation, and deep palpation. Flat palpation is applied to relatively superficial muscles. Pincer palpation is used when both sides of the muscle are accessible, allowing the muscle to be grasped between the fingers. Deep palpation becomes essential for deep muscles where there is considerable tissue between the muscle and the skin [26].

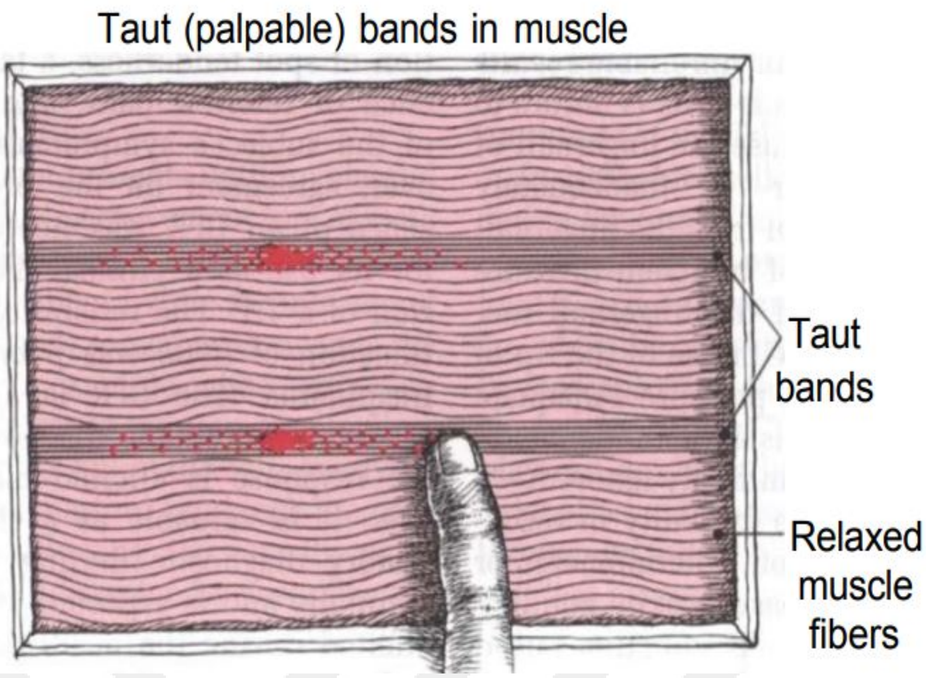


Figure 2.4. Schematic Drawing of the Taut Bands and TrPs (Red Spots) [26]

2.7.2. Trigger Point

TrPs are described as the most intense tender and hyperirritable area within muscles or their fascia, situated in palpable taut bands. If TrPs are adequately hyperirritable, can manifest as pain, tenderness, autonomic phenomena, and dysfunction in areas local and/or distant from their location [24]. Importantly, when pain is distant from the location, it follows a diffuse region referred to as 'myotomal' [59].

These points can trigger a local twitch response in muscle fibers through a specific palpation technique called snapping. Furthermore, applying digital pressure to the trigger point may cause the jump sign, where the patient might abruptly jump or move the extremity activated by the affected muscle group [24].

Travell and Simons define specific criteria for TrPs [56];

1. A palpable firm area of muscle, a taut band,
2. In the taut band, a specific area of extreme sensitivity to manual pressure, the TrP,
3. A characteristic pattern of pain, tingling, or numbness occurs in response to prolonged pressure on the TrP found in the taut band.
4. A local twitch of the taut band when the Trp is distorted transversely.

In addition, TrPs are classified as active, latent, central, attachment, key, and satellite [26].

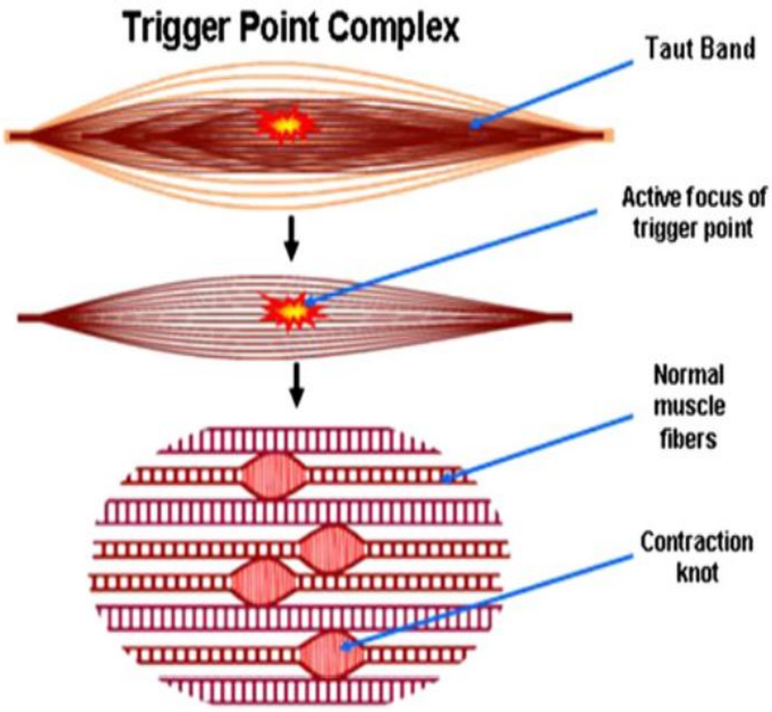


Figure 2.5. Trigger Point Complex [59]

2.7.2.1. Active Trigger Point

An active trigger point is a common source of clinical pain symptoms and causes continuous pain spontaneously without any compression. It is consistently tender and restricts the muscle's full lengthening. Additionally, it weakens the muscle and can cause pain to radiate to a specific area upon direct pressure. When adequately stimulated through palpation or a needle, it may trigger a local twitch response in the muscle fibers and, when compressed within the patient's tolerance, can induce referred motor and autonomic symptoms, typically in the pain reference zone [26].

2.7.2.2. Latent Trigger Point

A latent trigger point does not cause spontaneous pain but becomes painful only with palpation. It exhibits all the clinical characteristics of an active TrP and is always in a taut band that increases muscle tension and limits the ROM. The same factors contribute to the development of a latent TrP, to a lesser degree. Perpetuating factors can increase the stress and convert a latent TrP into an active one. However, an active TrP may spontaneously return to a latent state with sufficient rest and the absence of perpetuating factors. [26].

2.7.2.3. Central Trigger Point

A central TrP, closely linked to dysfunctional motor endplates, is typically located near the center of muscle fibers. This dysfunction triggers an energy crisis, which sensitizes local pain receptors. Consequently, this can lead to the development of contraction knots, resulting in small nodules and a taut band of tense muscle fibers [26].

2.7.2.4. Attachment Trigger Point

An attachment TrP is situated at the musculotendinous junction and/or osseous attachment of the muscle. The tension generated by central TrPs at the center also induces the formation of attachment TrPs in these regions. In addition, this sustained tension can produce enthesopathy if it is not treated [26].

2.7.2.5. Key Trigger Point

A Key TrP is an active TrP, that creates TrPs in other muscles when it exists. It can activate one or more satellite TPs [62].

2.7.2.6. Satellite Trigger Point

The TrP becomes active with the activation of the key TrP and develops around the key TrP in the same muscle or associated muscles with mechanical dysfunction [62].

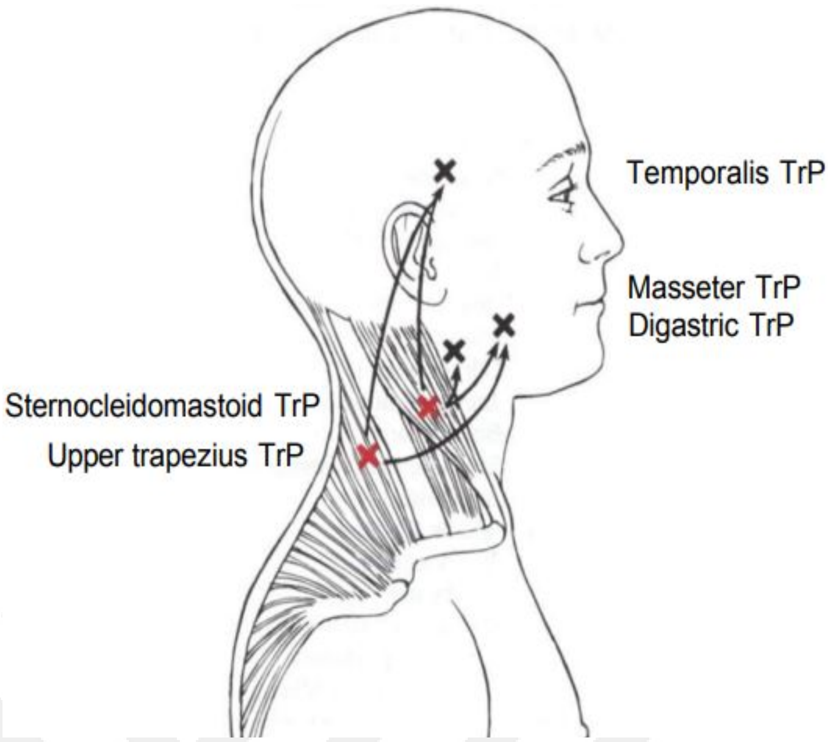


Figure 2.6. Key (*red* X) and Satellite (*black* X) Trigger Points [26]

2.7.3. Local Twitch Response

The local twitch response is rapid local contraction when mechanical stimulation is applied in the taut band. This response, specific to TrPs and absent in healthy muscles, is an important diagnostic symptom. It is a reflex contraction at the spinal cord level, independent of higher central nervous system structures. The closer the stimulation is to the TrP, the more pronounced the twitch response, and can not be triggered if the taut band is stimulated 3 cm or more away from the TrP zone. Thus, the absence of this response does not rule out the presence of MTrPs [60].

2.7.4. Jump Sign

The response that elicited in the patient by palpating taut bands and applying compression to the TrP. The patient may respond with general pain, wincing, crying out, or withdrawing. However, the jump sign by itself is not regarded as a definitive diagnostic criterion for a TrP [26].

2.8. Laboratory and Instrumental Tests

2.8.1. Routine Laboratory Tests

Laboratory studies are not used for diagnosing MPS or MTrP because no laboratory or imaging test is clinically useful for the diagnosis of MPS. These studies aim to identify conditions associated with MPS, including iron deficiency, hypothyroidism, deficiencies in vitamin D and vitamin B12, as well as recurrent vaginal and parasitic infections [60].

2.8.2. Ultrasound

The TrP nodule, whether active or latent, appears hypoechoic, elliptical, and focal in ultrasound imaging [60]. A vascular compression has also shown by ultrasound with active TrPs exhibiting high-resistance blood flow which differed from the latent TrPs and uninvolved myofascial tissue [63]. Furthermore, the practical use of ultrasound is starting to be examined, such as using ultrasound guidance for needling when treating deep muscles [60].

2.8.3. Electromyography

Studies using surface electromyography (EMG) indicate that muscles containing active trigger points (TrPs) fatigue more quickly, and become exhausted earlier than normal muscles [24]. In needle EMG, it is known that myofascial trigger points generate more EMG activity compared to non-sensitive muscle fibers. A study found that the activity of TrPs in patients with tension-type headaches was higher than those without headaches. Additionally, during psychological stress, there was an increase in EMG activity at the TrPs, while no changes were observed in the neighboring muscle fibers [64].

2.8.4. Thermography

Thermography is a technique that visualizes temperature differences on the body surface using a thermogram. A hot spot on a thermogram does not definitively indicate the presence of a TrP, as similar temperature alterations can occur in other painful conditions such as radiculopathy, joint dysfunction, or subcutaneous inflammation. Additionally, research on thermography in the relevant area has produced inconsistent findings. In certain instances, compression of the TrP induced hypothermia in the referred zone. Therefore, further research is necessary to establish a more precise definition of thermal changes associated with MPS. [24].

2.8.5. Skin Resistance

Skin resistance refers to the skin's resistance to conducting electrical current, and pain is a significant factor that reduces skin resistance. A study aimed at assessing whether skin resistance can be used to distinguish tissues containing TrPs from surrounding tissues found that skin resistance in areas with TrPs compared to surrounding tissues. Thus, the results suggest that this technique could be useful in identifying the TrPs [65].

2.9. Differential Diagnosis

MPS and various muscle pain diagnoses may overlap, with similar symptoms often reported. Literature indicates that MPS can present in unusual ways [28]. It has been associated with chronic conditions like shoulder pain, lateral epicondylalgia, and chronic tension-type headaches [66-68]. Furthermore, it can also occur in the affected limb of patients suffering from complex regional pain syndrome [69]. Moreover, one study showed that approximately one-third of individuals suspected of having carpal tunnel syndrome exhibited normal EMG findings alongside trigger points in the infraspinatus muscle [70].

Another condition that is often associated with and difficult to differentiate from MPS is fibromyalgia (FM). MPS refers to regional pain associated with TrPs, whereas FM is characterized by widespread pain with tender points persisting for over three months. However, MPS also has the potential to become widespread and if it is untreated, the pain can persist for more than three months [41]. In addition, although it is known that these are very different conditions, they are thought to potentially occur simultaneously. In this condition, it is significant to differentiate between TrPs and tender points [24].

Table 2.1. Differential diagnosis for MPS [28]

Joint disorders	Zygapophyseal joint disorders Osteoarthritis Loss of normal joint motion
Inflammatory disorders	Polymyositis Polymyalgia rheumatica Rheumatoid arthritis
Neurologic disorders	Radiculopathy Entrapment neuropathy Metabolic myopathy
Regional soft tissue disorders	Bursitis Epicondylitis Tendonitis Cumulative trauma
Diskogenic disorders	Degenerative disk disease Annular tears Disk protrusion or herniation
Visceral referred pain	Gastrointestinal Cardiac Pulmonary Renal
Mechanical stress	Postural dysfunction Scoliosis Leg length discrepancy
Nutritional, metabolic, and endocrine disorders	Vitamin deficiency (B_1, B_{12}, D, calcium, folic acid, iron, magnesium) Alcoholic and toxic myopathy Hypothyroidism
Psychological disorders	Depression Anxiety Disordered sleep
Infectious disease	Viral illness Chronic hepatitis Bacterial or viral myositis
Widespread chronic pain	Fibromyalgia

2.10. Treatment of Myofascial Pain Syndrome

Effective treatment of MPS resulting from TrPs involves more than just focusing on the TrPs. Identifying and addressing the underlying causes that activated the TrPs, correcting any perpetuating factors, and assisting the patient in restoring and maintaining normal muscle function are the main goals of the treatment [26].

Given the numerous treatment options available for MPS, treatment plans must be arranged according to the region of symptoms, disease duration, and personal circumstances of each patient. Those with a short duration of disease and mild symptoms can benefit from rehabilitation and physical therapy. However, if the disease has been present for a long time, symptoms are widespread, and previous treatments have been ineffective; in that case, more comprehensive treatment including invasive procedures and psychotherapy may be needed [4].

2.10.1. Elimination of Factors Leading to MPS

The fundamental approach to managing MTrPs is to treat the underlying pathology. Although initially pain can be suppressed by certain methods, it often reappears within a few days to weeks if the associated factors are not addressed. Once the underlying condition is fully healed, the active MTrPs will generally deactivate automatically [71].

Poor body biomechanics, structural asymmetries, overuse of muscles, and ergonomic factors should be investigated and corrected in every patient. For example, forward head posture and forward rolled shoulders are common causes of TrP related neck pain, and posterior displacement of the mandible can predispose to this abnormal posture. Treatment approaches that correct mandibular displacement will help improve posture and prevent the painful condition [41].

Medical conditions such as hypothyroidism, parasitic diseases, recurrent infections, and vitamin deficiency can also lead to widespread muscle pain. Treating these conditions significantly alleviates symptoms [41].

In addition, it is also known that psychological stress affects the pain condition of patients. A study has confirmed that TrPs exhibit abnormal EMG activity in response to psychological stress compared to surrounding tissues [64]. Therefore, it is necessary to plan a multidisciplinary treatment program for patients with MPS.

2.10.2. Exercise

The most efficient exercise methods for muscle rehabilitation of MPS consist of muscle stretching, strengthening, and aerobic activities. A program incorporating both active and passive muscle stretching exercises help alleviate muscle tenderness, while strengthening and aerobic exercises enhance circulation, muscle strength, and endurance [72]. Studies also demonstrated that exercise effectively addresses pain intensity, pressure pain threshold, and range of motion in patients with MPS [2,8].

Stretching exercises target muscles with TrPs and improve joint ROM, decrease pain, increase mobility, and restore normal activity [28]. A possible reason for the effectiveness of stretching is that it increases the distance between actin and myosin molecules, and lengthens the sarcomeres. This reduces local energy consumption and interrupts the energy crisis mechanism [24]. Another possible mechanism related to the effectiveness of stretching exercises involves blood circulation. Daily passive stretching of muscles enhances endothelium-dependent vasodilation and induces angiogenesis, which enhances exercise-induced hyperemia in the skeletal muscles. The probable mechanisms of these vascular adaptations are local ischemia and/or mechanical stretching of intramuscular blood vessels [73].

As TrPs reduce the muscle’s normal ROM, stretching beyond this restricted range can cause pain. In response, reflex muscle contractions occur, and sympathetic activity increases to return the muscle to its pain-free range. To prevent this, cold spray can be applied to the skin over the muscle before stretching. The sudden cooling and tactile stimulation help control pain and involuntary motor responses. Additionally, the spray has a local anti-inflammatory effect, promoting better muscle lengthening and relaxation [24].

Once optimal muscle length is restored and pain is alleviated, incorporating strengthening exercises into the program can facilitate the development of new movement patterns and enhance muscle endurance [28]. Additionally, addressing weak muscle groups, correcting posture, and providing feedback to prevent the overuse of dominant muscle groups are essential. For instance, the overuse of the upper trapezius and levator scapulae can be corrected by stretching these muscles while strengthening the scapular stabilizers, including the latissimus dorsi, rhomboids, and lower trapezius [28]. In addition, spinal stabilization exercises should also be included in the strengthening program. These exercises activate the deep postural spinal muscles such as the multifidus and transversus abdominis. Consequently, it enhances the function and strength of the spine, leading to a reduction in pain [74]. Studies have shown that spinal stabilization exercises are effective in reducing both chronic low back and chronic non-specific neck pain [74,75]. Another study has also demonstrated that spinal stabilization exercises improve postural deviations which are forward head posture and thoracic kyphosis [76].

A systematic review indicates that combining stretching and strengthening exercises results in greater short-term reductions in pain intensity associated with MPS [9]. This combined exercise can alleviate symptoms of myofascial pain because it enhances blood flow and energy metabolism in muscles, while also properly orienting the myofascial elements [5,10]

Another kind of exercise is aerobic exercise which increases blood pressure, blood flow, and oxygen saturation, allowing more blood to enter the MTrP. Additionally, it reduces circulating levels of pro-inflammatory markers and promotes the production of anti-inflammatory cytokines. Thus, aerobic exercise presents a potential treatment modality for managing MPS, and combining it with strengthening and stretching exercises would be effective. However, additional research is required to clarify the effects of aerobic exercise by itself or when combined with other exercises or treatment methods [8]. Although the effectiveness of exercise has been demonstrated, an important point to consider is the proper adjustment of its intensity. The key principle is to avoid heavy, rapid, and extended exercise. Heavy exercises can worsen damage to degenerative tissues of the tendons, ligaments, bursae, or the joint itself. They can also lead to muscle fatigue, which may cause muscle spasms that can restrict local circulation. Additionally, rapid exercises can lead to soft tissue injuries. Rapid muscle contractions are also more likely to cause muscle spasms compared to slower activities. Prolonged muscle contractions can lead to muscle spasms and consequently reduce local circulation [71].

2.10.3. Manual Therapy

Manual therapy is a crucial method for MPS treatment. Generally, the main principles of manual therapy typically involve stretching shortened muscles (or taut bands), increase of local circulation, providing counter-irritation (stimulating nociceptors to induce reflex inhibition of pain fiber conduction), and activating specific mechanisms through spinal reflexes (such as modification of TrP circuits) [77].

Ischemic compression (IC), also known as manual pressure release or trigger point release massage, is a form of manual therapy frequently used in the treatment of MPS. It involves applying continuous compression or persistent pressure on the TrP or surrounding areas, typically for a duration of 30 to 90 seconds. This pressure may cause local ischemia, thereby reducing the accumulation of inflammatory factors, and after interruption, enhanced blood reperfusion [1]. It also produces a localized stretch effect that lengthens sarcomeres [26]. A recent meta-analysis demonstrated that IC facilitated the restoration of ROM in MPS patients [78]. In a systematic review and meta-analysis conducted in 2022, it was observed that IC improved pain tolerance in subjects with

MPS. However, there was no evidence indicating a beneficial effect on self-reported pain [1]

Massage therapy is another type of manual therapy used in MPS that alleviates pain by adhering to the gate control theory, as well as by eliminating pain mediators through vasodilation [79]. Trampas et al. observed that clinical massage, in addition to stretching exercises, was effective in pain in MPS treatment [80]. Deep tissue massage (DTM) is particularly effective for alleviating muscle pain and spasms, increasing ROM, reducing tension in the fascia and muscles, and increasing local blood flow. Similarly, Bingölbali et al. showed that adding DTM to the conventional rehabilitation program for MPS increases neck ROM, diminishes pain and disability, and improves the quality of life [79].

Myofascial release therapy (MRT) has gained significant popularity in recent years. This technique aims to break pathological fascial adhesions and reduce muscle stiffness. Based on the application techniques, MRT includes two main techniques; direct and indirect [32,81]. Some studies have demonstrated the effectiveness of MRT on parameters such as pain and ROM [82]. However, the literature shows conflicting results regarding the outcomes of MFR techniques in MPS. These differing results reveal the necessity for further research [81].

Chiropractic therapy is also a manual therapy method that is used widely. Although the exact mechanism of pain relief is not fully understood, several studies have shown a notable and immediate decrease in TrP pain after spinal manipulation. It is suggested that connections exist between the facet nociceptive pathway and the TrP nociceptive pathway in the spinal cord. If this is true, applying manipulation to the facet nociceptors could activate a strong spinal reflex, interrupting the painful TrP circuits at the spinal cord level. However, the therapeutic benefits may be temporary if the main underlying cause is not effectively solved [71].

Another efficient technique for MPS is the post-isometric relaxation technique. In this method, the patient contracts the affected muscle at 10% to 25% of their maximum strength. After contraction, the muscle is relaxed and stretched. This technique has been recommended for MPS because tension and muscle tightness caused by MTrPs can be alleviated more effectively after a maximal voluntary contraction. In addition, this technique can be combined with eye movements and controlled respiration [71].

2.10.4. Physical Therapy Modalities

2.10.4.1.Transcutaneous Electrical Nerve Stimulation (TENS)

TENS is a treatment method used in pain management with electrodes applied to the painful area. It is thought to be effective based on the gate control theory explained by Melzack and Wall in 1965. This theory suggests that stimulation of large-diameter afferent nerves inhibits the transmission of signals from small-diameter nociceptive fibers at the level of the spinal cord's dorsal horn or higher [83]. Moreover, electrical stimulation has been found to release endorphins and endogenous opioids and activate central serotonergic and noradrenergic analgesic pathways. It additionally inhibits motor endplate activity related to MTrPs [84].

Although not extensively studied for MPS, the available evidence suggests that TENS might be an effective method. According to a recent systematic review, TENS can reduce pain intensity and improve joint ROM in patients with MPS [85].

2.10.4.2. Therapeutic Ultrasound (US)

Although the exact mechanisms of the US is unknown, a potential explanation is that tissue heating by the US could alleviate the local energy crisis [24]. This process is believed to ease pain in MPS by enhancing the permeability of blood vessels and cell membranes, stimulating angiogenesis, and improving microcirculation, which in turn leads to muscle relaxation and increased extensibility of connective tissues. Moreover, the analgesic effect of US on MPS may be due to its modulation of central nervous pathways [85]. This aspect is particularly significant in treating TrPs located deep within muscles that are inaccessible through manual techniques [24].

Literature presents conflicting results regarding the effectiveness of US therapy. Some studies show there is inadequate evidence to support the assertion that US is more effective than a placebo in treating musculoskeletal issues [86,87]. However, a systematic review that included three sham-controlled studies on the efficacy of US therapy for treating MPS found that low-intensity US significantly reduced pain [85]. Kadavar et al. also observed significant intragroup improvements in pain pressure threshold, favoring the US therapy group [88].

2.10.4.3.Hotpack (HP)

Applying an HP to the area where TrPs are located is recommended in treating MPS because it increases local circulation and promotes relaxation in superficial muscles, thereby decreasing TrP tension [89]. Additionally, reflex sympathetic outflow may stimulate deep-tissue layer blood circulation [90]. In application protocols, to enhance circulation in superficial tissues, it is typically used as an adjunct to other therapies and before the treatment [90].

2.10.4.4. Low-Level Lazer Therapy (LLLT)

LLLT is a form of light therapy particularly used for localized painful muscle disorders. LLLT is absorbed by the photoreceptors in the affected area, producing analgesic, anti-inflammatory, and regenerative effects. Furthermore, LLLT reduces edema by increasing lymphatic drainage [3].

A review article analyzing the effectiveness of LLLT in temporomandibular MPS concluded that LLLT outperformed the placebo group in pain relief [91]. Another study comparing the effects of occlusal splints and LLLT effects on MPS using thermographic evaluation, finding significant improvements in pain intensity for both groups. The key difference observed was a lower temperature in the masseter muscle of the LLLT group after treatment. The authors interpreted as indicative of a stronger anti-inflammatory response, suggesting that LLLT might be more effective than occlusal splints [92]. Conversely, another study investigating LLLT's impact on pain intensity, sensitivity, and qualitative assessments in MPS patients revealed no notable difference between the LLLT and placebo groups [93]. In a similar vein, Dundar et al. found no evidence that laser therapy was superior to placebo regarding pain severity, active range of motion, or neck disability index in cervical MPS treatment [94].

These conflicting results may be attributed to several factors. The effectiveness of different lasers can vary based on specific diagnoses and parameters such as wavelength, duration of treatment, energy density, number of treatments, and mode of delivery. Although this makes the comparison difficult and needs further studies with different conditions and techniques, LLLT is a safe and non-invasive treatment method for MPS [3].

2.10.4.5. Extracorporeal Shockwave Therapy (ESWT)

ESWT is believed to effectively manage pain by applying high-amplitude acoustic waves to the affected body area through various mechanisms.

One theory suggests that shockwaves encourage vascular perfusion by stimulating angiogenesis in ischemic muscles. Another theory indicates that shockwaves disrupt free nerve endings and eliminate ACh receptors, resulting in muscle relaxation. Additionally, shockwaves may directly break down actin-myosin bonds [95]. A recent systematic review and meta-analysis demonstrated that ESWT can reduce pain, increase the pain threshold, and reduce the neck and shoulder disability index in MPS compared with other treatment methods such as needling, injections, and US. [96]. Király et al. also showed that laser and ESWT combination was better than ESWT alone in MPS, suggesting that in clinical practice, combining ESWT with other treatment methods increases the therapeutic effect [97].

2.10.5. Pharmacologic Management

2.10.5.1. Nonsteroidal Anti-inflammatory Drugs (NSAID)

NSAIDs are commonly used for pain relief, but their effectiveness in treating chronic pain is often limited due to several side effects. Evidence supporting the use of oral NSAIDs for managing MPS is lacking. Conversely, topical NSAIDs have proven to be effective [32]. Hsieh et al. found that a topical diclofenac sodium patch reduced pain and enhanced function in upper trapezius MPS patients, compared to those receiving a placebo. However, there were no notable differences in the pain thresholds of MTrPs between the groups [98].

2.10.5.2. Muscle Relaxants

Muscle relaxants work by reducing skeletal muscle tone, which helps to relieve the increased muscle activity in MPS. Nevertheless, existing research fails to offer strong evidence supporting the effectiveness of muscle relaxants for any musculoskeletal pain condition [32].

2.10.5.3. Antidepressants

Tricyclic antidepressants (TCAs) are commonly prescribed to manage depression and various pain syndromes. Studies examining TCAs' efficacy in the management of MPS have demonstrated significant benefits [3]. Haviv et al. showed the effectiveness of TCAs in pain reduction in patients with chronic masticatory MPS [99]. Similarly, Bendtsen et al. found that amitriptyline, a form of TCA alleviates myofascial tenderness and headaches in individuals suffering from chronic tension-type headaches [100].

Another form of antidepressant is serotonin reuptake inhibitors, which can reduce general pain, and improve sleep and cognitive symptoms in patients with FM. Nevertheless, there is not any research specifically on MPS in the literature [101].

2.10.6. Invasive Methods

2.10.6.1.Dry Needling (DN)

Dry needling is a minimally invasive and non-pharmacological method that does not include any pharmacological agents or solutions for treating MPS pain. In this therapeutic procedure, a thin filiform no-bore needle is inserted into the MTrP until the LTR occurs [32].

Although there is some research on DN, the exact mechanisms underlying the deactivation of MTrPs of needling are unclear. However, the potential effects can be explained through different approaches. One indicates that the DN inhibits spontaneous electrical activity by eliciting LTR. Some research has demonstrated that needling can increase blood circulation and oxygenation. Moreover, some indicate that the effects of needling can be explained by neurophysiologic approaches [102]. Results obtained from a study conducted by Hsieh et al. showed that dry needling at the MTrPs modulates some biochemicals related to pain and inflammation. In this way, DN provides pain control at the peripheral level. However, a study revealed that consecutive sessions could reverse this effect [103]. According to Chu, the LTR after needling may cause large-diameter sensory afferent stimulation, and this stimulation leads to the “gate-controlling” effect that blocks the noxious input generated from MTrP [104]. In addition, Niddam et al. showed that pain can mediated with DN in conjunction with electrical stimulation by activating the endogenous opioids from higher centers [105].

Furthermore, the effectiveness of DN can be explained by the placebo effect and the release of neurotransmitters such as serotonin and noradrenaline [102].

The effectiveness of DN in MPS has been supported by several studies. A recent systematic review and meta-analysis observed that DN was more effective than the sham/placebo group immediately after and over a short-term period. However, this effect was not observed when comparing DN to manual therapy and physical therapy interventions. Additionally, DN has been found no significant effect on pressure pain sensitivity and ROM in this study [106]. Fernández-De-Las-Peñas et al. demonstrated that adding DN to other physical therapy approaches is more effective for improving ROM and decreasing pain [107].

2.10.6.2. Injections

TrP injection therapy is a popular invasive method used to relieve pain, and muscle spasms, improve ROM, and encourage physical therapy methods in MPS [108]. Receiving the LTR response during the injection is important for the spontaneous reduction in pain and increase in optimal results from the injection [109]. Hong revealed that the LTR response received during injection into the upper trapezius muscle was important in improving the subjective pain response and improving neck ROM [110]. Today, the efficacy of the injection of botulinum toxin has not been confirmed although some results are showing the effectiveness of botulinum toxin. Also, it is an expensive solution. Therefore, injection of local anesthetics is comparatively preferable [24]. Notably, injection alone is rarely effective in treating chronic MPS. A multidisciplinary approach to managing MPS is recommended, including the appropriate organization of all modalities such as physical therapy, psychotherapy, and pharmacotherapy [108].

2.11. Attentional Focus

The first study on the attentional focus was conducted in 1998 by Wulf et al. [111]. Attentional focus (AF) is a well-established motor learning component, and its use is common among fitness professionals. AF refers to the mental focus of an individual while executing a movement or particular activity. There are two main types of AF; internal and external. In the internal focus of attention (IFA), the individual thinks about and focuses on bodily movements during a performance; for example, directing attention to squeezing the gluteal muscles in a squat. Conversely, the external focus of attention (EFA) directs the individual's focus to the environment; for example, focusing on driving oneself away from the floor while squatting [112].

2.11.1. Attentional Focus and Motor Learning

How humans acquire and refine movement skills has been studied from various scientific perspectives and analyses, including behavioral, social-cognitive, neurophysiological, and neurocognitive. Wulf et al. presented an OPTIMAL theory (Optimizing Performance Through Intrinsic Motivation and Attention for Learning), which posits that understanding motor learning requires attention to motivational and attentional factors. This theory indicates that learners who adopts an external focus of attention instead of an internal focus can learn faster and achieve higher levels of skill sooner. In addition, studies have shown that the use of EFA proves more effective than an internal focus of attention (IFA) for both effectiveness—such as accuracy in targeting, generating specific force, and maintaining balance—and efficiency (e.g., reduced muscular activity, reduced oxygen consumption, and heart rate during movement [113].

The AF effect has been explained by the constrained action hypothesis by Wulf et al. According to this theory, EFA promotes an automatic type of movement control that permits an unconscious, fast, and reflexive process to control movement. This allows the motor system to be more naturally self-organized and leads to effective learning. However, IFA constrains the automatic processes. As a result, IFA degrades the performance and learning process [114].

In the 1960s, Paul Fitts explained the motor learning process with three phases; cognitive, associative, and autonomous. During the cognitive stage, movements are under conscious control, and as the movement becomes more fluid and efficient, the need for conscious control decreases [115]. Wulf emphasized that switching to the automatic phase as soon as possible is necessary to accelerate the motor learning process and suggested using EFA, which provides more automatic control [116].

Some studies have also demonstrated an association between EFA and automaticity. For example, Wulf et al. found short reaction times with EFA in a balance task. Shorter reaction times in a secondary task suggested that the primary activity required less attention, or was more automatic. Additionally, they found that reaction times reduced with the practice, suggesting that the attentional demands became less demanding with the experience. Importantly, shorter reaction times for the EFA group than the IFA group supported the idea that an external focus promotes automaticity, accelerating learning. In addition to reaction times, according to the frequency characteristic of the balance records, more frequent and smaller amplitude adjustments were found in the EFA compared to the IFA. This effect is also related to the automatic process of EFA [114]. Moreover, McNevin et al. demonstrated that moving the external focus away from the body resulted in higher frequencies and greater stability in a balance task compared to focusing on the external focus closer to the body. This also suggests that focusing on a more distant focus enhances the learning process by promoting automaticity [117]. Kal et al. recently shown that cognitive dual-task costs are reduced with an external focus rather than an internal one. Their research also assessed movement fluency (i.e., jerk) and movement regularity (i.e., sample entropy) under external and internal focus conditions during a cyclic leg extension-flexion task. Both parameters showed improvement with an external focus, reinforcing the idea that a greater degree of automaticity is attained when employing an external focus [118].

2.11.2. Attentional Focus and Motor Performance

Effective motor function is crucial for survival and growth, with skilled movement being important for numerous activities [113]. The effectiveness of EFA and IFA has been examined across various dimensions of motor performance [119]. These generally include movement effectiveness—such as balance, accuracy, and the quality of movement form—and movement efficiency related to muscular activity, endurance, speed, force production, and oxygen consumption [119,120].

Studies examining the relationship between the accuracy of performance and AF have shown that in one study, using an EFA reduced target deviation in golf shots, and distal EFA was superior to proximal EFA and IFA which is the least accurate performance. In the same study, similar results were observed for performance made under anxiety, with distal EFA providing superior accuracy [121]. Similarly, a study demonstrated that EFA during dart throwing led to fewer errors and improved performance. Additionally, this study found that EFA reduced preparation time between throws, decreased EMG activity in the triceps brachii muscle, and increased the variability of shoulder joint movement in kinematic measurements. These results indicate that using EFA promotes movement economy [122].

In balance tasks, several studies have shown that using EFA is better than using IFA for improving balance performance [123]. In 1998, Wulf and colleagues found that the EFA group had better balancing skills than the IFA group in different tasks (ski stimulator and stabilometer). Additionally, according to the retention test conducted a day after practice, during which no instructions were given, the external focus condition proved more effective than the internal focus condition. In other words, EFA is more effective for learning than IFA [111]. Similarly, a study also showed that the EFA group had a better balance of performance and learning process than the IFA group [114]. In contrast, some studies have not supported the superior benefits of external focus compared to internal focus [124,125]. De Bruin et al. found no difference in balance performance and learning when attention was directed to an external or internal following 5 weeks of training protocol in older adults [124]. Similarly, In a study by Wulf in 2008 with world-class acrobats, it was found that there was no superiority of external focus over internal focus; instead, the control group demonstrated better balance performance. This finding suggests that external focus instructions may benefit top-level performers less [125].

When examining some studies on the effects of the AF strategies on movement form, it is similarly observed that an external focus yields better results. Abdollahipour et al. demonstrated that an external focus enhances both jump height and the quality of gymnastics performances, as measured by execution deductions, more effectively than using an internal focus or no focus instructions at all [126]. An et al. explored the influence of AF instructions on movement form which included rotation of the shoulders relative to the pelvis during the downswing (known as X-factor stretch) and the maximum angular velocities of the pelvis, shoulders, and wrists in low-skilled golfers. The findings revealed that participants in the EFA group achieved higher maximum angular velocities, greater X-factor stretch, and increased carry distance compared to the IFA and control groups, which resulted in similar. These results indicate that movement form can be improved with external focus instructions; thus, the outcome of movement is affected positively [127].

Oxygen consumption is an objective parameter of the movement economy and the lower level represents the better movement economy due to the reduced consumption of resources. In endurance sports, the relationship between AF and oxygen consumption was investigated, and although contrary results, several studies have similarly shown that EFA produces more effective results in performance compared to IFA [128]. Hill et al. studied recreational runners and reported that the movement economy was better when EFA was used. Heart rate and oxygen consumption (VO2) were significantly lower in the external focus condition than in the IFA and control conditions [128]. Also, Schücker et al. found similar results that EFA is better than IFA in terms of the physiological performance measure of oxygen consumption in endurance sports [129].

In addition to these parameters, studies have examined the effect of AF strategies on muscular activity. Vancet et al. conducted two experiments where participants performed biceps curl while focusing on the arm (IFA) and curl bar (EFA). In the first experiment, EFA conditions led to faster movement performance than IFA. Also, integrated EMG (iEMG) activity was reduced when the EFA condition was adopted. In experiment 2, movement time was controlled, and iEMG activity was again reduced under EFA conditions. [130]. Another study examining AF instructions' effects on muscle activity during an isometric task found that error decreased in the EFA condition, and the EMG and mean power frequency values in the antagonist muscle decreased. However, the AF strategies did not affect the agonist muscle in this study. Researchers have interpreted these results as indicating that EFA has made motor unit recruitment more efficient and improved performance by reducing co-contraction during movement [131]. Furthermore, Zachry et al. examined the relationship between EMG results and performance. In this study where participants performed free basketball shots, it was revealed that the accuracy rate was higher in the EFA condition compared to the IFA and the biceps and triceps muscle EMG activities were lower in the EFA condition. Thus, it was demonstrated that reduced EMG activity is associated with increased performance accuracy. Another important point in the study was that, despite the participants focusing on the wrist, changes in muscular activity were observed in the biceps and triceps muscles. This situation has also shown that the AF strategy can affect not only muscle activation in the relevant area but also the entire motor system. As a result, these findings suggest that the decrease in EMG activity with the use of EFA can be explained by the more efficient recruitment of motor units during movement, and this situation is believed to contribute to the execution of movement being more accurate and requiring less effort [132]. Similarly, studies showed that EFA enhances muscular endurance [133,134] and leads to greater force production when compared to IFA [135].

Furthermore, a meta-analysis examining the impact of attentional focus strategies on muscular strength concluded that using an EFA can significantly enhance muscle strength performance and may lead to greater lower-extremity strength gains in comparison to an IFA [136].

2.11.3. Attentional Focus and Rehabilitation

In recent years, the evidence from healthy individuals has caused discussions in the rehabilitation community regarding the clinical significance of attentional focus [17]. Many studies conducted in this context have shown that external focus cues used in rehabilitation are more effective than internal ones.

In this regard, a study showed that EFA induced a greater improvement than IFA in immediate motor performance and continuous motor skills and motor learning in visually impaired individuals [137]. Similarly, using external focus instructions positively results in Idiopathic Parkinson's disease across performance outcomes such as postural stability, balance, and walking step length [18,138], and stroke patients showed greater improvements in terms of movement speed and force during different tasks related to reaching and grasping an object when instructed externally rather than internally [19,139]. Additionally, using EFA is more advantageous for performance outcomes such as throwing and gait in other neurological disorders, such as cerebral palsy and multiple sclerosis [20,21].

In a study conducted with cancer patients, it was found that the patients' visuomotor performance was better when EFA was used compared to IFA and control conditions, and it was stated that the use of EFA in cancer patients could help reduce the negative effects of the chemotherapy on motor skills [22]. Moreover, a study showed that in an exercise program conducted over 6 weeks with obese individuals, the group that received external focus instructions demonstrated better improvement in functional performance, balance, and muscle strength parameters than the group that received internal focus instructions [23].

According to some studies, it is observed that EFA is superior to IFA in improving motor performance in musculoskeletal disorders [13,14]. Gökeler et al. conducted a study in which they administered a single-leg hop test to participants following anterior cruciate ligament (ACL) reconstruction. The study examined jump distance, knee kinematics in the frontal and sagittal planes, and the time to reach peak knee flexion angles. Participants were divided into two groups; one received EFA instructions while the other was instructed using IFA instructions. The results indicated that, for the injured leg, the IFA group had significantly less knee flexion at initial contact compared to the EFA group. Additionally, peak knee flexion was also significantly lower in the IFA group for both legs—injured and non-injured. Furthermore, the time to peak knee flexion was shorter for the IFA group in comparison to the EFA group for both legs [140]. Rotem-Lehrer & Laufer evaluated subjects with ankle sprains during a balance task, finding that the EFA group performed better in the transfer phase. The EFA group also exhibited significant difference in all stability parameters, whereas the IFA group showed no significant pre-to-post training score changes over time [141]. Similarly, Laufer et al. studied postural stability in patients with ankle sprains and discovered that the EFA group demonstrated greater improvement in the stability acquisition phase at level 6 [142]. Kuzu et al. examined the effects of external focus-based dynamic balance training on pain, functionality, and balance in individuals suffering from chronic low back pain, finding that the EFA group had greater enhancements in dynamic balance, fall risk, stability limits, physical performance, posture, spinal mobility, and postural endurance compared to the IFA [143].

3. MATERIALS AND METHOD

This study is a randomized controlled trial conducted at Istanbul Kadıköy Florence Nightingale Hospital between February 2024 and March 2025, following ethical approval granted by Marmara University (25.01.2024/03) (Appendix 8.1). The study was also registered to ClinicalTrials.gov (NCT06248372).

The study investigates the effects of different attentional focus strategies used during an exercise program on pain, pressure pain intensity, quality of life, endurance, disability, and resistance to the breaking angle in individuals with MPS affecting the neck and upper back regions.

3.1. Subjects

A total of 36 patients aged 18 to 65 participated in this study. They were informed about the study's plan and purpose and signed a consent form. Eligible patients exhibited symptomatic MPS in the neck and upper back regions, specifically involving the upper and middle trapezius, levator scapulae, rhomboids, infraspinatus, and supraspinatus muscles, as confirmed by a physician. Additionally, they experienced pain lasting over 3 months, characterized by a pain intensity rating of 3 or higher on the Numeric Pain Rating Scale (NPRS$\geqslant$3).

Participants were randomly divided into three groups. This randomization was computer-based and carried out via https://www.randomizer.org [144]. During the process, the total number of groups and participants was first determined, and a randomization list was created. Each newly admitted participant was assigned to the corresponding group based on their order of arrival.

This study's estimated sample size was calculated by using a similar study examining the changes in parameters focused on pain and disability in patients with chronic non-specific neck pain after two experimental treatments with a control group [145].

As a result of the power analysis using the G*Power 3.1.9 program (G*Power, Universität Düsseldorf, Germany), when the effect size was calculated at the medium, the type I error amount was taken as $\alpha = 0.05$, the targeted power of the test was $1- \beta = 0.85$, the minimum number of samples required for statistical analyzes for three groups was determined as 36, minimum of n=12 individuals for each group.

3.1.1.Inclusion Criteria

- Being 18-65 year-old
- A physician confirmed an MPS in either unilateral or bilateral neck and upper back regions (including the upper-middle trapezius, levator scapulae, rhomboids, infraspinatus, and supraspinatus muscles)
- Having persistent pain lasting over three months, with a pain rating of 3 or more on the Numeric Pain Scale (NPRS≥3).
- Not participating in any sports activity
- Not having received any physical therapy and/or exercise sessions within the last 4 weeks.

3.1.2. Exclusion Criteria

- Diagnosed with fibromyalgia syndrome, cervical disc pathologies, malignancy, or neurological and/or inflammatory conditions.
- A history of neck, shoulder, or upper back surgeries and/or traumas.
- Receiving analgesics or anti-inflammatory drugs
- The presence of neurological and/or psychological conditions that would prevent understanding and focus on verbal instructions used during exercises.
- Other medical conditions that restrict involvement in exercise sessions
- Pregnancy

3.2. Flow of Research

Ethics committee approval required for this study was obtained from Marmara University Non-Interventional Ethics Committee with protocol number 03. Participants took part voluntarily, and written informed consent was obtained from all who agreed to participate (Appendix 8.2). A total of 36 subjects engaged in the research, completing exercise sessions twice weekly for 6 weeks, resulting in a total of 12 sessions. **Figure 3.1** illustrates the flow chart of the patients involved in the study.

Participants were divided into 3 groups randomly; External Focus Group (EFG), Internal Focus Group (IFG), and Control Group (CG). Each group received the same exercise sessions except for verbal instructions.

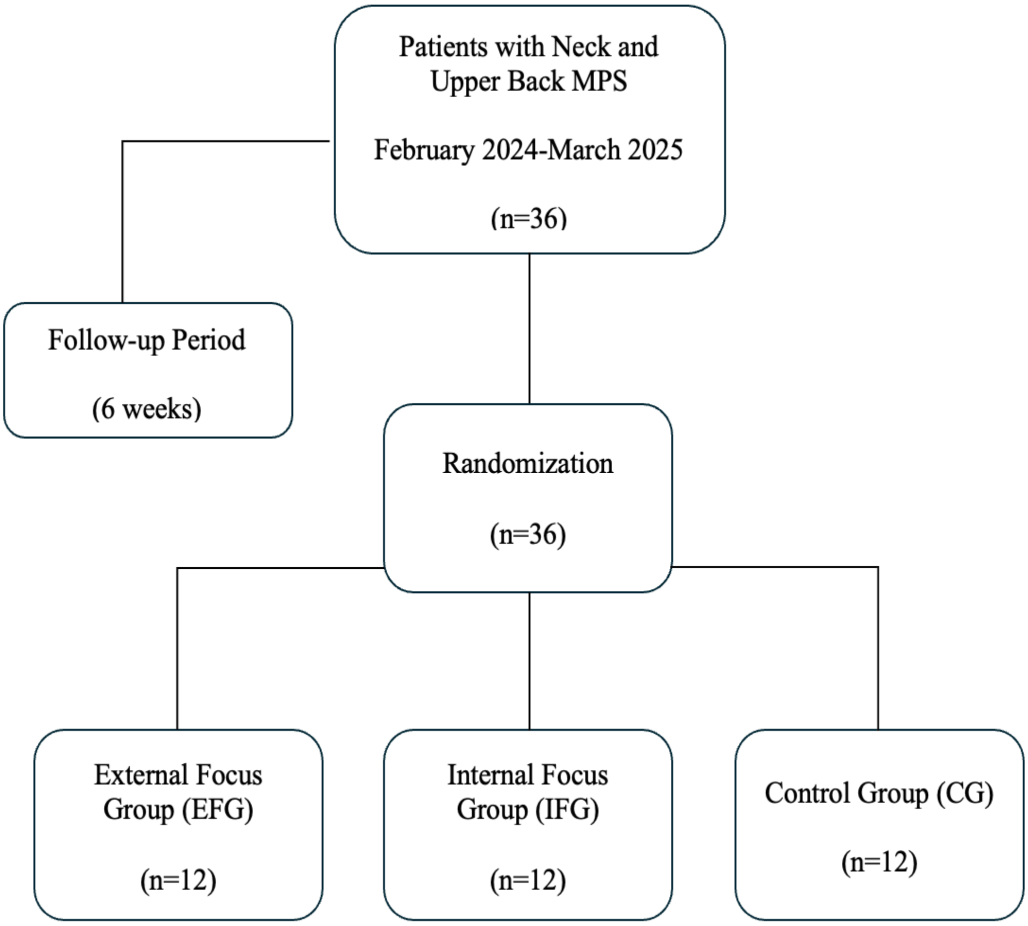


Figure 3.1. Flow of Chart

3.3. Study Protocol and Design

The study's purpose and content were explained to participants according to the consent form. All volunteers completed demographic information and consent forms prior to participating in the study. Demographic data was gathered from participants before they began the exercise program, demographic information was collected from participants and the Numeric Pain Rating Scale (NPRS), Pressure Pain Threshold (PPT), Neck Disability Index (NDI), Short Form 12 (SF-12) Questionnaire, Beck Depression Inventory (BDI), and postural assessment by using York Posture Rating Chart (NYPR). Following these assessments, participants were assigned to one of three groups: External Focus (EFG), Internal Focus (IFG), or Control Group (CG). Each group performed the same exercises, differing only in the verbal instructions provided. The IFG focused on internal cues related to body movements, the EFG emphasized external cues using metaphors or analogies, and the CG did not concentrate on any specific attentional cues during the exercises. Each session lasted 45 minutes, occurred twice a week, for six weeks, and was conducted in the same environment under the supervision of the same physiotherapist for each session.

3.4.Evaluation

Participants were evaluated at the beginning (week 0) and after the last session of the exercise program (week 6), and the results were recorded.

3.4.1. Demographic Information Form

The age, gender, occupation (workless, employed, retired), education (primary school, high school, higher education), smoking, body weight, height, and dominant hand of the individuals participating in the study were recorded. (Appendix 8.3)

3.4.2. Numeric Pain Rating Scale (NPRS)

A widely used metric for evaluating pain intensity is a numeric scale typically ranging from 0 to 10, comprising 11 total numbers. Participants select the number that most accurately represents their experienced pain level, with 0 indicating the lowest level of pain (no pain) and 10 signifying the highest level (the worst pain imaginable) [146]. This study examined the overall pain intensity related to neck and upper back pain experienced by patients over the last week.

3.4.3. Pressure Pain Threshold (PPT)

Before assessing the pressure pain threshold (PPT), participants were asked to lie facedown. The researchers identified the four most painful points on both sides of the upper and middle trapezius, levator scapulae, rhomboids, infraspinatus, and supraspinatus. These points were marked on an upper body chart according to reference points (cervical and thoracic vertebrae, spine of scapula, and medial border of the scapula) to ensure they could be replicated in the subsequent evaluation. A digital algometer (Jtech Medical Commander Echo) was then employed to measure the pressure pain threshold at the four most painful myofascial trigger points. The algometer features a flat circular tip measuring 1 cm^2, which is pressed slowly against the skin over the trigger points at a standardized rate of 50 kPa/s until the participant indicates “stop” when the compression sensation alters to pain and after this point, the pressure is stopped, and the value is measured by algometer. This process is repeated three times with a 30-second rest between each trial, and the average was considered as the pressure pain threshold [147]

Figure 3.2. Digital Algometer


Figure 3.3. Measurement of Pressure Pain Threshold

3.4.4. New York Posture Rating Chart (NYPRC)

This rating chart monitors and scores posture changes across 13 distinct body parts. These segments include posterior views of the head, shoulders, spine, hips, feet, and arches, along with lateral (left side) views of the neck, chest, shoulders, upper back, trunk, abdomen, and lower back. A score of 5 points is assigned for correct posture, 3 points for moderately impaired posture, and 1 point for seriously impaired posture. The resulting total score from the test ranges from a maximum of 65 to a minimum of 13 [148].

In the study, during this assessment, participants were asked to remove thick clothes to ensure their body regions were visible and to stand in as comfortable and natural position as possible. Also, the background where the participants stood was ensured to be plain.

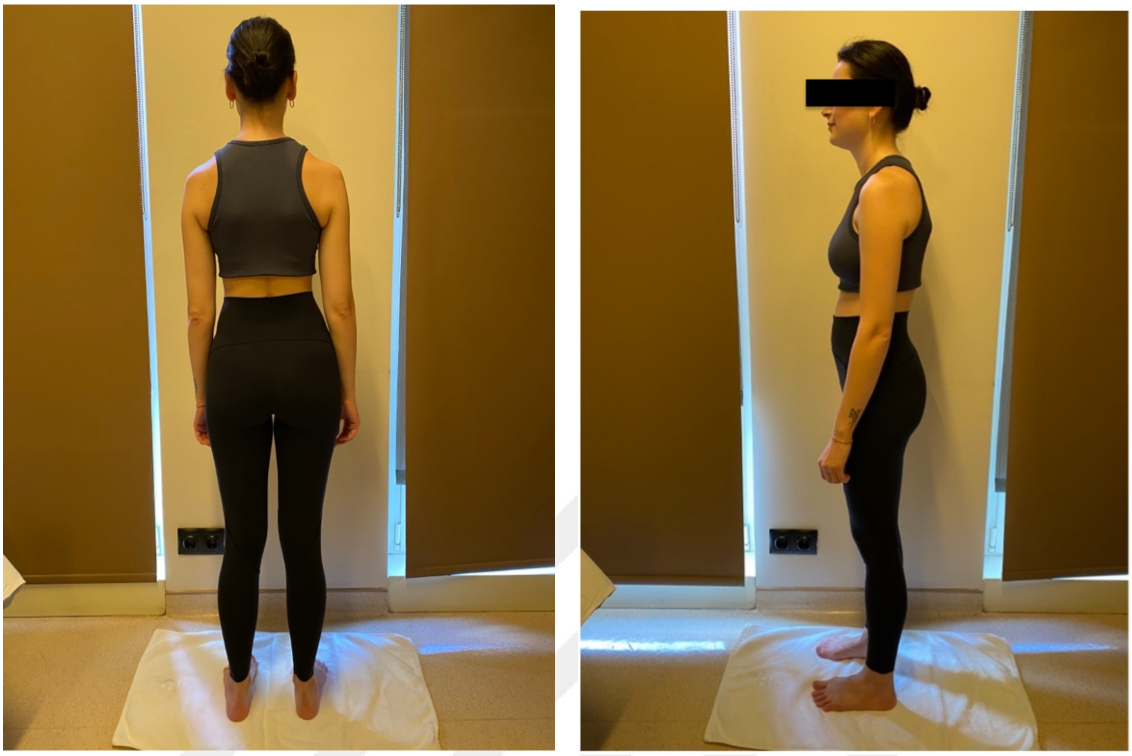


Figure 3.4. Postural Assessment

3.4.5. Neck Disability Index (NDI)

The NDI is a self-report questionnaire designed to evaluate the impact of neck pain on a patient's daily life and to assess their self-rated disability associated with it. Each section is rated on a scale from 0 to 5, where 0 indicates "no pain" and 5 signifies "the worst imaginable pain." A lower score suggests that the individual's daily activities are less affected. This index was validated for reliability in Turkish by Telci et al. [149].

3.4.6. Short Form 12 (SF-12) Questionnaire

This self-reported outcome measure evaluates how health affects an individual's daily life. It is primarily utilized to assess the quality of life (QOL) among individuals. The SF-12, a condensed version of the SF-36, comprises 12 distinct items and features two components: physical and mental health. A higher score reflects better health status [150]. The reliability and validity of the SF-36 was conducted in 1999 by Koçyiğit et al. [151].

3.4.7. Beck Depression Inventory (BDI)

This inventory consists of 21 questions designed to assess the severity of depression. Each question allows for four possible responses, scored from 0 to 3. The cumulative score reflects depression severity: 0–9 indicates minimal depression, 10–18 suggests mild depression, 19–29 points to moderate depression, and 30–63 signifies severe depression. Higher scores correlate with greater severity of depression. Hisli et al. [152] conducted the validity and reliability of this inventory.

3.5. Rehabilitation Protocols and Intervention

Following the previously mentioned assessments, participants were randomly assigned to one of three groups: External Focus Group (EFG), Internal Focus Group (IFG), and Control Group (CG). Subsequently, all groups engaged in the same exercise program, which included identical exercise types, sequences, loads, and equipment, except for the verbal instructions given; these either directed attention to the internal or external environment, or provided no attentional instructions for the control group. The IFG concentrated on internal cues related to body movements, such as joint movements, whereas the EFG utilized external cues apart from body movement by metaphors or analogies. The CG, on the other hand, did not focus on any attentional cues during their exercises.

The exercise program included strengthening and stretching exercises, progressively structured over a 6-week, with sessions held twice a week. The difficulty of the exercises was increased every 2 weeks.

Each session began with warm-up exercises that included dynamic stretches targeting the neck and upper back, followed by strengthening exercises focused on weak muscles. The session concluded with cool-down exercises that involved static stretching for tense muscles.

Each exercise was performed for 10 repetitions with a total volume of 3 sets and 10-second rest intervals. Dynamic stretching exercises were done 10 repetitions, and static stretching exercises were done in 3 cycles, each held for 30 seconds. Each session lasted 45 minutes, and sessions were conducted in the same environment under the supervision of the same physiotherapist to ensure consistency in verbal instructions. The instructions were repeated every 10 repetitions in the groups that received attentional focus instructions.

Table 3.1. Examples of instructions given to EFG and IFG

Name of Exercise	EFG Instructions	IFG Instructions
Squat with shoulder flexion **(Figure 11)**	Stand with your feet at shoulder width. Bend your knees as if sitting back into an invisible chair, and extend your arms towards the ceiling. Afterward, rise back up and lower your arms.	Position your feet shoulder-width apart, bending your hips and knees to a 90-degree angle while lifting your arms up to ear level. Next, stand up, lowering your arms to your hips by engaging your hip and thigh muscles.
Bridge **(Figure 12)**	Lie on your back with your knees opened to the sides, in line with your hips. Lift your hips by imagining equal-sized balls passing under your hips.	Lie on your back with your knees opened to the sides, in line with your hips. Squeeze your glute muscles and raise your hips until they are level with your knees.
Hug a tree with moderate theraband **(Figure 13)**	While standing, place the resistance band around your upper back and pull it forward by imagining that you are hugging the tree with your arms.	While standing, place the resistance band around your upper back and pull it forward while moving your shoulder blades away from each other.
Wall shoulder, back and hamstring stretch **(Figure 14)**	Stand facing a wall, a foot away, and lean your spine forward. Place your hands against the wall while imagining moving the wall away.	Stand a foot away from the wall and bend forward from the hips, placing your hands on the wall.

Table 3.2. Exercise program of the study

Exercise Type	Exercises
Warm-up (Week 1,2,3,4,5,6) **Dynamic Stretching Exercises** 10 repetitions for each exercise.	1. Head rotation 2. Thoracic flexion and extension in standing 3. Bilateral side bend 4. Forward bend 5. Cat-Cow 6. Bilateral thoracic rotation in 4KP 7. Scapula mobilization in 4KP
Level 1 (Week 1,2) **Strengthening Exercises** 10 repetitions 10- second-rest intervals 3 sets	1. Shoulder horizontal abduction in 4KP (bilateral) 2. Shoulder extension in 4KP (bilateral) 3. Hip extension in 4KP (bilateral) 4. Prone back extension 5. Prone shoulder horizontal abduction 6. Prone shoulder extension 7. Bridge 8. Bridge with shoulder flexion 9. Supine one-leg stretch in a tabletop position (bilateral) 10. Supine reverse arm leg in a tabletop position 11. Sidelying clamshell (bilateral) 12. Sidelying thoracic rotation (bilateral) 13. Shoulder horizontal abduction with moderate theraband 14. Scapular retraction with moderate theraband 15. Shoulder extension with moderate theraband 16. Shoulder external rotation with moderate theraband
Level 2 (Week 3,4) **Strengthening Exercises** 10 repetitions 10 seconds-rest intervals 3 sets	1. Reverse arm-leg in 4KP 2. Plank prep in 4KP 3. Prone lower trap raise 4. Prone shoulder horizontal abduction with 1 kg weight 5. Prone extension with shoulder extension with 1 kg 6. Bridge with moderate theraband 7. Supine bicycle 8. Supine reverse arm leg with 1kg weight

	9. Abdominal crunch 10. Sidelying clamshell with leg elevation 11. Sidelying thoracic rotation with moderate theraband 12. Squat with shoulder flexion 13. Hug a tree with moderate theraband 14. Shoulder external rotation with abduction with moderate theraband 15. Shoulder diagonal up with moderate theraband
Level 3 (Week 5,6) **Strengthening Exercises** 10 repetitions 10 seconds-rest intervals 3 sets	1. Shoulder flexion in 4KP with moderate theraband 2. Hip extension in 4KP with moderate theraband 3. Shoulder horizontal abduction circles in 4KP with 1 kg weight (bilateral) 4. Shoulder extension pulses in 4KP with 1 kg weight (bilateral) 5. Prone extension with shoulder swimming 6. Kneeling Triceps push-up 7. Single-leg bridge 8. Abdominal crunch in tabletop position 9. Supine bicycle with abdominal crunch 10. Squat with shoulder flexion with 1 kg weight 11. Shoulder diagonal up with moderate theraband with thoracic rotation 12. Serratus punch with thoracic rotation (bilateral) with moderate theraband
Cool-down (Week 1,2,3,4,5,6) **Static Stretching Exercises** 30 seconds hold for each exercise 4 cycles	1. Posterior shoulder stretch 2. Trapezius stretch 3. Levator scapula stretch 4. Pectoral stretch 5. Child pose 6. Wall shoulder, back and hamstring stretch

Figure 3.5. Squat with Shoulder Flexion

Figure 3.6. Bridge

Figure 3.7. Hug a Tree with a Moderate Theraband

Figure 3.8. Wall Shoulder, Back and Hamstring Stretch

3.6. Statistical Analysis

Statistical analyses were conducted using SPSS (Statistical Package for Social Sciences) for Windows 22. The Shapiro-Wilk test assessed the normality of the data distribution. For normally distributed data, parametric tests were applied, with results reported as mean ± standard deviation. Conversely, non-parametric tests were used for non-normally distributed data, presenting results as median (min:max). Categorical variables were analyzed using the Chi-square or Fisher-Freeman-Halton tests, and results reported as frequencies and percentages. When comparing more than two groups, a one-way analysis of variance (ANOVA) or a Kruskal-Wallis test was executed. If significant differences were found in the Kruskal-Wallis test, pairwise comparisons followed using the Dunn-Bonferroni post-hoc test. To assess changes from baseline among groups, difference scores (difference = post-pre) for scale values, and percent change values [% change = ((post-pre) / pre) × 100] were calculated for measurement variables and compared accordingly. For within groups (pre- and post-intervention), either the paired t-test or the Wilcoxon signed-rank test was utilized based on data distribution. A significance level of $\alpha = 0.05$ was established for all statistical analyses.

4. RESULTS

The mean age of participants in the CG was 37.83±12.95 years, in the EFG it was 39.83±15.39 years, and in the IFG it was 39.33±1.90 years. The body mass index (BMI) for participants in CG was 24.48±2.81 kg/m², in the EFG it was 23.51±3.56 kg/m², and in the IFG it was 23.81±2.99 kg/m². There were no statistically significant differences in age and BMI among the groups (p>0,05). These results are presented in **Table 4.1.**

Table 4.1. Physical Features of Participants

	CG (n=12)	**EFG (n=12)**	**IFG (n=12)**	**F/KW-H**	**p value**
Age (years) (Median [min:max])	37.50 [23:61]	44.00 [20:59]	35.00 [25:60]	** 0.06	0.966
BMI (kg/m2) (Mean±SD)	24.48±2.81	23.51±3.56	23.81±2.99	* 0.30	0.740

Data expressed as median (min: max) or mean ± standard deviation based on data distribution.

*: One-way analysis of variance test (ANOVA), **: Kruskal-Wallis test,

CG: control group, EFG: external focused group, IFG: internal focused group

Further descriptive characteristics of groups (gender, occupation, education, smoking, and dominant hand, are shown in Table 4.2. There were no significant differences between the groups regarding these characteristics (p > 0.05).

Table 4.2. Descriptive Group Characteristics

		CG (n=12) n (%)	EFG (n=12) n (%)	IFG (n=12) n (%)	χ²	p value
Gender	Male	3 (25%)	3 (25%)	4 (33.3%)	* 0.28	0.87
	Female	9 (75%)	9 (75%)	8 (66.7%)		
Occupation	Employed	10 (83.3%)	10 (83.3%)	9 (75%)	** 0.49	1.000
	Retired	2 (16.7%)	2 (16.7%)	3 (25%)		
Education	Higher Education	7 (58.3%)	9 (75%)	7 (58.3%)	**1.02	0.750
	High School	5 (41.7%)	3 (25%)	5 (41.7%)		
Smoking	No	7 (58.3%)	7 (58.3%)	4 (33.3%)	* 2.00	0.368
	Yes	5 (41.7%)	5 (41.7%)	8 (66.7%)		
Dominant Hand	Left	0 (0%)	1 (8.3%)	0 (0%)	** 1.87	1.000
	Right	12 (100%)	11 (91.7%)	12 (100%)		

Data expressed as n (%) ,*: chi-square analysis, **: Fisher-Freeman-Halton Exact test

CG: Control group, EFG: External focused group, IFG: Internal focused group

Descriptive statistics were utilized to analyze the characteristics of each group based on pre-intervention outcome measures. No significant differences were observed in pre-intervention results across the study groups for PPT, NDI, NYPRC, SF-12 Physical Component Scores (PCS), Mental Component Scores (MCS), and BDI ($p>0.05$). However, a significant difference was found in the NPRS pre-intervention scores between the groups ($p<0.05$). The description and comparison of the pre-intervention results for NPRS, PPT, NDI, NYPRC, SF-12 subcomponents, and BDI among the groups can be found in **Table 4.3.**

Table 4.3. Comparison of pre-intervention results of each group

	CG (n=12) (Mean±SD)/ (Median [min:max])	**EFG (n=12)** (Mean±SD)/ (Median [min:max])	**IFG (n=12)** (Mean±SD)/ (Median [min:max])	**F/KW-H**	**p value**
NPRS pre-test	5.50 [5:6]	7.00 [5:8]	6.50 [5:8]	** 9.02	**0.011**
PPT pre test	4.99±0.98	4.89±0.96	5.56±1.34	* 1.26	0.297
NDI pre test	15.33±3.79	13.92±4.03	12.58±5.10	* 1.19	0.314
SF-12 PCS pre-test	36.03 [18.08:50.12]	40.33 [26.77:48.68]	39.68 [32.00:47.78]	** 1.68	0.432
SF-12 MCS pre-test	44.71±7.80	37.15±10.35	43.32±9.99	* 2.17	0.130
NYPRC pre-test	32.67±4.25	36.17±2.88	35.67±4.37	* 2.83	0.073
BDI pre-test	13.92±6.14	14.17±4.17	11.83±4.68	* 0.76	0.473

Data expressed as median (min: max) or mean ± standard deviation based on data distribution.

* One-way analysis of variance test (ANOVA), ** Kruskal-Wallis test, **statistically significant (p<0.05)**

CG: Control group, EFG: External focused group, IFG: Internal focused group, NPRS: Numeric pain rating scale, PPT: Pressure pain threshold, NDI: Neck disability index, NYPRC: New York posture rating chart, SF-12 PCS: SF-12 physical health composite score, SF-12 MCS: SF-12 mental health composite score, BDI: Beck depression inventory.

To evaluate the changes from baseline between groups, difference scores (difference = post-test – pre-test) were calculated for score-based variables, and percentage change values (percentage change = ((post–pre)/pre)×100) were calculated for measurement-based variables. The group comparisons indicated a statistically significant difference only in the PPT variable ($p < 0.05$). Therefore, the Dunn-Bonferroni post-hoc test was conducted to measure PPT percentage change values. The post-hoc analysis showed a statistically significant difference between the IFG and EFG groups ($p = 0.035$). These statistics are shown in **Table 4.4.** and demonstrated in **Graph 4.1.** and **Graph 4.2.**

Compared to baseline, the IFG group showed an average increase of 16.34% (minimum: -2.67%, maximum: 54.97%), whereas the EFG group showed an average increase of 38.84% (minimum: 3.48%, maximum: 122.01%). No statistically significant differences were observed between the IFG and CG or CG and EFG groups ($p > 0.05$).

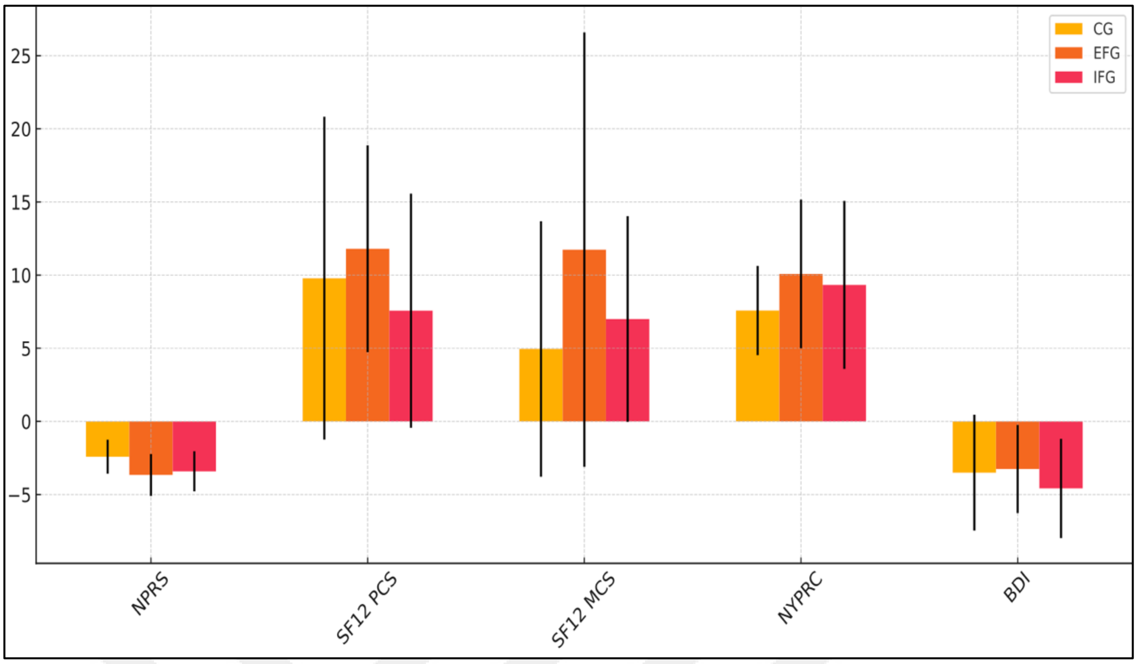
Table 4.4. Between-Group Comparison of Change Scores and Percentage Changes from Baseline

	CG (n=12) (Mean±SD)/ (Median [min:max])	**EFG (n=12)** (Mean±SD)/ (Median [min:max])	**IFG (n=12)** (Mean±SD)/ (Median [min:max])	**F/KW-H**	**p value**	**Pairwise comparisons p value †**
NPRS change score	-2,41±1.16	-3.66±1.43	-3.41±1.37	* 2.96	0.066	-
PPT % change	24.64 [12.61:68.30]	38.84 [3.48:122.01]	16.34 [-2.67:54.97]	** 6.50	**0.039**	IFG-CG:1,000 IFG-EFG:**0,035** CG-EFG:0,323
NDI change score	-4.00 [-13.00:-2.00]	-5.00 [-13.00:-1.00]	-4.50 [-12.00:-1.00]	** 0.21	0.897	-
SF12 PCS change score	9.79±11.03	11.80±7.07	7.57±8.00	* 0.68	0.512	-
SF12 MCS change score	4.95±8.73	11.74±14.84	7.00±7.03	* 1.26	0.297	-
NYPRC change score	7.58±3.05	10.08±5.08	9.33±5.74	* 0.86	0.429	-
BDI change score	-3.50±3.96	-3.25±3.01	-4.58±3.39	*0.49	0.613	-

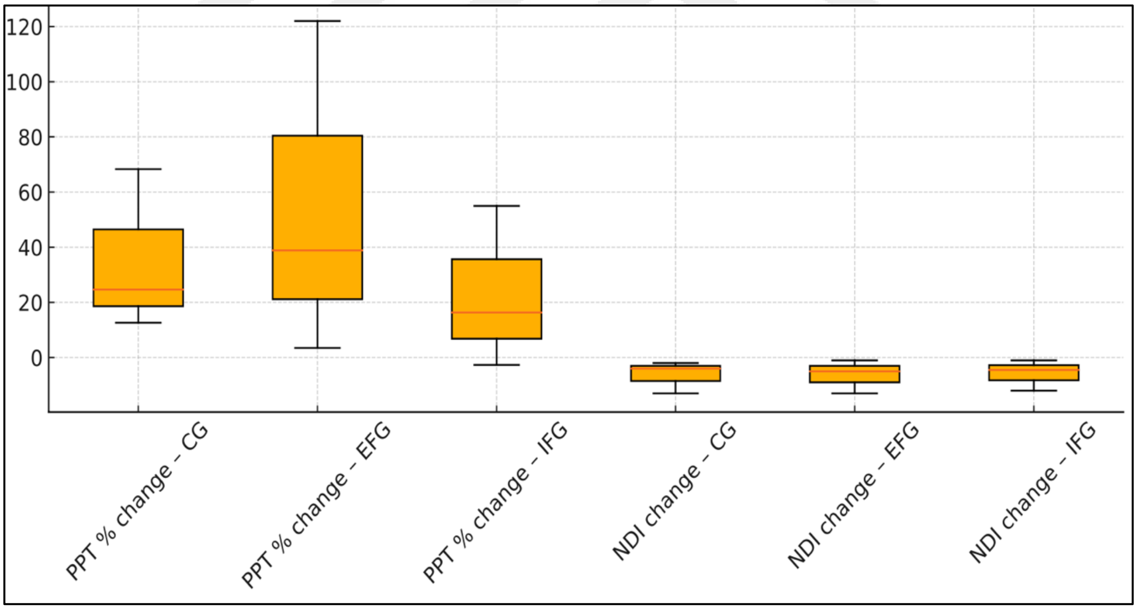
Data expressed as median (min: max) or mean ± standard deviation based on data distribution.

* One-way analysis of variance test (ANOVA), ** Kruskal-Wallis test, **statistically significant (p<0.05)**

†Pairwise comparisons were conducted using the Dunn-Bonferroni post hoc test, CG: Control group, EFG: External focused group, IFG: Internal focused group, NPRS: Numeric pain rating scale, PPT: Pressure pain threshold, NDI: Neck disability index, NYPRC: New York posture rating chart, SF-12 PCS: SF-12 physical health composite score, SF-12 MCS: SF-12 mental health composite score, BDI: Beck depression inventor



Graph 4.1. Between-group Comparisons of Change Score for Parametric Measures



Graph 4.2. Between-group Comparisons of Change Score for Non-parametric Measures

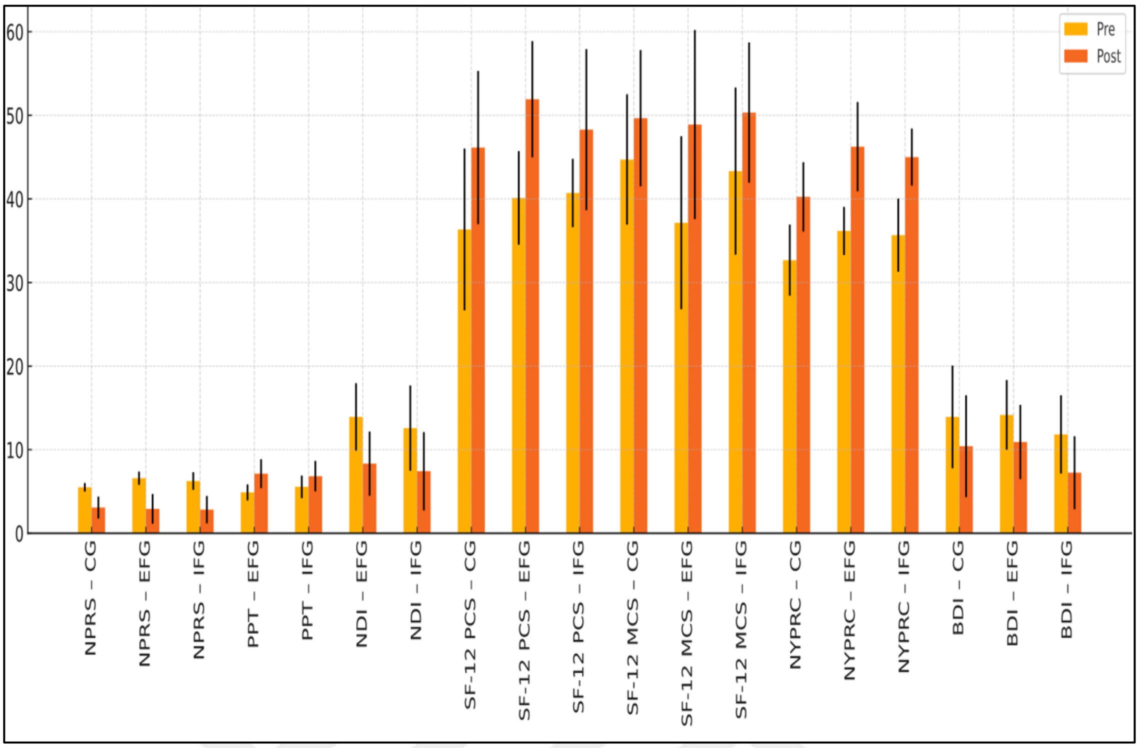
When within-group changes were examined, statistically significant improvements were found in all outcome parameters in both the EFG and IFG groups (p < 0.05). In the CG group, while most parameters showed significant improvements, the MCS subcomponents of the SF-12 did not demonstrate a statistically significant improvement (p > 0.05). **Table 4.5** presents a comparison of pre- and post-intervention outcome measures within the groups, as illustrated in **Graph 4.3.** and **Graph 4.4.**

Table 4.5. Comparison of pre and post intervention outcome measures within groups

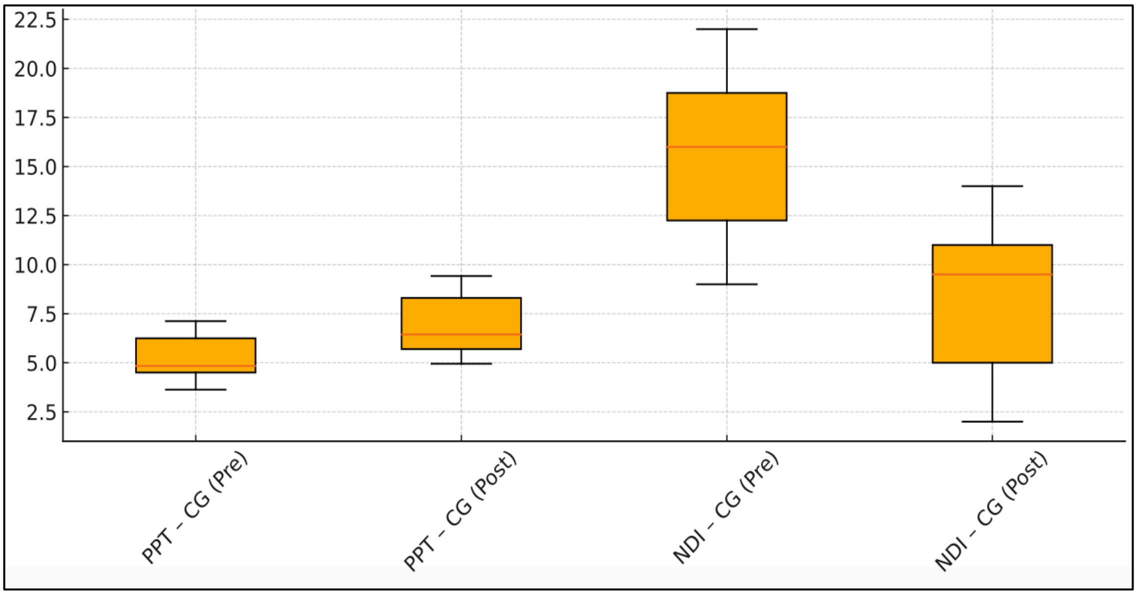
	Group	**Pre- test** (Mean±SD)/ (Median [min:max])	**Post- test** (Mean±SD)/ (Median [min:max])	**t/z**	**p value**
NPRS	CG	5.50±0.52	3.08±1.31	* 7.18	**<0.001**
	EFG	6.58±0.79	2.92±1.78	* 8.84	**<0.001**
	IFG	6.25±1.05	2.83±1.64	* 8.58	**<0.001**
PPT	CG	4.84 [3.63:7.12]	5.70 [4.95:9.42]	** -3.05	**0.002**
	EFG	4.89±0.96	7.13±1.73	* -5.38	**<0.001**
	IFG	5.56±1.34	6.83±1.83	*-4.28	**0.001**
NDI	CG	16.00 [9:22]	9.50 [2:14]	** -3.07	**0.002**
	EFG	13.92±4.03	8.33±3.84	* 4.37	**0.001**
	IFG	12.58±5.10	7.42±4.68	* 5.47	**<0.001**
SF-12 PCS	CG	36.35±9.68	46.15±9.16	* -3.07	**0.011**
	EFG	40.12±5.60	51.93±6.95	* -5.78	**<0.001**
	IFG	40.71±4.09	48.29±9.63	* -3.28	**0.007**
SF-12 MCS	CG	44.71±7.80	49.66±8.15	* -1.96	0.075
	EFG	37.15±10.35	48.90±11.31	* -2.74	**0.019**
	IFG	43.32±9.99	50.33±8.39	* -3.44	**0.005**
NYPRC	CG	32.67±4.25	40.25±4.15	* -8.58	**<0.001**
	EFG	36.17±2.88	46.25±5.34	* -6.86	**<0.001**
	IFG	35.67±4.37	45.00±3.41	* -5.63	**<0.001**
BDI	CG	13.92±6.14	10.42±6.09	* 3.05	**0.011**
	EFG	14.17±4.17	10.92±4.44	* 3.72	**0.003**
	IFG	11.83±4.68	7.25±4.37	* 4.67	**0.001**

Data expressed as median (min: max) or mean ± standard deviation based on data distribution.

* paired sample t-test, ** Wilcoxon sing rank test, **statistically significant (p<0.05)**, CG: Control group, EFG: External focused group, IFG: Internal focused group, NPRS: Numeric pain rating scale, PPT: Pressure pain threshold, NDI: Neck disability index, NYPRC: New York posture rating chart, SF-12 PCS: SF-12 physical health composite score, SF-12 MCS: SF-12 mental health composite score, BDI: Beck depression inventory



Graph 4.3. Within-Group Changes in Parametric Measures



Graph 4.4. Within-Group Changes in Non-parametric Measures

5. DISCUSSION

This research examines how various attentional focus strategies influence disability, posture, quality of life (QOL), and depression among patients suffering from neck and upper back Myofascial Pain Syndrome (MPS). The primary results revealed improvements in pain, pressure pain thresholds, neck disability, posture, quality of life, and depression parameters in all three groups. However, the control group did not exhibit a statistically significant improvement in the mental health subcomponent of quality of life. Following the intervention, a notable difference in the PPT parameter highlighted the superiority of the EFG group compared to the IFG group. There were no significant differences among the groups for the other measured outcomes.

MPS is caused by trigger points in the muscle(s) or their fascia and is a common pain condition and the lifetime prevalence of MPS can reach up to 85%. [24,32]. Since the etiology and pathogenesis of MPS are not fully understood, treatment approaches are customized based on clinical symptoms, and a standardized treatment protocol has not been established. However, different techniques have been proposed for MPS treatment [2]. Among these, exercise is one of the most commonly preferred approaches due to its non-invasive, non-pharmacological, low-cost, and safe nature. [2,8]. Although traditional parameters are frequently used in exercise planning, the use of attentional focus strategies especially EFA has attracted attention in terms of motor performance and learning. [114,117,118].

Pain is a primary symptom of MPS, and exercise therapy, whether used alone or in combination with other treatment methods, is an effective approach to reduce pain intensity and enhance both physical and psychological function in patients with MPS. Numerous studies demonstrate the benefits of exercise therapy for those with MPS. For instance, Buttagat et al. found that stretching and scapular stabilization exercises three times a week for four weeks showed considerable reductions in the scapulocostal region resulted in significant improvements in pain intensity, PPT, muscle tension, and anxiety levels at both two and four weeks post-intervention period. In contrast, no improvements was observed in these parameters in the control group that did not receive exercise therapy. [153] Additionally, in the study conducted by Kang et al., the effects of cervical and scapular strengthening exercises on pain, cervical ROM, upper trapezius muscle tone and stiffness, disability level and quality of life were investigated in individuals with chronic neck pain. Participants were randomly assigned to two groups: one received exercise therapy, while the other received massage therapy focusing on the upper trapezius muscle. Both interventions were administered five days a week for four weeks. At the end of the treatment period, statistically significant improvements were observed across all parameters in both groups, but the exercise therapy group demonstrated notably greater enhancements compared to the control group [154]. Similarly, Tunwattanapong et al. provided neck and shoulder stretching exercises for four weeks in addition to ergonomic education to office workers with chronic non-specific neck pain. They found that the group performing stretching exercises exhibited greater improvements in pain scores, quality of life, and neck function compared to the group that received only ergonomic education [155]. Furthermore, a recent systematic review suggested that combining stretching and strengthening exercises leads to more effective short-term (≤ 3 months) reductions in pain intensity than minimal or no intervention methods for individuals with MPS [9]. When examining the studies on the effects of attentional focus strategies in exercise on pain, it becomes apparent that the evidence is insufficient and heterogeneous. For example, Aghakeshizadeh et al. recruited individuals with patellofemoral pain who were regularly engaged in aerobic or athletic activities, and all participants underwent lower extremity strengthening exercises over six weeks. They were randomly assigned to three groups: one receiving external focus instructions (EFG), another internal focus instructions (IFG), and a control group without any specific guidance during exercises. At the end of the six weeks, pain levels improved for all groups; however, those in the attentional focus groups was more pronounced than in the control group. However, there was no significant difference in pain levels between the internal and external focus groups. However, in this study, feedback provided during the exercises aimed to correct movement errors. In the IFG, incorrect patterns were corrected verbally, while in the EFG, corrections were made either through the therapist's manual guidance or a band for feedback [156]. The differences in attentional focus usage between our study and this one might explain the differences in findings. In another study, Zamani et al. examined the effects of external focus training on pain in patients with chronic low back pain. In an experimental group received the external focus intervention in addition to motor control training, instructed to hit unpredictable moving objects with their upper extremities, with the task difficulty progressively increasing the task difficulty progressively increasing. However, the control group received only motor control training. Following the treatment, the experimental group showed a greater reduction in pain intensity compared to the control group [157]. However, this method may have served more as an additional exercise intervention rather than purely as an external focus strategy; the engagement of the upper extremities, which also involved trunk muscles, might have provided an additional advantage to the experimental group. When studies with methodological similarities to ours, similar results are obtained. For instance, a study by Homa et al. assessed the effects of hip and knee exercises performed with attentional focus instructions on balance and pain in elderly male patients with knee osteoarthritis. The participants were divided into two groups. Following electrotherapy, one group engaged in exercises with external focus instructions, while the other utilized internal focus instructions three times a week over eight weeks. While both groups exhibited significant pain improvement, but there was no notable difference between them [158]. Likewise, a recent study by Kuzu et al. found that dynamic balance exercises with various attentional focus instructions three times weekly for eight weeks to participants with chronic low back pain, alongside traditional physiotherapy methods. This study found a significant pain reduction in both groups; however, no significant difference was identified [143]. Nevertheless, the lack of a control group in these studies, combined with various treatment methods used alongside attentional focus approaches, might have diminished the observed effects of the attentional focus techniques. In our study, consistent with existing literature on exercise interventions, we developed a program that incorporated stretching exercises for tight muscle groups and strengthening exercises aimed at enhancing scapular and trunk stabilization for weaker muscles. This strategy resulted in notable improvements in pain intensity across all groups ($p < 0.05$). Consequently, we can confirm that both stretching and strengthening exercises are crucial in alleviating pain related to neck and upper back MPS. However, post-treatment evaluations revealed no significant differences among the groups, ($p > 0.05$) indicating that the attentional focus instructions provided during exercises did not notably affect pain outcomes, as opposed to the exercises themselves.

Pressure pain threshold (PPT) is a valid measurement method used to objectively assess the sensitivity of a painful area and monitor changes following interventions. It is frequently utilized in the literature, particularly for evaluating MTrPs. Studies have shown that individuals with musculoskeletal pain exhibit greater sensitivity in affected areas compared to corresponding areas on the opposite side, resulting in significantly lower PPT values. Similarly, studies have demonstrated that PPT values in painful regions are significantly lower than those in healthy controls [159]. Additionally, studies have shown that exercising muscles in healthy individuals can increase the PPT in both upper and lower extremities [160,161,162]. However, there is no consensus in the literature on whether the exercise should be applied to the painful area or to a non-painful area. When examining studies conducted on individuals with chronic pain, some of these studies demonstrated that exercises applied to areas away from the painful region can increase PPT in the painful area. For instance, Lannersten et al. observed that isometric contractions performed in a non-painful region, of participants with shoulder myalgia led to an increase in PPT in the painful region. In contrast, contractions applied directly to the painful area did not produce such an increase [163]. Similarly, Burrows et al. found that in patients with chronic knee osteoarthritis, upper body exercises significantly increased PPT not only in the upper body but also in the lower body, whereas lower body exercises did not have the same effect [164]. This finding has been interpreted to suggest that exercises applied directly to painful body regions may activate pain-facilitating mechanisms at local, spinal, or supraspinal levels, thereby nullifying the hypoalgesic effects of exercise [162]. However, studies examining the long-term effects of exercise in individuals with pain have shown that exercises targeting the painful area also increase the PPT in the pain region. Henriksen et al. involved 60 patients with knee osteoarthritis; the group that performed regular strengthening and coordination exercises for the lower extremities over 12 weeks demonstrated a significant increase in PPT scores compared to the group that did not receive exercise treatment [165]. Buttagat et al. showed that scapular stabilization exercises applied for four weeks to individuals with myofascial pain in the scapulocostal region increased the PPT in the scapular muscles [153]. Similarly, in a study conducted by Ylinen et al., patients with chronic neck pain lasting more than six months underwent intermittent strengthening and endurance training targeting the neck muscles and were evaluated with a 12-month follow-up. As a result, the groups who received strengthening and endurance training for the neck muscles showed higher PPT values in the painful region than the control group that did not participate in the exercise program. This increase is explained by several mechanisms involving muscle structure and the nervous system. Strength training may enhance the density of the Na^+–K^+ pump and increase the number of capillaries and shifting catabolic metabolism into an anabolic state, which can reduce the sensitivity. Regular exercise also improves motor control and promotes neural adaptations, suppressing pain transmission pathways at spinal and supraspinal levels. Furthermore, increased muscle strength can enhance stability and reduce tissue load, helping to alleviate pain. Exercise may also reduce pain-enhancing emotions such as fear. [159]. Beyond exercise itself, attentional focus has also been shown to modulate neuromuscular efficiency and pain perception. Several studies examine the immediate effect of attentional focus on pain perception. In the study by Diotaiuti et al., participants underwent a cold pressor test and were instructed to adopt either an internal focus (e.g., concentrating on the sensation in their hand) or an external focus (e.g., imagining a warm scene). The results showed that participants with an external focus reported significantly lower levels of perceived pain compared to those with an internal focus and the control group [166]. Similarly, Chayadi et al. investigated the effects of distraction strategies on pain threshold, pain tolerance, and perceived pain intensity. When participants engaged in tasks that diverted their attention away from the pain stimulus, increases in pain threshold and tolerance, as well as decreases in perceived pain intensity, were observed. This suggests that by shifting attention away from the pain and making the external focus the primary task, the attention given to the pain stimulus (as a secondary task) is reduced, thereby diminishing pain perception [167]. In our study, we applied stretching and strengthening exercises to both the painful area and the distant areas for six weeks. Consistent with the literature, we observed an increase in the PPT values of the painful area following the exercise sessions ($p < 0.05$). This finding suggests that a long-term and regular exercise program applied to both the painful and the distant regions can enhance pain tolerance by increasing the pain threshold in the painful area. Importantly, a significant difference in PPT improvement was found between the attentional focus groups; participants who exercised with external focus instructions demonstrated considerably greater increases in PPT [%38.84 (3.48:122.01)] compared to those who exercised with internal focus instructions [%24.64 (-2.67:54.97)], ($p < 0.05$). We can interpret this finding in line with the results of previous studies examining the immediate effects of attentional focus on pain tolerance. During the exercise sessions, attention may have been indirectly diverted away from the painful area, causing pain to become a secondary task. This may have helped participants in reorganizing their pain responses during the six weeks intervention, contributing to a more significant improvement in PPT values. An alternative explanation can also be proposed to explain this outcome. Most studies indicate that using an external focus of attention may be more effective than an internal focus in terms of parameters that reflect movement effectiveness, such as balance and smoothness of movement, as well as parameters related to movement efficiency, including muscle activity, speed, endurance, and maximal force production. Specifically, EMG activity in muscles is lower when using an external focus, while performance and maximal force output improve compared to conditions with an internal focus. This suggests that an external focus enables agonist and antagonist muscles to activate at more optimal levels and recruits muscle fibers more effectively, thereby preventing unnecessary activations and promoting higher performance [120]. In this context, exercises performed with an external focus in our study may have resulted in muscle activation with less effort and tension, potentially improving the participants' ability to tolerate pain.

Chronic MPS may lead to various problems and frequently cause functional disability. Studies found that individuals with chronic neck myofascial pain have higher levels of neck disability compared to healthy controls [168, 169]. Numerous studies have demonstrated that exercise interventions can lead to significant improvements in neck disability. For instance, Letafatkar et al. investigated the effects of therapeutic exercises, including muscle strength, endurance, and coordination, on pain, disability, posture, and general health status in female dentists with chronic neck pain. After an 8-week exercise program, significant improvements were observed in the exercise group in terms of pain intensity, NDI scores, posture, and health status. [170]. Kang et al. also involved individuals with chronic neck pain, participants who performed strength training focused on the cervical and scapular muscles, showed improvements in their NDI scores by the end of the fourth week. This improvement was more significant than that observed in the group receiving massage therapy to the upper trapezius muscle [154]. Similarly, a recent systematic review which evaluated the effectiveness of exercise for office workers with chronic neck pain, concluded that strengthening the neck, shoulder, and scapular muscles effectively reduces pain and disability.[171]. In line with the literature, we observed a significant decrease in neck disability scores across all groups following the 6-week exercise program ($p < 0.05$). Therefore, we can confirm that therapeutic exercise is essential for reducing disability in patients with neck and upper back MPS. Additionally, we think that this improvement is due to a decrease in pain intensity. In addition, although attentional focus strategies were applied during exercise, no significant differences were observed between the groups in terms of disability levels ($p > 0.05$). We suggest that this may be due to the lack of a significant difference in improvement in pain intensity between groups, which may have limited the potential for further improvement in disability with the use of attentional focus.

Postural disorders, particularly cervical and thoracic angle deviations and scapular dyskinesia, are considered both a cause and a consequence of cervical myofascial pain syndrome and increases in postural problems likely lead to greater pain intensity. In the study conducted by Telli et al., the frequency of scapular dyskinesia and loss of cervical lordosis in individuals with MPS in the neck region, along with the effects of these disorders on pain intensity, were evaluated. As a result of the study, loss of cervical lordosis was detected in 52.25% of patients, and scapular dyskinesis was observed in 44.5% of patients in the study population (74 females, 27 males). Moreover, in individuals with scapular dyskinesis, all pain scores, pain duration, the number of active MTrPs, and postural abnormalities (such as forward head posture, rounded shoulders, shoulder elevation, and thoracic kyphosis) were found to be significantly higher. In patients with loss of cervical lordosis, the pain score in activity was particularly elevated. However, in individuals with both scapular dyskinesis and loss of cervical lordosis, the presence of MTrPs was found to be significantly higher and the severity of postural impairments were more pronounced. These findings suggest that scapular dyskinesis and loss of cervical lordosis are critical postural factors leading to increased pain and postural dysfunction in patients with neck MPS. Therefore, it is recommended that rehabilitation programs incorporate postural correction exercises, scapular stabilization, and proprioceptive exercises to achieve better clinical outcomes [172]. In a study conducted by Gümüşçü et al., individuals with chronic neck pain were included and randomly divided into three groups. After all groups received conventional physical therapy, deep cervical flexor exercises were applied to one group and a combination of neck and core stabilization exercises was applied to the other group. The control group received only conventional treatment. The treatment program was applied three days a week for four weeks. Although improvements were observed in pain, posture, ROM, and neck disability parameters in all groups after the treatment, the group receiving combined exercise therapy was found to be significantly superior to the other groups in terms of pain and postural improvement. These results suggest that combined neck and core stabilization exercises may be a more effective approach than neck exercises and conventional treatment alone in terms of pain and postural improvement [173]. When examining the effects of attentional focus strategies used in exercise on posture, only one study appears. This study, conducted by Kuzu et al., included individuals with chronic low back pain and assessed the effects of dynamic balance training combined with two different attentional focus strategies, in addition to electrotherapy and exercises targeting spinal mobility and lumbar stability. The results showed that the group performing balance exercises with an external focus of attention demonstrated greater improvements in posture score compared to the group using the internal focus [143]. The difference between this study and ours is that the attentional focus strategies used in the study were applied during balance tasks. In our study, consistent with the literature, improvements in postural scores were observed in all groups after the intervention ($p < 0.01$). This suggests that therapeutic exercises have a positive impact on posture in MPS. However, no significant differences were found between groups ($p < 0.05$). This may be due to participants not engaging in dynamic exercises that target postural control, as attentional focus is more evident during goal-directed movements or balance tasks in the literature. Thus, we suggest that the impact of attentional focus on postural control can vary with intervention content, and protocols should include functional tasks to achieve a more accurate effect on posture.

MPS is a regional musculoskeletal disorder and is not classified as a subtype of emotional or psychological disorders. However, it is closely associated with emotional factors such as depression, anxiety, sleep disturbances, and stress [174]. Numerous studies have examined the relationship between chronic pain and depression, demonstrating that individuals with chronic musculoskeletal disorders tend to exhibit higher levels of depression. Although the debate continues as to whether pain leads to depression or vice versa, the current consensus is that both conditions can affect one another, and this interaction may vary depending on individual differences [175]. Okumuş et al. reported higher levels of depression in patients with MPS compared to a control group of healthy individuals. Using the BDI, they assessed the severity of depression and found a positive correlation between pain intensity and depression levels [61]. Similarly, Esenyel et al. reported a positive correlation between depression levels and pain severity in patients with MTrPs in the upper trapezius muscle [176]. In our study, a significant improvement in depression levels was observed in all groups (p <

0.05) in parallel with the decrease in pain intensity due to regular exercise. This finding is similar to the literature showing the relationship between depression and pain. However, the lack of a statistically significant difference in depression levels between the groups may be due to the fact that the attentional focus strategies used during exercise did not cause changes in pain levels between the groups.

The relationship among chronic pain, depression, and quality of life (QOL) has long been a topic of discussion. MPS, due to its persistent pain, movement limitations, and resulting disability, is a common musculoskeletal disorder that can lead to a decline in QOL [177]. Bal et al. demonstrated that individuals with MPS had poorer scores in pain, energy, physical mobility, sleep, and emotional reactions compared to healthy controls [178]. Similarly, Şahin et al., evaluating patients with cervical MPS found that the role, pain, and energy subscales of the SF-36 were significantly lower [179]. However, studies have shown that exercise and physical activity can improve the QOL for individuals with chronic musculoskeletal pain. For example, Cuesta-Vargas et al. implemented an eight-week therapeutic exercise program, along with general health education, for individuals experiencing chronic musculoskeletal pain. They observed significant improvements in all SF-12 subparameters by the end of the intervention [180]. Similarly, Salo et al. divided patients with chronic non-specific neck pain into two groups: one group engaged in stretching and strengthening exercises, while the other group focused solely on stretching exercises and was monitored for one year using home-based programs. They assessed the patient using the RAND36-Item Health Survey and found similar levels of improvement in QOL across both groups [181]. These findings demonstrate that exercise, regardless of its type, can have a positive impact on the QOL for individuals with chronic musculoskeletal pain. In this study, we employed the SF-12 to evaluate health status. Designed to be shorter and more practical than the SF-36, it is well-suited for clinical environments. This tool evaluates individuals' health based on two key components: the physical health composite score (PCS) and the mental health composite score (MCS). Consistent with existing research, our findings indicated significant enhancements in the PCS across all three groups. ($p < 0.05$). However, notable improvements in the MCS were found only within the internal and external focus groups, not in the control group ($p > 0.05$). This suggests that directing attention during exercise may enhance its mental benefits. We propose that the absence of attentional focus instructions for the control group may have resulted in more passive exercise participation, reduced motivation, and diminished awareness. Conversely, the guided attentional focus in the other groups likely increased satisfaction with the exercise, encouraged a stronger sense of engagement, improved interaction with the therapist, created a sense of support, and supported the development of self-efficacy and intrinsic motivation, ultimately promoting a more positive influence on mental well-being.

To the best of our knowledge, it is the first study to investigate the effects of attentional focus strategies during exercise on pain, disability, posture, quality of life, and depression in patients with neck and upper back MPS. Therefore, this study makes a significant contribution to the literature by demonstrating the potential role of attentional focus instructions in exercise for neck and upper back MPS, a common musculoskeletal problem. In addition, the inclusion of a control group and the use of no other application during the intervention period allowed for a more accurate and reliable assessment of attentional focus effects. All treatment approaches were conservative in nature and had no adverse effects. Another advantage of the study is the use of measurement instruments that have been proven to be valid and reliable. Although the study has several strengths, it also has several limitations. First, there was a significant difference in pain levels between groups at baseline. Although this difference was explained by the difference analysis, it could still affect the interpretation of treatment effects. Second, it was not possible to control for participants' attentional focus. Although frequent reminders were used to increase compliance, the possibility remains that individuals may adopt a different focus than instructed, and compliance was not assessed with any measurement tool. Third, a cognitive assessment of the participants was not conducted at the beginning; this evaluation could have contributed to a more homogeneous group in terms of cognitive abilities. Fourth, the participants were not evaluated over the 6-week period, which would have provided valuable insight into the short-term effects. Additionally, long-term follow-up data were not collected after the intervention, which would have provided information about the sustainability of the treatment effects. Furthermore, although participants were unaware of their group allocation, having the same person administer the intervention and conduct the assessments can lead to a potential source of bias. Finally, the intervention was performed twice a week for six weeks, which may not have been sufficient to result in significant changes in some participants.

Considering the limitations of our study, future research should investigate the importance of attention focus strategies in individuals with myofascial pain and other painful conditions using larger samples and longer follow-up periods.

6. CONCLUSION

This study indicates that the exercise method used in the treatment of patients with neck and upper back MPS may be effective in improving symptoms without a specific focus, but the use of the attentional focus may improve mental well-being better in these patients. At the same time, the current findings suggest that the use of EFA may be more effective for improving pain perception than IFA. Thus, performing exercises for neck and upper back MPS with a therapist's guidance, particularly through EFA, is an effective clinical strategy that enhances treatment effectiveness.

7. REFERENCES

1. Lu W, Li J, Tian Y, Lu X. Effect of ischemic compression on myofascial pain syndrome: a systematic review and meta-analysis. Chiropractic & Manual Therapies. 2022 Sep 1;30(1).

2. Guzmán-Pavón MJ, Cavero-Redondo I, Martínez-Vizcaíno V, Fernández-Rodríguez R, Reina-Gutierrez S, Álvarez-Bueno C. Effect of Physical Exercise Programs on Myofascial Trigger Points–Related Dysfunctions: A Systematic Review and Meta-analysis. Pain Medicine. 2020 Oct 4;21(11):2986–96.

3. Urits I, Charipova K, Gress K, Schaaf AL, Gupta S, Kiernan HC, et al. Treatment and management of myofascial pain syndrome. Best Practice & Research Clinical Anaesthesiology. 2020 Aug;34(3).

4. Cao QW, Peng BG, Wang L, Huang YQ, Jia DL, Jiang H, et al. Expert consensus on the diagnosis and treatment of myofascial pain syndrome. World Journal of Clinical Cases. 2021 Mar 26;9(9):2077–89.

5. Majlesi J, Unalan H. Effect of Treatment on Trigger Points. Current Pain and Headache Reports. 2010 Jul 23;14(5):353–60.

6. van Middelkoop M, Rubinstein SM, Verhagen AP, Ostelo RW, Koes BW, van Tulder MW. Exercise therapy for chronic nonspecific low-back pain. Best Practice & Research Clinical Rheumatology. 2010 Apr;24(2):193–204.

7. Pedersen BK, Saltin B. Exercise as Medicine - Evidence for Prescribing Exercise as Therapy in 26 Different Chronic Diseases. Scandinavian Journal of Medicine & Science in Sports. 2015 Nov 25;25(s3):1–72.

8. Ahmed S, Khattab S, Haddad C, Babineau J, Furlan A, Kumbhare D. Effect of aerobic exercise in the treatment of myofascial pain: a systematic review. Journal of Exercise Rehabilitation. 2018 Dec 27;14(6):902–10.

9. Mata Diz JB, de Souza JRLM, Leopoldino AAO, Oliveira VC. Exercise, especially combined stretching and strengthening exercise, reduces myofascial pain: a systematic review. Journal of Physiotherapy. 2017 Jan;63(1):17–22.

10. Jafri MS. Mechanisms of Myofascial Pain. International Scholarly Research Notices. 2014 Aug 18;2014:1–16.

11. American College of Sports Medicine. Progression Models in Resistance Training for Healthy Adults. Medicine & Science in Sports & Exercise [Internet]. 2009 Mar;41(3):687–708. Available from: https://pubmed.ncbi.nlm.nih.gov/19204579/

12. Nadzalan AM, Lee JLF, Mohamad NI, Azzfar MS, Malek NFA, Waqqash E. The Effects of Focus Attention Instructions on the Movement Kinetics, Muscle Activation and Performance during Resistance Exercise. Journal of Physics: Conference Series. 2020 Apr;1529:022008.

13. Piccoli A, Rossettini G, Cecchetto S, Viceconti A, Ristori D, Turolla A, et al. Effect of Attentional Focus Instructions on Motor Learning and Performance of Patients with Central Nervous System and Musculoskeletal Disorders: a Systematic Review. Journal of Functional Morphology and Kinesiology. 2018 Jul 25;3(3):40.

14. Sturmberg C, Marquez J, Heneghan N, Snodgrass S, van Vliet P. Attentional focus of feedback and instructions in the treatment of musculoskeletal dysfunction: A systematic review. Manual Therapy. 2013 Dec;18(6):458–67.

15. Wulf G, Shea C, Park JH. Attention and Motor Performance: Preferences for and Advantages of an External Focus. Research Quarterly for Exercise and Sport. 2001 Dec;72(4):335–44.

16. Stoate I, Wulf G. Does the Attentional Focus Adopted by Swimmers Affect Their Performance? International Journal of Sports Science & Coaching. 2011 Mar;6(1):99–108.

17. Snodgrass SJ, Heneghan NR, Tsao H, Stanwell PT, Rivett DA, Van Vliet PM. Recognising neuroplasticity in musculoskeletal rehabilitation: A basis for greater collaboration between musculoskeletal and neurological physiotherapists. Manual Therapy. 2014 Dec;19(6):614–7.

18. Landers MR, Hatlevig RM, Davis AD, Richards AR, Rosenlof LE. Does attentional focus during balance training in people with Parkinson's disease affect outcome? A randomised controlled clinical trial. Clinical Rehabilitation. 2015 Feb 19;30(1):53–63.

19. Durham KF, Sackley CM, Wright CC, Wing AM, Edwards MG, van Vliet P. Attentional focus of feedback for improving performance of reach-to-grasp after stroke: a randomised crossover study. Physiotherapy. 2014 Jun;100(2):108–15.

20. Pourazar M. Effects of External and Internal Focus of Attention in Motor Learning of Children with Cerebral Palsy. 2017.

21. Shafizadeh M, Platt GK, Mohammadi B. Effects of different focus of attention rehabilitative training on gait performance in Multiple Sclerosis patients. Journal of Bodywork and Movement Therapies. 2013 Jan;17(1):28–34.

22. Porter JM, Anton PM. Directing Attention Externally Improves Continuous Visuomotor Skill Performance In Older Adults Who Have Undergone Cancer Chemotherapy. Journal of the American Geriatrics Society. 2011 Feb;59(2):369–70.

23. Luca Cavaggioni, Gilardini L, Redaelli G, Croci M, Raffaella Cancello, Paolo Capodaglio, et al. A Pilot Study on Attentional Focus in Prescribing Physical Exercise in Outpatients with Obesity. Healthcare. 2022 Nov 17;10(11):2306–6.

24. Giamberardino MA, Affaitati G, Fabrizio A, Costantini R. Myofascial pain syndromes and their evaluation. Best Practice & Research Clinical Rheumatology. 2011 Apr;25(2):185–98.

25. Simons D. Myofascial pain and fibromyalgia. Fricton JR, Awad EA , editor. Vol. 17. New York: Raven Press; 1990.

26. Travell JG, Simons DG. Myofascial pain and dysfunction. 2nd ed. Vol. 1. Baltimore: Williams & Wilkins; 1999.

27. Tough EA, White AR, Richards S, Campbell J. Variability of Criteria Used to Diagnose Myofascial Trigger Point Pain Syndrome—Evidence From a Review of the Literature. The Clinical Journal of Pain. 2007 Mar;23(3):278–86.

28. Borg-Stein J, Iaccarino MA. Myofascial Pain Syndrome Treatments. Physical Medicine and Rehabilitation Clinics of North America. 2014 May;25(2):357–74.

29. Lavelle ED, Lavelle W, Smith HS. Myofascial Trigger Points. Anesthesiology Clinics. 2007 Dec;25(4):841–51.

30. Cummings M, Baldry P. Regional myofascial pain: diagnosis and management. Best Practice & Research Clinical Rheumatology. 2007 Apr;21(2):367–87.

31. Lam C, Vinicius Tieppo Francio, Gustafson K, Carroll M, York A, Chadwick AL. Myofascial pain – A major player in musculoskeletal pain. Baillière's best practice and research in clinical rheumatology/Baillière's best practice & research Clinical rheumatology. 2024 Apr 1;101944–4.

32. Galasso A, Urits I, An D, Nguyen D, Borchart M, Yazdi C, et al. A Comprehensive Review of the Treatment and Management of Myofascial Pain Syndrome. Current Pain and Headache Reports. 2020 Jun 27;24(8).

33. X L, Wang R, Xing X, Shi X, Tian J, Zhang J, et al. Acupuncture for Myofascial Pain Syndrome: A Network Meta-Analysis of 33 Randomized Controlled Trials. PubMed. 2017 Sep 1;20(6):E883–902.

34. Cerezo-Téllez E, Torres-Lacomba M, Mayoral-del Moral O, Sánchez-Sánchez B, Dommerholt J, Gutiérrez-Ortega C. Prevalence of Myofascial Pain Syndrome in Chronic Non-Specific Neck Pain: A Population-Based Cross-Sectional Descriptive Study. Pain Medicine. 2016 Jun 20;17(12):2369–77.

35. Fricton JR, Kroening R, Haley D, Siegert R. Myofascial pain syndrome of the head and neck: a review of clinical characteristics of 164 patients. Oral Surgery, Oral Medicine, Oral Pathology. 1985 Dec;60(6):615–23.

36. Hidalgo-Lozano A, Fernández-de-las-Peñas C, Alonso-Blanco C, Ge HY, Arendt-Nielsen L, Arroyo-Morales M. Muscle trigger points and pressure pain hyperalgesia in the shoulder muscles in patients with unilateral shoulder impingement: a blinded, controlled study. Experimental Brain Research. 2010 Feb 26;202(4):915–25.

37. Bron C, Dommerholt JD. Etiology of Myofascial Trigger Points. Current Pain and Headache Reports. 2012 Jul 27;16(5):439–44.

38. Skootsky SA, Jaeger B, Oye RK. Prevalence of myofascial pain in general internal medicine practice. Western Journal of Medicine [Internet]. 1989;151(2):157–60.

39. Vázquez Delgado E, Cascos-Romero J, Gay Escoda C. Myofascial pain syndrome associated with trigger points: A literature review. (I): Epidemiology, clinical treatment and etiopathogeny. Articles publicats en revistes (Odontoestomatologia) [Internet]. 2009 Oct 1 [cited 2024 May 8].

40. Roth RS, Horowitz K, Bachman JE. Chronic myofascial pain: Knowledge of diagnosis and satisfaction with treatment. Archives of Physical Medicine and Rehabilitation. 1998 Aug;79(8):966–70.

41. Gerwin RD. Classification, epidemiology, and natural history of myofascial pain syndrome. Current Pain and Headache Reports. 2001 Oct;5(5):412–20.

42. Rollman GB, Lautenbacher S. Sex Differences in Musculoskeletal Pain. The Clinical Journal of Pain 2001 Mar 1;17(1):20.

43. Saxena A, Chansoria M, Tomar G, Kumar A. Myofascial pain syndrome: an overview. Journal of Pain & Palliative Care Pharmacotherapy [Internet]. 2015 Mar 1;29(1):16–21.

44. Rachlin ES, Rachlin IS. Myofascial Pain and Fibromyalgia. 2002.

45. Lalchhuanawma A. Myofascial Pain Syndrome: Physical Activity, Nutrition and Health. American Journal of Sports Science and Medicine. 2019 Mar 22;7(1):20–2.

46. Ge HY, Fernández-de-las-Peñas C, Arendt-Nielsen L. Sympathetic facilitation of hyperalgesia evoked from myofascial tender and trigger points in patients with unilateral shoulder pain. Clinical Neurophysiology. 2006 Jul;117(7):1545–50.

47. Schmitter M, Keller L, Giannakopoulos N, Rammelsberg P. Chronic stress in myofascial pain patients. Clinical oral investigations. 2009 Aug 25;14(5):593–7.

48. Lin WC, Shen CC, Tsai SJ, Yang AC. Increased Risk of Myofascial Pain Syndrome Among Patients with Insomnia. Pain Medicine. 2017 Feb 11;18(8):1557–65.

49. Siegfried Mense, Simons DG, I Jon Russell. Muscle pain : understanding its nature, diagnosis, and treatment. Philadelphia: Lippincott Williams & Wilkins; 2001.

50. Holanda L, Fernandes A, Cabral AC, Santos Junior F. Pathophysiology of myofascial trigger points: a review of literature. International Journal of Basic and Applied Sciences. 2014 Dec 30;4(1):73.

51. Shah JP, Phillips TM, Danoff JV, Gerber LH. An in vivo microanalytical technique for measuring the local biochemical milieu of human skeletal muscle. Journal of Applied Physiology. 2005 Nov;99(5):1977–84.

52. Huguenin LK. Myofascial trigger points: the current evidence. Physical Therapy in Sport. 2004 Feb;5(1):2–12.

53. Malanga GA, Cruz Colon EJ. Myofascial Low Back Pain: A Review. Physical Medicine and Rehabilitation Clinics of North America. 2010 Nov;21(4):711–24.

54. Gunn CC. Radiculopathic Pain: Diagnosis and Treatment of Segmental Irritation or Sensitization. Journal of Musculoskeletal Pain. 1997 Jan;5(4):119–34.

55. Yap EC. Myofascial Pain – An Overview. Annals of the Academy of Medicine, Singapore. 2007 Jan 15;36(1):43–8.

56. Hubbard DR, Berkoff GM. Myofascial Trigger Points Show Spontaneous Needle EMG Activity. Spine. 1993 Oct 1;18(13):1803.

57. Rivner MH. The neurophysiology of myofascial pain syndrome. Current Pain and Headache Reports 2001 Oct [cited 2019 Dec 10];5(5):432–40.

58. Borg-Stein J, Simons DG. Myofascial pain. Archives of Physical Medicine and Rehabilitation 2002 Mar;83:S40–7.

59. Bennett R. Myofascial pain syndromes and their evaluation. Best Practice & Research Clinical Rheumatology. 2007 Jun;21(3):427–45.

60. Gerwin RD. Diagnosis of Myofascial Pain Syndrome. Physical Medicine and Rehabilitation Clinics of North America. 2014 May;25(2):341–55.

61. M. Okumus, E. Ceceli, F. Tuncay, S. Kocaoglu, N. Palulu, Z.R. Yorgancioglu. The relationship between serum trace elements, vitamin B12, folic acid and clinical parameters in patients with myofascial pain syndrome. Journal of back and musculoskeletal rehabilitation. 2010 Nov 5;23(4):187–91.

62. Hazleman B, Riley G, Speed C. Soft Tissue Rheumatology. Oxford University Press, USA; 2004.

63. Sikdar S, Shah JP, Gebreab T, Yen RH, Gilliams E, Danoff J, et al. Novel Applications of Ultrasound Technology to Visualize and Characterize Myofascial Trigger Points and Surrounding Soft Tissue. Archives of Physical Medicine and Rehabilitation 2009 Nov;90(11):1829–38.

64. Mcnulty Wh, Gevırtz Rn, Hubbard Dr, Berkoff Gm. Needle electromyographic evaluation of trigger point response to a psychological stressor. Psychophysiology. 1994 May;31(3):313–6.

65. Shultz SP, Driban JB, Swanik CB. The Evaluation of Electrodermal Properties in the Identification of Myofascial Trigger Points. Archives of Physical Medicine and Rehabilitation. 2007 Jun;88(6):780–4.

66. Bron C, Dommerholt J, Stegenga B, Wensing M, Oostendorp RA. High prevalence of shoulder girdle muscles with myofascial trigger points in patients with shoulder pain. BMC Musculoskeletal Disorders. 2011 Jun 28;12(1).

67. Fernández-Carnero, J., Fernández-de-Las-Peñas, C., de la Llave-Rincón, A. I., Ge, H. Y., & Arendt-Nielsen, L. Prevalence of and Referred Pain From Myofascial Trigger Points in the Forearm Muscles in Patients With Lateral Epicondylalgia. The Clinical Journal of Pain. 2007 May;23(4):353–60.

68. Couppé, C., Torelli, P., Fuglsang-Frederiksen, A., Andersen, K. V., & Jensen, R.. Myofascial Trigger Points Are Very Prevalent in Patients With Chronic Tension-type Headache. The Clinical Journal of Pain. 2007 Jan;23(1):23–7.

69. Rashiq S, Galer BS. Proximal Myofascial Dysfunction in Complex Regional Pain Syndrome: A Retrospective Prevalence Study. The Clinical Journal of Pain. 1999 Jun;15(2):151–3.

70. Qerama E, Kasch H, Fuglsang-Frederiksen A. Occurrence of myofascial pain in patients with possible carpal tunnel syndrome - A single-blinded study. European Journal of Pain. 2009 Jul;13(6):588–91.

71. Hong CZ. Treatment of myofascial pain syndrome. Current Pain and Headache Reports. 2006 Sep;10(5):345–9.

72. Fricton J. Myofascial Pain. Oral and Maxillofacial Surgery Clinics of North America 2016 Aug;28(3):289–311.

73. Hotta K, Behnke BJ, Arjmandi B, Ghosh P, Chen B, Brooks R, et al. Daily muscle stretching enhances blood flow, endothelial function, capillarity, vascular volume and connectivity in aged skeletal muscle. The Journal of physiology [Internet]. 2018;596(10):1903–17.

74. Sullivan AB, Scheman J, Venesy D, Davin S. The Role of Exercise and Types of Exercise in the Rehabilitation of Chronic Pain: Specific or Nonspecific Benefits. Current Pain and Headache Reports [Internet]. 2012 Jan 19;16(2):153–61. Available from: https://link.springer.com/article/10.1007/s11916-012-0245-3

75. Azadi F, Nabi Amjad R, Marioryad H, Alimohammadi M, Karimpour Vazifehkhorani A, Poursadeghiyan M. Effect of 12-Week Neck, Core, and Combined Stabilization Exercises on the Pain and Disability of Elderly Patients With Chronic Non-specific Neck Pain: A Clinical Trial. Salmand. 2019 Mar 30;614.

76. Esmaeili Z, Ghani Zadeh Hesar N, Mohammad Ali Nasab Firouzjah E, Roshani S. Comparing the effect of functional corrective exercises versus core stability exercises and a combined program on forward head posture and kyphosis in female adolescence. Journal of Rehabilitation Sciences & Research. 2021 Jun 1;8(2):62–8.

77. Hong CZ. Myofascial Pain Therapy. Journal of Musculoskeletal Pain. 2004 Jan;12(3-4):37–43.

78. Guzmán-Pavón MJ, Cavero-Redondo I, Martínez-Vizcaíno V, Torres-Costoso AI, Reina-Gutiérrez S, Álvarez-Bueno C. Effect of Manual Therapy Interventions on Range of Motion Among Individuals with Myofascial Trigger Points: A Systematic Review and Meta-Analysis. Pain Medicine. 2021 Jul 21;

79. Bingölbali Ö, Taşkaya C, Alkan H, Altındağ Ö. The effectiveness of deep tissue massage on pain, trigger point, disability, range of motion and quality of life in individuals with myofascial pain syndrome. Somatosensory & Motor Research. 2023 Jan 16;1–7.

80. Trampas A, Kitsios A, Sykaras E, Symeonidis S, Lazarou L. Clinical massage and modified Proprioceptive Neuromuscular Facilitation stretching in males with latent myofascial trigger points. Physical Therapy in Sport. 2010 Aug;11(3):91–8.

81. Suresh A, Sudhan S. A Literature Review to Analyse the Outcome of Myofascial Release for Myofascial Pain Syndrome. Journal Of Clinical And Diagnostic Research. 2020;

82. Rodríguez-Huguet M, Rodríguez-Almagro D, Rodríguez-Huguet P, Martín-Valero R, Lomas-Vega R. Treatment of Neck Pain With Myofascial Therapies: A Single Blind Randomized Controlled Trial. Journal of Manipulative and Physiological Therapeutics [Internet]. 2020 Feb 1;43(2):160–70.

83. Melzack R, Wall PD. Pain Mechanisms: A New Theory. Science. 1965 Nov 19;150(3699):971–8.

84. Ahmed S, Haddad C, Subramaniam S, Khattab S, Kumbhare D. The Effect of Electric Stimulation Techniques on Pain and Tenderness at the Myofascial Trigger Point: A Systematic Review. Pain Medicine. 2019 Jan 25;20(9):1774–88.

85. He P, Fu W, Shao H, Zhang M, Xie Z, Xiao J, et al. The effect of therapeutic physical modalities on pain, function, and quality of life in patients with myofascial pain syndrome: a systematic review. BMC musculoskeletal disorders. 2023 May 12;24(1):376.

86. Robertson VJ, Baker KG. A Review of Therapeutic Ultrasound: Effectiveness Studies. Physical Therapy. 2001 Jul 1;81(7):1339–50.

87. van der Windt DAWM, van der Heijden GJMG, van den Berg SGM, ter Riet G, de Winter AF, Bouter LM. Ultrasound therapy for musculoskeletal disorders: a systematic review. Pain. 1999 Jun;81(3):257–71.

88. Kavadar G. Efficacy of conventional ultrasound therapy on myofascial pain syndrome: a placebo controlled study. Ağrı - The Journal of The Turkish Society of Algology. 2015;

89. Hou CR, Tsai LC, Cheng KF, Chung KC, Hong CZ. Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. Archives of Physical Medicine and Rehabilitation. 2002 Oct;83(10):1406–14.

90. Benjaboonyanupap D, Paungmali A, Pirunsan U. Effect of Therapeutic Sequence of Hot Pack and Ultrasound on Physiological Response Over Trigger Point of Upper Trapezius. Asian Journal of Sports Medicine 2015 Sep 1;6(3).

91. Munguia F, Jang J, Salem M, Clark G, Enciso R. Efficacy of Low-Level Laser Therapy in the Treatment of Temporomandibular Myofascial Pain: A Systematic Review and Meta-Analysis. Journal of Oral & Facial Pain and Headache. 2018 Jul;32(3):287–97.

92. Altindiş T, Güngörmüş M. Thermographic evaluation of occlusal splint and low level laser therapy in myofascial pain syndrome. Complementary Therapies in Medicine. 2019 Jun;44:277–81.

93. Magri LV, Carvalho VA, Rodrigues FCC, Bataglion C, Leite-Panissi CRA. Effectiveness of low-level laser therapy on pain intensity, pressure pain threshold, and SF-MPQ indexes of women with myofascial pain. Lasers in Medical Science. 2017 Jan 4;32(2):419–28.

94. Dundar U, Evcik D, Samli F, Pusak H, Kavuncu V. The effect of gallium arsenide aluminum laser therapy in the management of cervical myofascial pain syndrome: a double blind, placebo-controlled study. Clinical Rheumatology 26(6):930–4.

95. Ramon S, Gleitz M, Hernandez L, Romero LD. Update on the efficacy of extracorporeal shockwave treatment for myofascial pain syndrome and fibromyalgia. International Journal of Surgery. 2015 Dec;24:201–6.

96. Wu T, Li S, Ren J, Wang D, Ai Y. Efficacy of extracorporeal shock waves in the treatment of myofascial pain syndrome: a systematic review and meta-analysis of controlled clinical studies. Annals of Translational Medicine. 2022 Feb;10(4):165–5.

97. Király M, Bender T, Hodosi K. Comparative study of shockwave therapy and low-level laser therapy effects in patients with myofascial pain syndrome of the trapezius. Rheumatology International. 2018 Aug 31;38(11):2045–52.

98. Hsieh LF, Hong CZ, Chern SH, Chen CC. Efficacy and Side Effects of Diclofenac Patch in Treatment of Patients with Myofascial Pain Syndrome of the Upper Trapezius. Journal of Pain and Symptom Management. 2010 Jan;39(1):116–25.

99. Haviv Y, Zini A, Sharav Y, Almoznino G, Benoliel R. Nortriptyline Compared to Amitriptyline for the Treatment of Persistent Masticatory Myofascial Pain. Journal of Oral & Facial Pain and Headache. 2019 Jan;33(1):7–13.

100. Bendtsen L, Jensen R. Amitriptyline Reduces Myofascial Tenderness in Patients with Chronic Tension-Type Headache. Cephalalgia. 2000 Jul;20(6):603–10.

101. Comeau D, Otis J, Weller J. Myofascial Pain. Seminars in Neurology. 2018 Dec;38(06):640–3.

102. Cagnie B, Dewitte V, Barbe T, Timmermans F, Delrue N, Meeus M. Physiologic Effects of Dry Needling. Current Pain and Headache Reports. 2013 Jun 26;17(8).

103. Hsieh YL, Yang SA, Yang CC, Chou LW. Dry Needling at Myofascial Trigger Spots of Rabbit Skeletal Muscles Modulates the Biochemicals Associated with Pain, Inflammation, and Hypoxia. Evidence-Based Complementary and Alternative Medicine [Internet]. 2012;2012:1–12.

104. Chu J, Schwartz I. The muscle twitch in myofascial pain relief: effects of acupuncture and other needling methods. Electromyography and clinical neurophysiology [Internet]. 2002 Jul 1 [cited 2024 Jun 14];42(5):307–11.

105. Niddam DM, Chan RC, Lee SH, Yeh TC, Hsieh JC. Central Modulation of Pain Evoked From Myofascial Trigger Point. The Clinical Journal of Pain. 2007 Jun;23(5):440–8

106. Navarro-Santana MJ, Sanchez-Infante J, Fernández-de-las-Peñas C, Cleland JA, Martín-Casas P, Plaza-Manzano G. Effectiveness of Dry Needling for Myofascial Trigger Points Associated with Neck Pain Symptoms: An Updated Systematic Review and Meta-Analysis. Journal of Clinical Medicine. 2020 Oct 14;9(10):3300.

107. Fernández-De-Las-Peñas C, Plaza-Manzano G, Sanchez-Infante J, Gómez-Chiguano GF, Cleland JA, Arias-Buría JL, et al. Is Dry Needling Effective When Combined with Other Therapies for Myofascial Trigger Points Associated with Neck Pain Symptoms? A Systematic Review and Meta-Analysis. Harth M, editor. Pain Research and Management. 2021 Feb 2;2021:1–24.

108. Criscuolo CM. Interventional approaches to the management of myofascial pain syndrome. Current Pain and Headache Reports. 2001 Oct;5(5):407–11.

109. Hong CZ. Considerations and Recommendations Regarding Myofascial Trigger Point Injection. Journal of Musculoskeletal Pain. 1994 Jan;2(1):29–59.

110. Hong CZ. Trigger Point Injections: Dry Needling V8 Lidocaıne Injection. American Journal of Physical Medicine & Rehabilitation. 1992 Aug 1;71(4):251.

111. Wulf G, Höß M, Prinz W. Instructions for Motor Learning: Differential Effects of Internal Versus External Focus of Attention. Journal of Motor Behavior. 1998 Jun;30(2):169–79.

112. Schoenfeld BJ, Contreras B. Attentional Focus for Maximizing Muscle Development. Strength and Conditioning Journal. 2016 Feb;38(1):27–9.

113. Wulf G, Lewthwaite R. Optimizing performance through intrinsic motivation and attention for learning: The OPTIMAL theory of motor learning. Psychonomic Bulletin & Review. 2016 Jan 29;23(5):1382–414.

114. Wulf G, McNevin N, Shea CH. The automaticity of complex motor skill learning as a function of attentional focus. The Quarterly Journal of Experimental Psychology A. 2001 Nov 1;54(4):1143–54.

115. Fitts PM. Perceptual-Motor Skill Learning. Categories of Human Learning. 1964;243–85.

116. Jenkins S. Extended Book Review: Attention and Motor Skill Learning. International Journal of Sports Science & Coaching. 2007 Sep;2(3):329–34.

117. McNevin NH, Shea CH, Wulf G. Increasing the distance of an external focus of attention enhances learning. Psychological Research. 2003 Feb;67(1):22–9.

118. Kal EC, van der Kamp J, Houdijk H. External attentional focus enhances movement automatization: A comprehensive test of the constrained action hypothesis. Human Movement Science. 2013 Aug;32(4):527–39.

119. Chua LK, Jimenez-Diaz J, Lewthwaite R, Kim T, Wulf G. Superiority of external attentional focus for motor performance and learning: Systematic reviews and meta-analyses. Psychological Bulletin. 2021 Jun;147(6):618–45.

120. Wulf G. Attentional focus and motor learning: a review of 15 years. International Review of Sport and Exercise Psychology. 2013 Sep;6(1):77–104.

121. Bell JJ, Hardy J. Effects of Attentional Focus on Skilled Performance in Golf. Journal of Applied Sport Psychology. 2009 May 6;21(2):163–77.

122. Lohse KR, Sherwood DE, Healy AF. How changing the focus of attention affects performance, kinematics, and electromyography in dart throwing. Human Movement Science. 2010 Aug;29(4):542–55.

123. Kim T, Jimenez-Diaz J, Chen J. The effect of attentional focus in balancing tasks: A systematic review with meta-analysis. Journal of Human Sport and Exercise. 2017;12(2).

124. de Bruin ED, Swanenburg J, Betschon E, Murer K. A randomised controlled trial investigating motor skill training as a function of attentional focus in old age. BMC Geriatrics. 2009 May 8;9(1).

125. Wulf G. Attentional Focus Effects in Balance Acrobats. Research Quarterly for Exercise and Sport. 2008 Sep;79(3):319–25.

126. Abdollahipour R, Wulf G, Psotta R, Palomo Nieto M. Performance of gymnastics skill benefits from an external focus of attention. Journal of Sports Sciences [Internet]. 2015;33(17):1807–13.

127. An J, Wulf G, Kim S. Increased Carry Distance and X-Factor Stretch in Golf Through an External Focus of Attention. Journal of Motor Learning and Development. 2013 Mar;1(1):2–11.

128. Hill A, Schücker L, Hagemann N, Strauß B. Further Evidence for an External Focus of Attention in Running: Looking at Specific Focus Instructions and Individual Differences. Journal of Sport and Exercise Psychology. 2017 Oct;39(5):352–65.

129. Schücker L, Hagemann N, Strauss B, Völker K. The effect of attentional focus on running economy. Journal of Sports Sciences. 2009 Oct;27(12):1241–8.

130. Vance J, Wulf G, Töllner T, McNevin N, Mercer J. EMG Activity as a Function of the Performer's Focus of Attention. Journal of Motor Behavior. 2004 Nov;36(4):450–9.

131. Lohse KR, Sherwood DE, Healy AF. Neuromuscular Effects of Shifting the Focus of Attention in a Simple Force Production Task. Journal of Motor Behavior. 2011 Feb 28;43(2):173–84.

132. Zachry T, Wulf G, Mercer J, Bezodis N. Increased movement accuracy and reduced EMG activity as the result of adopting an external focus of attention. Brain Research Bulletin. 2005 Oct;67(4):304–9.

133. Marchant DC, Greig M, Bullough J, Hitchen D. Instructions to Adopt an External Focus Enhance Muscular Endurance. Research Quarterly for Exercise and Sport. 2011 Sep;82(3):466–73.

134. Nadzalan AM, Low J, Mohamad NI. The Effects of Focus Attention Instructions on Strength Training Performances. International Journal of Humanities and Management Sciences 2015 Dec 1;3(6):418–23.

135. Marchant DC, Greig M, Scott C. Attentional Focusing Instructions Influence Force Production and Muscular Activity During Isokinetic Elbow Flexions. Journal of Strength and Conditioning Research. 2009 Nov;23(8):2358–66.

136. Grgic J, Mikulic I, Mikulic P. Acute and Long-Term Effects of Attentional Focus Strategies on Muscular Strength: A Meta-Analysis. Sports. 2021 Nov 12;9(11):153.

137. Abdollahipour R, Land WM, Cereser A, Chiviacowsky S. External relative to internal attentional focus enhances motor performance and learning in visually impaired individuals. Disability and Rehabilitation. 2019 Feb 8;42(18):2621–30.

138. Beck EN, Almeida QJ. Dopa-Responsive Balance Changes Depend on Use of Internal Versus External Attentional Focus in Parkinson Disease. Physical Therapy. 2016 Oct 6;97(2):208–16.

139. Fasoli SE, Trombly CA, Tickle-Degnen L, Verfaellie MH. Effect of Instructions on Functional Reach in Persons With and Without Cerebrovascular Accident. American Journal of Occupational Therapy. 2002 Jul 1;56(4):380–90.

140. Gokeler A, Benjaminse A, Welling W, Alferink M, Eppinga P, Otten B. The effects of attentional focus on jump performance and knee joint kinematics in patients after ACL reconstruction. Physical Therapy in Sport. 2015 May;16(2):114–20.

141. Rotem-Lehrer N, Laufer Y. Effect of Focus of Attention on Transfer of a Postural Control Task Following an Ankle Sprain. Journal of Orthopaedic & Sports Physical Therapy. 2007 Sep;37(9):564–9.

142. Laufer Y, Rotem-Lehrer N, Ronen Z, Khayutin G, Rozenberg I. Effect of Attention Focus on Acquisition and Retention of Postural Control Following Ankle Sprain. Archives of Physical Medicine and Rehabilitation. 2007 Jan;88(1):105–8.

143. Kuzu Ş. Kronik Bel Ağrılı Bireylerde Eksternal Odaklı Dinamik Denge Eğitiminin Ağrı Fonksiyonellik Ve Denge Üzerine Etkilerinin İncelenmesi. 2023;

144. Randomizer.org. 2019. Available from: https://www.randomizer.org/

145. Bernal-Utrera C, Gonzalez-Gerez JJ, Anarte-Lazo E, Rodriguez-Blanco C. Manual therapy versus therapeutic exercise in non-specific chronic neck pain: a randomized controlled trial. Trials. 2020 Jul 28;21(1).

146. Rodriguez CS. Pain measurement in the elderly: A review. Pain Management Nursing. 2001 Jun;2(2):38–46.

147. Rahbar M, Samandarian M, Salekzamani Y, Khamnian Z, Dolatkhah N. Effectiveness of extracorporeal shock wave therapy versus standard care in the treatment of neck and upper back myofascial pain: a single blinded randomised clinical trial. Clinical Rehabilitation. 2020 Jul 30;35(1):102–13.

148. McRoberts LB, Cloud RM, Black CM. Evaluation of the New York Posture Rating Chart for Assessing Changes in Postural Alignment in a Garment Study. Clothing and Textiles Research Journal. 2013 Mar 4;31(2):81–96.

149. Aslan E, Karaduman A, Yakut Y, Aras B, Simsek İE, Yaglý N. The Cultural Adaptation, Reliability and Validity of Neck Disability Index in Patients With Neck Pain. Spine. 2008 May;33(11):E362–5.

150. H. Koçyiğit, Ö. Aydemir, N. Ölmez, A. Memiş. SF-36'nin Türkçe için güvenilirliği ve geçerliliği. Ilaç ve tedavi dergisi,. 1999 Jan 1;12(2):102–6.

151. Soylu C, Kutuk B. Reliability and Validity of the Turkish Version of SF-12 Health Survey. Turkish Journal of Psychiatry. 2021;33.2:108–17.

152. Hisli N. Beck depresyon envanterinin universite ogrencileri icin gecerliligi, guvenilirligi. (A reliability and validity study of Beck Depression Inventory in a university student sample). J. Psychol.,. 1989.

153. Buttagat V, Taepa N, Suwannived N, Rattanachan N. Effects of scapular stabilization exercise on pain related parameters in patients with scapulocostal syndrome: A randomized controlled trial. Journal of Bodywork and Movement Therapies. 2016 Jan;20(1):115–22.

154. Kang T, Kim B. Cervical and scapula-focused resistance exercise program versus trapezius massage in patients with chronic neck pain: A randomized controlled trial. Medicine. 2022 Sep 30;101(39):e30887.

155. Tunwattanapong P, Kongkasuwan R, Kuptniratsaikul V. The effectiveness of a neck and shoulder stretching exercise program among office workers with neck pain: a randomized controlled trial. Clinical Rehabilitation. 2015 Mar 16;30(1):64–72.

156. Aghakeshizadeh F, Letafatkar A, Thomas AC. Internal and external focus show similar effect on the gait kinematics in patients with patellofemoral pain: a randomised controlled trial. Gait & Posture. 2020 Dec;84:155–61.

157. Zamani H, Mahdi Dadgoo, Akbari M, Javad Sarrafzadeh, Mohammadreza Pourahmadi. Effects of External Focus and Motor Control Training in Comparison with Motor Control Training Alone on Pain, Thickness of Trunk Muscles and Function of Patients with Recurrent Low Back Pain: A Single Blinded, Randomized Controlled Trial. PubMed. 2022 Sep 1;10(9):766–74.

158. Homa P, Sadeghı Heydar, Yahya S, Alı Am. The Effect of Two Selected Exercise Protocols alongside Attention Instructions on the Pain and Balance of Male Elderly Suffering Knee Osteoarthritis. SID. 2021;6(3).

159. Ylinen J, Takala EP, Kautiainen H, Nykänen M, Häkkinen A, Pohjolainen T, et al. Effect of long-term neck muscle training on pressure pain threshold: A randomized controlled trial. European Journal of Pain. 2005 Dec;9(6):673–3.

160. Kosek E, Ekholm J. Modulation of pressure pain thresholds during and following isometric contraction. Pain. 1995 Jun;61(3):481–6.

161. Koltyn Kf, Trıne Mr, Stegner Aj, Tobar Da. Effect of isometric exercise on pain perception and blood pressure in men and women. Medicine and Science in Sports and Exercise. 2001 Feb;33(2):282–90.

162. Vaegter HB, Jones MD. Exercise-induced hypoalgesia after acute and regular exercise: experimental and clinical manifestations and possible mechanisms in individuals with and without pain. PAIN Reports. 2020 Sep;5(5):e823.

163. Lannersten L, Kosek E. Dysfunction of endogenous pain inhibition during exercise with painful muscles in patients with shoulder myalgia and fibromyalgia. Pain. 2010 Oct;151(1):77–86.

164. Burrows NJ, Booth J, Sturnieks DL, Barry BK. Acute resistance exercise and pressure pain sensitivity in knee osteoarthritis: a randomised crossover trial. Osteoarthritis and Cartilage. 2014 Mar;22(3):407–14.

165. Henriksen M, Klokker L, Graven-Nielsen T, Bartholdy C, Schjødt Jørgensen T, Bandak E, et al. Association of Exercise Therapy and Reduction of Pain Sensitivity in Patients With Knee Osteoarthritis: A Randomized Controlled Trial. Arthritis Care & Research [Internet]. 2014 Nov 24;66(12):1836–43. Available from: https://onlinelibrary.wiley.com/doi/full/10.1002/acr.22375

166. Diotaiuti P, Corrado S, Mancone S, Falese L, Rodio A, Siqueira TC, et al. Influence of Cognitive Orientation and Attentional Focus on Pain Perception. International Journal of Environmental Research and Public Health. 2021 Jul 5;18(13):7176.

167. Chayadi E, McConnell BL. Gaining insights on the influence of attention, anxiety, and anticipation on pain perception. Journal of Pain Research. 2019 Mar; Volume 12:851–64.

168. Duyur Çakıt B, Genç H, Altuntaş V, Erdem HR. Disability and related factors in patients with chronic cervical myofascial pain. Clinical Rheumatology. 2009 Feb 18;28(6):647–54.

169. Muñoz-Muñoz S, Muñoz-García MT, Alburquerque-Sendín F, Arroyo-Morales M, Fernández-de-las-Peñas C. Myofascial Trigger Points, Pain, Disability, and Sleep Quality in Individuals With Mechanical Neck Pain. Journal of Manipulative and Physiological Therapeutics. 2012 Oct;35(8):608–13.

170. Letafatkar A, Rabiei P, Alamooti G, Bertozzi L, Farivar N, Afshari M. Effect of therapeutic exercise routine on pain, disability, posture, and health status in dentists with chronic neck pain: a randomized controlled trial. International Archives of Occupational and Environmental Health. 2019 Oct 25;93, 281-290.

171. Jones LB, Jadhakhan F, Falla D. The influence of exercise on pain, disability and quality of life in office workers with chronic neck pain: A systematic review and meta-analysis. Applied Ergonomics 2024 May 1;117:104216.

172. Telli H, Sağlam G. Scapular dyskinesis and loss of cervical lordosis in myofascial pain syndrome and its effects on pain and posture disorders. Turkish Journal of Physical Medicine and Rehabilitation [Internet]. 2022 Dec 3;69(2):188–99.

173. Besta Hazal Gumuscu, Eylul Pinar Kisa, Begum Kara Kaya, Rasmi Muammer. Comparison of three different exercise trainings in patients with chronic neck pain: A randomized controlled study. Korean J Pain 2023 Mar 21;36(2):242–52.

174. Lalchhuanawma A, Sanghi D. The Link Between Emotional and Psychological Distress with Myofascial Pain Syndrome. American Journal of Sports Science. 2019;7(4):177.

175. Altindag O, Gur A, Altindag A. The Relationship Between Clinical Parameters and Depression Level in Patients with Myofascial Pain Syndrome: Table 1. Pain Medicine. 2008 Mar;9(2):161–5.

176. Esenyel M, Caglar N, Aldemir T. Treatment of Myofascial Pain. American Journal of Physical Medicine & Rehabilitation 2000;79(1):48.

177. Çeliker R, Atalay A, Guven Z. Health-related Quality of Life in Patients with Myofascial Pain Syndrome. Current Pain and Headache Reports. 2010 Aug 6;14(5):361–6.

178. Bal S, Çeliker R. Health-Related Quality of Life in Patients with Myofascial Pain Syndrome: A Controlled Clinical Study. Journal of Musculoskeletal Pain. 2009 Jan;17(2):173–7.

179. Sahin N, Karataş O, Ozkaya M, Cakmak A, Berker E. Demographics features, clinical findings and functional status in a group of subjects with cervical myofascial pain syndrome. The Journal of the Turkish Society of Algology. 2008 Jul 1;20(3):14–9.

180. Cuesta-Vargas AI, González-Sánchez M, Casuso-Holgado MJ. Effect on health-related quality of life of a multimodal physiotherapy program in patients with chronic musculoskeletal disorders. Health and Quality of Life Outcomes. 2013;11(1):19.

181. Salo P, Ylönen-Käyrä N, Häkkinen A, Kautiainen H, Mälkiä E, Ylinen J. Effects of long-term home-based exercise on health-related quality of life in patients with chronic neck pain: A randomized study with a 1-year follow-up. Disability and Rehabilitation. 2012 Mar 19;34(23):1971–7.

8. APPENDIX

8.1. Ethical Approval Form

T.C.
MARMARA ÜNİVERSİTESİ
Sağlık Bilimleri Fakültesi
Girişimsel Olmayan Klinik Çalışmalar Etik Kurulu

PROJENİN ADI	: "Miyofasyal Ağrı Sendromlu Hastalarda Dikkat Odağı Stratejilerinin Ağrı, Disabilite, Postür, Yaşam Kalitesi Ve Depresyon Üzerindeki Etkilerinin İncelenmesi"
PROJENİN YÜRÜTÜCÜSÜ	: Dr. Öğr. Üyesi Elif Tuğçe ÇİL
PROJEDEKİ ARAŞTIRICILAR	: Yağmur BARLAS
ONAY TARİHİ VE SAYISI	: 25.01.2024/03

Sayın: Dr. Öğr. Üyesi Elif Tuğçe ÇİL

"03" protokol numaralı "Miyofasyal Ağrı Sendromlu Hastalarda Dikkat Odağı Stratejilerinin Ağrı, Disabilite, Postür, Yaşam Kalitesi Ve Depresyon Üzerindeki Etkilerinin İncelenmesi" İsimli projeniz Fakültemiz Etik Kurulu tarafından incelenmiş oy birliği ile etik yönden uygun olduğuna karar verilmiştir.

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Marmara Üniversitesi Sağlık Bilimleri Fakültesi 34854 Başıbüyük/Maltepe /İSTANBUL
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sbfetikkurul@gmail.com
http://sbf.marmara.edu.tr

8.2. Informed Consent Form

Sayın Katılımcı,

Yukarıda adı yazılı araştırmaya katılmak üzere davet edilmiş bulunmaktasınız. Bu araştırmada yer almayı kabul etmeden önce, araştırmanın ne amaçla yapılmak istendiğini anlamanız ve bu bilgilendirme sonucunda kararınızı vermeniz gerekmektedir. Aşağıdaki bilgileri lütfen dikkatlice okuyunuz, sorularınız olursa sorunuz ve açık yanıtlar isteyiniz.

Bu araştırma ile miyofasyal ağrı sendromlu hastalarda dikkat odağı stratejilerinin ağrı, disabilite, postür, yaşam kalitesi ve depresyon üzerindeki etkilerinin incelenmesi amaçlanmıştır ve literatürdeki eksikliğin giderilmesi hedeflenmiştir. Araştırma için Kadıköy Florence Nightingale Hastanesi Tıp Merkezi'nden izin alınmıştır. Araştırmaya sizin dışınızda 35 kişi katılacaktır. Sizden bu çalışmada 6 hafta süreyle haftada 2 gün olacak şekilde fizyoterapist eşliğinde egzersiz programına katılmanız ve çalışma öncesi ve sonrasında olmak üzere 3 adet anket doldurmanız istenecek ve araştırmacı tarafından postürünüz (duruşunuz) değerlendirilecek ve dijital bir algometre yardımı ile ağrılı noktalardaki basınç ağrı eşiğiniz ölçülecektir. Egzersizler yaklaşık 45 dakika sürecek, değerlendirmeleriniz ise yaklaşık 15 dakika sürecekir. Bunun size ve yakınlarınıza hiçbir zararı olmayacaktır. Çalışmaya katılmakla parasal yük altına girmeyeceksiniz ve size de herhangi bir ödeme yapılmayacaktır.

Bu araştırmaya katılıp katılmamakta tümüyle özgürsünüz. Gerek duyduğunuz tüm bilgileri istemeye ve doğru, açık, anlaşılır bilgi almaya hakkınız vardır. Araştırmaya katılmayı istemezseniz burada size verilen hizmet olumlu veya olumsuz şekilde etkilenmeyecektir. Gerekli gördüğü takdirde araştırmanın herhangi bir kısmında katılımcı araştırmadan çıkabilir, araştırmacı çalışmayı sonlandırabilir. Araştırmanın tüm aşamalarında kimlik bilgileriniz gizli tutulacaktır. Araştırma kapsamında elde edilen bilgiler bilimsel amaçlarla kullanılabilir gizlilik kurallarına uyulmak kaydıyla sunulabilir ve yayınlanabilir.

Araştırma ile ilgili daha fazla bilgiye ihtiyaç duyarsanız araştırmacı Yağmur Barlas'a ……… numaralı telefondan günün 24 saati ulaşabilirsiniz.

Yukarıda yer alan ve araştırmaya başlanmadan önce katılımcılara verilmesi gereken bilgileri içeren metni okudum (ya da sözlü olarak dinledim). Araştırma kapsamında elde edilen şahsıma ait bilgilerin bilimsel amaçlarla kullanılmasını, gizlilik kurallarına uyulmak kaydıyla sunulmasını ve yayınlanmasını, hiçbir baskı ve zorlama altında kalmaksızın, kendi özgür irademle kabul ettiğimi beyan ederim.

Katılımcının

Adı Soyadı:
Adresi:
Telefon Numarası:
Tarih/İmzası:

Araştırmacının

Adı-Soyadı:
Adresi:
Telefon Numarası:
Tarih/İmzası:

8.3. Demographic Information Form

Adınız-Soyadınız:

Cinsiyetiniz:

Doğum tarihiniz (Gün/Ay/Yıl):

Boyunuz (m):

Kilonuz (kg):

Mesleğiniz:

( ) Çalışıyor

( ) Emekli

( ) İşsiz

Eğitim Durumunuz:

( ) İlkokul

( ) Lise

( ) Yüksek öğretim (üniversite, lisans, yüksek lisans, doktora)

Sigara Kullanımı:

( ) Var

( ) Yok

Dominant Taraf:

( ) Sağ

( ) Sol

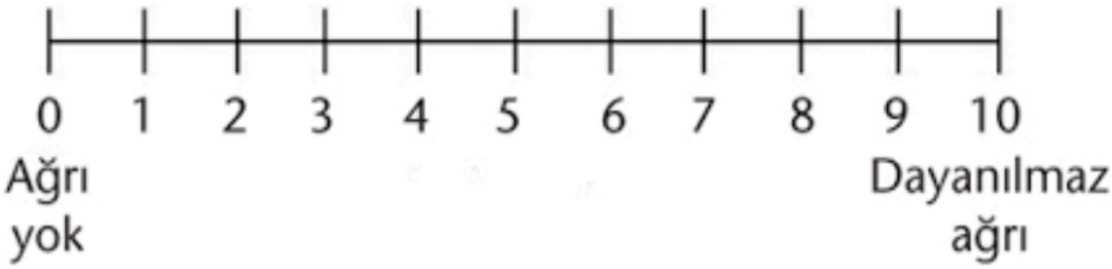
Kronik bir rahatsızlığınız var mıdır? Varsa lütfen hastalığınızı belirtiniz.

…………………………………………………………………………………..

Daha önce geçirmiş olduğunuz bir cerrahi var mıdır? Varsa lütfen belirtiniz.

……………………………………………………………………………………

8.4. Numeric Pain Rating Scale



Tedavi Öncesi	
Tedavi Sonrası	

8.5. Neck Disability Index

Boyun Özürlülük Sorgulama Anketi
(Neck Disability Index)

Hastanın Adı Soyadı: ____________________ Tarih: ..../..../......

Bu sorgulama formu boyun ağrınızın günlük yaşam aktivitelerinizi yerine getirme yeteneklerinizi nasıl etkilediğini anlamamıza yardımcı olacak şekilde tasarlanmıştır. Lütfen her bölümdeki bir kutucuğu işaretleyiniz. Bir bölümde birden çok yanıtı kendinize yakın hissetseniz bile, şu anki durumunuza en yakın olan seçeneği işaretleyiniz.

1

Boyunda Ağrı Yoğunluğu

A - Şu anda hiç boyun ağrım yok.
B - Şu anda çok hafif derecede boyun ağrım var.
C - Boyun ağrım orta derecede ve gelip gidiyor.
D - Boyun ağrım orta şiddette ve değişkenlik göstermiyor.
E - Boyun ağrım şiddetli fakat gelip gidiyor.
F - Boyun ağrım şiddetli ve değişkenlik göstermiyor.

2

Kişisel Bakım (giyinme ve temizlenme)

A - Ek bir ağrıya neden olmadan kendime bakabiliyorum.
B - Kendime normal olarak bakabiliyorum fakat bu ek bir ağrıya neden oluyor.
C - Kendi bakımımı yaparken ağrım artıyor, yavaşlıyorum ve dikkatli oluyorum.
D - Biraz yardıma ihtiyacım var fakat kişisel bakımımın çoğunu yapabiliyorum.
E - Kişisel bakımım ile ilgili işlerin çoğunda her gün yardıma ihtiyacım var.
F - Giyinemiyorum. Zorlukla yıkanıyorum ve yataktan çıkmıyorum.

3

Yük Kaldırma (boyun ağrınız olmadığı zamanlarda kaldırdığınız ağır yüklere eşit ağırlıkta)

A - Ek bir ağrı hissetmeden ağır yükleri kaldırabiliyorum.
B - Ağır yükleri kaldırabiliyorum, fakat ek bir ağrıya neden oluyor.
C - Ağrı yükleri yerden kaldırmama engel oluyor, fakat yükler, örneğin masa üstü gibi uygun bir yere yerleştirilirse kaldırabiliyorum.
D - Ağrı ağır yük kaldırmama engel oluyor, fakat hafif ve orta ağırlıktaki yükler örneğin masa üstü gibi uygun bir yere yerleştirilirse kaldırabiliyorum.
E - Çok hafif yükleri kaldırabiliyorum.
F - Hiçbir şeyi kaldıramıyorum ve taşıyamıyorum.

4

Okuma

A - Hiç boyun ağrısı hissetmeden istediğim kadar okuyabiliyorum.
B - Hafif bir boyun ağrısı hissederek istediğim kadar okuyabiliyorum.
C - Orta derecede boyun ağrısı hissederek istediğim kadar okuyabiliyorum.
D - Boynumda orta derecede ağrı nedeniyle istediğim kadar okuyamıyorum.
E - Boynumda şiddetli ağrı nedeniyle istediğim kadar okuyamıyorum.
F - Boyun ağrısı nedeniyle hiç okuyamıyorum.

5

Baş ağrıları

A - Hiç baş ağrım yok.
B - Sık olmayan hafif baş ağrılarım var.
C - Orta derecede baş ağrılarım var.
D - Sık gelen orta derecede baş ağrılarım var.
E - Sık gelen ağır derecede baş ağrılarım var.
F - Hemen hemen her zaman baş ağrılarım var.

6

Konsantrasyon

A - İstediğim zaman dikkatimi hiç zorlanmadan istediğim kadar toplayabiliyorum.
B - Hafifçe zorlanarak dikkatimi toplayabiliyorum.
C - İstediğim zaman biraz zorlanarak dikkatimi toplayabiliyorum.
D - İstediğim zaman epeyce zorlanarak dikkatimi toplayabiliyorum.
E - İstediğim zaman dikkatimi toplamakta çok fazla zorlanıyorum.
F - Dikkatimi hiç toplayamıyorum..

7

İş (Herhangi bir işte çalışmıyorsanız lütfen G seçeneğini işaretleyiniz)

A - İstediğim kadar iş yapabilirim.
B - Her günkü işlerimi yapabilirim, ama daha fazlasını yapamam.
C - Her günkü işlerimin çoğunu yapabilirim, daha fazlasını yapamam.
D - Her günkü işlerimi yapamam.
E - Herhangi bir işi zorlukla yapabilirim.
F - Hiçbir iş yapamam

8

Araba Kullanma

A - Boyun ağrısı hissetmeden araba kullanabiliyorum.
B-Boynumda hafif bir ağrı hissi ile istediğim kadar araba kullanabiliyorum.
C - Boynumda orta derecede ağrı nedeni ile istediğim kadar araba kullanamıyorum.
D - Orta derecede bir boyun ağrısı nedeniyle istediğim kadar araba kullanamıyorum.
E - Boynumda şiddetli ağrı nedeniyle güçlükle araba kullanabiliyorum.
F - Boyun ağrısı nedeniyle hiç araba kullanamıyorum.

9

Uyku

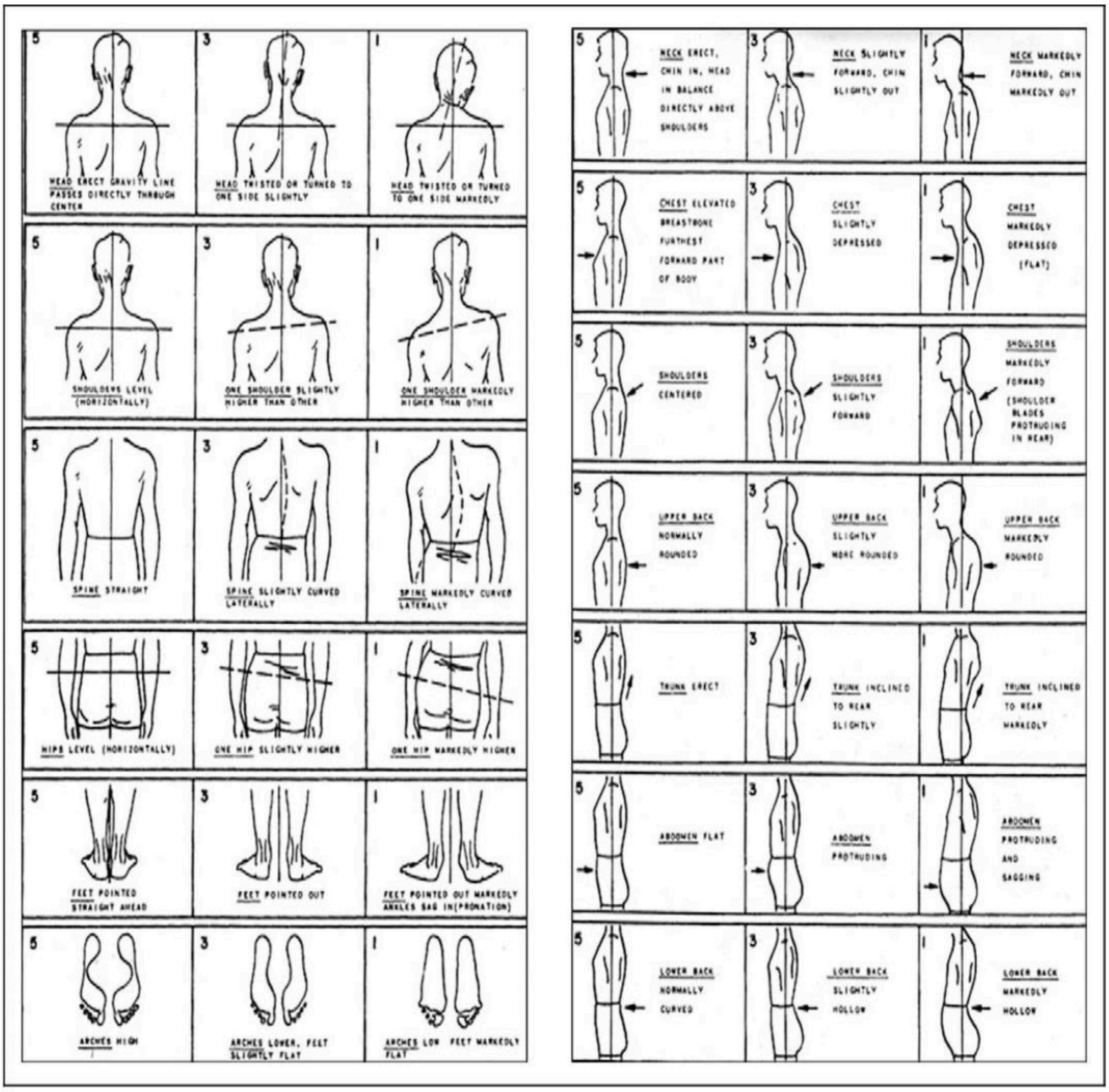
A - Uyku problemim yok.
B - Uykum çok hafif bozuk (bir saatten az süreyle biraz bozuk).
C - Uykum hafif bozuk (1-2 saat uykusuzluk).
D - Uykum orta derecede bozuk (2-3 saat kadar süren uykusuzluk).
E - Uykum çok bozuk (3-5 saat süreyle uykusuzluk).
F-Uykum tamamen bozuk (5-7 saat süresince uykusuzluktur).

10

Boş zaman aktiviteleri

A - Tüm boş zaman aktivitelerine boynumda ağrı hissetmeden katılabiliyorum.
B - Tüm boş zaman aktivitelerine boynumda biraz ağrı hissederek katılabiliyorum.
C-Boynumdaki ağrı nedeni ile tüm boş zaman aktivitelerinin bir kısmına katılabiliyorum.
D-Boynumdaki ağrı nedeni ile boş zaman aktivitelerinin çok az bir kısmına katılabiliyorum.
E-Boynumdaki ağrı nedeni ile boş zaman aktivitelerine hemen hemen hiç katılamıyorum.
F - Hiç bir aktiviteye hiç bir şekilde katılamıyorum.

8.6. Newyork Posture Rating Chart



Tedavi Öncesi Skor	
Tedavi Sonrası Skor	

8.7. SF-12 Quality of Life Questionnaire

SF-12 SAGLIK DENETIMI

SF-12 sağlık denetimi sağlığınız hakkındaki görüşlerinizi sorgulamaktadır. Bu test ile nasıl hissettiğiniz ve genel aktivitelerinizde ne kadar iyi olduğunuz hakkında bilgi sahibi olabilirsiniz.

Her sorunun yanıtını istenildiği gibi işaretleyiniz. Eğer sorunun cevabından emin değilseniz verebildiğiniz en iyi cevabı veriniz.

1- Genelde sağlık durumunuz nasıldır? (bir tanesini işaretleyiniz)

Mükemmel	Çok iyi	İyi	Fena değil	Kötü
1	2	3	4	5

2- Aşağıdakiler gün içinde yapabileceğiniz aktivitelerden bazılarıdır. Bu aktiviteler sırasında sağlığınız sizi kısıtlıyor mu? Kısıtlıyorsa ne kadar? (her satırdan bir numarayı işaretleyiniz)

AKTİVİTELER	EVET çok kısıtlandı	EVET az kısıtlandı	HAYIR kısıtlanmadı
a- Masayı hareket ettirmek, elektrik süpürgesini itmek, bowling yada golf gibi orta dereceli aktiviteler	1	2	3
b- Merdivenin pek çok basamağını çıkmak	1	2	3

3- <u>Geçen 4 hafta</u> boyunca günlük aktiviteleriniz ya da işiniz sırasında <u>fiziksel sağlığınız nedeniyle</u> aşağıdaki problemlerle karşılaştınız mı? (her satırdan bir numarayı işaretleyiniz)

	EVET	HAYIR
a- İstediğinizden daha azını başarabilme	1	2
b- İşiniz yada diğer aktiviteleriniz sırasında gerekli performansı göstermekte zorlanma (örneğin daha fazla efor sarfetmek)	1	2

4- <u>Geçen 4 hafta</u> boyunca günlük aktiviteleriniz ya da işiniz sırasında <u>duygusal problemleriniz nedeniyle</u> aşağıdaki problemlerle karşılaştınız mı? (her satırdan bir numarayı işaretleyiniz)

	EVET	HAYIR
a- İstediğinizden daha azını başarabilme	1	2
b- İşiniz yada diğer aktiviteleriniz sırasında her zaman olduğunuz kadar dikkatli olamama	1	2

5- <u>Geçen 4 hafta</u> boyunca ağrınız normal işinizi (ev işleri ve ev dışındaki işleri kapsamak üzere) ne kadar aksattı? (bir tanesini işaretleyiniz)

Hiç	Çok az	Orta derecede	Fazla	Oldukça fazla
1	2	3	4	5

6- Aşağıdaki sorular sizin <u>geçen 4 hafta</u> boyunca nasıl hissettiğiniz hakkındadır. Her soru için hissettiğinize en yakın şıkkı işaretleyiniz. <u>Geçen 4 hafta</u> boyunca ne kadar sıklıkla; (Her satırdan bir numara işaretleyiniz)

	Tüm hafta	Çoğu zaman	Sıklıkla	Bazen	Nadiren	Hiçbir zaman
a- Kendinizi sakin ve huzurlu hissettiniz?	1	2	3	4	5	6
b- Kendinizi enerjik hissettiniz?	1	2	3	4	5	6
c-Kendinizi hiçbir şeyin sizi mutlu edemeyeceği kadar kederli hissettiniz ?	1	2	3	4	5	6

7- <u>Geçen 4 hafta</u> boyunca ne kadar sıklıkla sosyal aktiviteleriniz (arkadaşlarınızı ziyaret etmek gibi) <u>fiziksel sağlığınız ya da duygusal problemleriniz</u> nedeniyle engellendi? (Bir tanesini işaretleyiniz)

Her zaman	Çoğu zaman	Bazen	Nadiren	Hiç
1	2	3	4	5

8.8. Beck Depression Inventory

Beck Depresyon Ölçeği

Hastanın Adı Soyadı: ____________________ Tarih: ___/___/______

Aşağıda 21 maddeden oluşan formda yazılı seçenekleri dikkatlice okuyunuz. Geçtiğimiz bir (1) hafta içindeki kendi ruh durumunuzu göz önünde bulundurarak size en çok uyan, yani sizin durumunuzu en iyi anlatan 'bir' ifadeyi işaretleyiniz.

1
- ☐ 0 Kendimi üzüntülü ve sıkıntılı hissetmiyorum.
- ☐ 1 Kendimi üzüntülü ve sıkıntılı hissediyorum.
- ☐ 2 Hep üzüntülü ve sıkıntılıyım.
- ☐ 3 O kadar üzüntülü ve sıkıntılıyım ki artık dayanamıyorum

2
- ☐ 0 Gelecekten umutsuz ve karamsar değilim.
- ☐ 1 Gelecek için karamsarım.
- ☐ 2 Gelecekten hiçbir şey beklemiyorum.
- ☐ 3 Geleceğimden umutsuzum ve sanki hiçbir şey düzelmeyecekmiş gibi geliyor.

3
- ☐ 0 Kendimi başarısız bir insan olarak görmüyorum.
- ☐ 1 Kendimi çevremdeki birçok kişiden daha başarısız hissediyorum.
- ☐ 2 Geçmişime baktığımda başarısızlıklarla dolu olduğunu görüyorum.
- ☐ 3 Kendimi tümüyle başarısız bir insan olarak görüyorum.

4
- ☐ 0 Birçok şeyden eskisi kadar zevk alıyorum.
- ☐ 1 Her şeyden eskisi gibi hoşlanmıyorum.
- ☐ 2 Artık hiçbir şey tam anlamıyla zevk vermiyor.
- ☐ 3 Her şeyden sıkılıyorum.

5
- ☐ 0 Sağlığım beni fazla endişelendirmiyor.
- ☐ 1 Ağrı, sancı, mide bozukluğu veya kabızlık gibi rahatsızlıklar beni endişelendiriyor.
- ☐ 2 Sağlık endişem nedeniyle başka şeyleri düşünmem zorlaşıyor.
- ☐ 3 Sağlığımdan o kadar endişeliyim ki başka hiçbir şey düşünemiyorum.

6
- ☐ 0 Bana cezalandırılmışım gibi geliyor.
- ☐ 1 Cezalandırılabileceğimi seziyorum.
- ☐ 2 Cezalandırılmayı bekliyorum.
- ☐ 3 Cezalandırıldığımı hissediyorum.

7
- ☐ 0 Kendimden hoşnutum
- ☐ 1 Kendimden pek hoşnut değilim.
- ☐ 2 Kendime kızıyorum.
- ☐ 3 Kendimden nefret ediyorum.

8
- ☐ 0 Başkalarından daha kötü olduğumu sanmıyorum.
- ☐ 1 Zayıf yanlarım ve hatalarımdan dolayı kendi kendimi eleştiririm.
- ☐ 2 Hatalarımdan dolayı her zaman kendimi kabahatli bulurum.
- ☐ 3 Her aksilik karşısında kendimi kabahatli bulurum.

9
- ☐ 0 Kendimi öldürmek gibi düşüncelerim yok.
- ☐ 1 Zaman zaman kendimi öldürmeyi düşündüğüm oluyor.
- ☐ 2 Kendimi öldürmek isterdim
- ☐ 3 Fırsatını bulsam kendimi öldürürdüm.

10
- ☐ 0 İçimden her zamankinden fazla ağlamak gelmiyor.
- ☐ 1 Zaman zaman içimden ağlamak geliyor.
- ☐ 2 Çoğu zaman ağlıyorum.
- ☐ 3 Eskiden ağlayabilirdim şimdi istesem de ağlayamıyorum.

11
- ☐ 0 Diğer insanlara karşı ilgimi kaybetmedim.
- ☐ 1 Eskisine göre insanlarla daha az ilgiliyim.
- ☐ 2 Diğer insanlara karşı ilgimin çoğunu kaybettim.
- ☐ 3 Diğer insanlara karşı hiç ilgim kalmadı.

12
- ☐ 0 Şimdi her zaman olduğumdan daha sinirli değilim.
- ☐ 1 Eskisine göre daha kolay kızıyor veya sinirleniyorum.
- ☐ 2 Şimdi hep sinirliyim.
- ☐ 3 Bir zamanlar beni sinirlendiren şeyler şimdi hiç sinirlendirmiyor.

13
- ☐ 0 Eskiden olduğu kadar kolay karar verebiliyorum.
- ☐ 1 Eskiden olduğu kadar kolay karar veremiyorum
- ☐ 2 Karar verirken eskisine göre çok güçlük çekiyorum.
- ☐ 3 Artık hiç karar veremiyorum.

14
- ☐ 0 Aynaya baktığımda kendimde bir değişiklik görmüyorum.
- ☐ 1 Daha yaşlanmışım ve çirkinleşmişim gibime geliyor.
- ☐ 2 Görünüşümün çok değiştiğini ve daha çirkinleştiğimi hissediyorum.
- ☐ 3 Kendimi çok çirkin buluyorum.

15
- ☐ 0 Eskisi kadar iyi çalışabiliyorum.
- ☐ 1 Bir şeyler yapabilmek için gayret göstermem gerekiyor.
- ☐ 2 Bir şeyler yapabilmek için kendimi çok zorlamam gerekiyor.
- ☐ 3 Hiçbir şey yapamıyorum.

16
- ☐ 0 Her zamanki gibi uyuyabiliyorum.
- ☐ 1 Eskiden olduğu gibi uyuyamıyorum.
- ☐ 2 Her zamankinden bir iki saat daha erken uyanıyorum ve yeniden uyuyamıyorum.
- ☐ 3 Her zamankinden çok daha erken uyanıyorum ve yeniden uyuyamıyorum.

17
- ☐ 0 Her zamankinden daha çabuk yorulmuyorum.
- ☐ 1 Her zamankinden daha çabuk yoruluyorum.
- ☐ 2 Yaptığım her şey beni yoruyor.
- ☐ 3 Kendimi hiçbir şey yapamayacak kadar yorgun hissediyorum.

18
- ☐ 0 İştahım her zamanki gibi.
- ☐ 1 İştahım eskisi kadar iyi değil.
- ☐ 2 İştahım çok azaldı.
- ☐ 3 Artık hiç iştahım yok.

19
- ☐ 0 Son zamanlarda kilo vermedim.
- ☐ 1 İki kilodan fazla kilo verdim.
- ☐ 2 Dört kilodan fazla kilo verdim.
- ☐ 3 Altı kilodan daha fazla kilo verdim

20
- ☐ 0 Kendimi herhangi bir şekilde suçlu hissetmiyorum.
- ☐ 1 Kendimi zaman zaman suçlu hissediyorum.
- ☐ 2 Çoğu zaman kendimi suçlu hissediyorum.
- ☐ 3 Kendimi her zaman suçlu hissediyorum.

21
- ☐ 0 Cinsel konulara olan ilgimde bir değişme fark etmedim
- ☐ 1 Cinsel konulara eskisinden daha az ilgiliyim.
- ☐ 2 Cinsel konulara şimdi çok daha az ilgiliyim.
- ☐ 3 Cinsel konulara olan ilgimi tamamen kaybettim.

Toplam Puan (0-63): ___________

Aaron T Beck (1988) Clinical Psychology Review, Vol. 8, pp. 77-100, 1988

Tasarım ve düzenleme: Dr. Ender Salbaş 2019

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8.9. Pressure Pain Threshold Assessment

BASINÇ AĞRI EŞİĞİ ÖLÇÜMÜ

Tedavi Öncesi:

Etkilenen Bölge	Algometre Ölçüm Değerleri	Ortalama Değer
1.	1.	
	2.	
	3.	
2.	1.	
	2.	
	3.	
3.	1.	
	2.	
	3.	
4.	1.	
	2.	
	3.	

Tedavi Sonrası:

Etkilenen Bölge	Algometre Ölçüm Değerleri	Ortalama Değer
1.	1.	
	2.	
	3.	
2.	1.	
	2.	
	3.	
3.	1.	
	2.	
	3.	
4.	1.	
	2.	
	3.	

8.10. Curriculum Vitae

Kişisel Bilgiler

Adı	YAĞMUR	Soyadı	BARLAS

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora			
Yüksek Lisans			
Lisans	Fizyoterapi ve Rehabilitasyon	**T.C. Yeditepe Üniversitesi**	2021
Lise	-		

Bildiği Yabancı Dilleri	Yabancı Dil Sınav Notu (#)

Başarılmış birden fazla sınav varsa(KPDS, ÜDS, TOEFL; EELTS vs), tüm sonuçlar yazılmalıdır

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
Fizyoterapist	Florence Nightingale Hastanesi	2023-devam
		-

Bilgisayar Bilgisi

Program	Kullanma becerisi

*Çok iyi, iyi, orta, zayıf olarak değerlendirin

Bilimsel Çalışmaları

SCI, SSCI, AHCI indekslerine giren dergilerde yayınlanan makaleler

Diğer dergilerde yayınlanan makaleler

Uluslararası bilimsel toplantılarda sunulan ve bildiri kitabında (*Proceedings*) basılan bildiriler

Hakemli konferans/sempozyumların bildiri kitaplarında yer alan yayınlar

Diğer (Görev Aldığı Projeler/Sertifikaları/Ödülleri)
