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YEDİTEPE UNIVERSITY
INSTITUTE OF HEALTH SCIENCES
DEPARTMENT OF PHYSIOTHERAPY AND REHABILITATION

**THE EFFECTS OF MULLIGAN CONCEPT
AMONG DESK WORKERS WITH NON-SPECIFIC
CHRONIC NECK PAIN**

MASTER OF THESIS

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APPROVAL

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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 that has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

ASLIHAN SEZEN, PT.



DEDICATION

I would like to dedicate my thesis to my dear husband Yunus Küçüktepe, my beloved mother Zekiye Okul and my biggest supporter Alper Okul.

ASLIHAN SEZEN



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LIST OF SYMBOLS AND ABBREVIATIONS

AAL	Anterior Longitudinal Ligament
CNP	Chronic Neck Pain
DZ	Dizygotic
ET	Exercise Therapy
HP	Hot-Pack
MMT	Mulligan Mobilization Technique
MT	Manuel Therapy
MZ	Monozygotic
NAGs	Natural Apophyseal Glides
NCNP	Non-specific Chronic Neck Pain
NDI	Neck Disability Index
NP	Neck Pain
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
PLL	Posterior Longitudinal Ligament
ROM	Range Of Motion
SCC	Sternocleidomastoid
SF-36	Short-Form 36
SMT	Spinal Manipulative Therapy
SNAGs	Sustained Natural Apophyseal Glides
TENS	Transcutaneous Electrical Nerve Stimulation
US	Ultrasound
VAS	Visuel Analog Skale
WADs	Post-impact Disorders

ABSTRACT

Sezen, A (2024). The Effects Of Mulligan Concept Among Desk Workers With Non-Specific Chronic Neck Pain. Yeditepe University Institute of Health Sciences, Department of Physiotherapy Master's Thesis, Istanbul.

The aim of this study was to compare the effects of the Mulligan mobilization technique versus placebo on pain, range of motion, muscle strength, neck disability level and quality of life in desk workers with chronic neck pain of unknown cause. The study included 30 desk workers aged 18-60 years with non-specific chronic neck pain. The 30 participants who volunteered for the study were divided into 2 groups as Mulligan (n=15) and Placebo (n=15). Participants who scored at least 5 points on the Neck Disability Index score were included in the study. Mulligan technique was applied to the Mulligan group, while Sham-Mulligan was applied to the placebo group. Pain Visual Analog Scale (VAS), Range of Motion (ROM) universal goniometer, muscle endurance Chattanooga Stabilizer Pressure biofeedback unit, Neck Disability Index (NDI) and Quality of Life (SF-36) values were recorded before and after treatment. Participants were treated for 12 sessions 3 times a week for a total of 4 weeks. Physical therapy modalities of TENS for 20 minutes, US for 5 minutes and HOTPACK for 20 minutes were applied to both groups. As a result of the study, it was found that there was a statistically significant difference between the groups in pain (VAS) and ROM values in flexion, right and left rotation, right and left lateral flexion ($p<0.05$). At the end of the study, VAS and ROM (flexion, right and left rotation, right and left lateral flexion) improved more significantly in the Mulligan group than in the placebo group ($p<0.05$). Muscle endurance showed a significant improvement in the Mulligan group ($p<0.05$). However, no significant difference was observed between the groups ($p>0.05$). The mean neck disability indicator was statistically higher in the Mulligan and Placebo groups pretest than posttest ($p<0.05$). However, no significant difference was found between the groups. There was no significant difference in SF-36 results between the groups ($p>0.05$). In conclusion, Mulligan mobilization technique may reduce pain and improve joint motion limitation in desk workers with chronic neck pain of unknown cause.

Keywords: Mulligan Concept, Nonspecific Chronic Neck Pain, Placebo.

ÖZET

Sezen, A (2024). Spesifik Olmayan Kronik Boyun Ağrılı Masa Başlı Çalışanlarında Mulligan Konseptinin Etkisi. Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü, Fizyoterapi Anabilim Dalı Yüksek Lisans Tezi, İstanbul.

Bu çalışmanın amacı Mulligan mobilizasyon tekniğinin plasebo etkisine karşı spesifik olmayan kronik boyun ağrılı masa başlı çalışanlarında ağrı, eklem hareket açıklığı , kas kuvveti, boyun engellilik düzeyi ve yaşam kalitesi üzerindeki etkilerini karşılaştırmaktır. Çalışmaya 18-60 yaşları arasında spesifik olmayan kronik boyun ağrılı 30 masa başlı çalışanı dahil edilmiştir. Çalışmaya gönüllü olan 30 katılımcı Mulligan (n=15) ve Plasebo (n=15) olmak üzere 2 gruba ayrılmıştır. Çalışmaya Boyun Engellilik Index skorundan en az 5 puan almış katılımcılar alınmıştır. Mulligan grubuna Mulligan tekniği uygulanırken , plasebo grubuna Sham-Mulligan uygulanmıştır. Hastaların ağrı Görsel Analog Skala (VAS) , eklem hareket açıklığı (ROM) universal gonyometre , kas enduransı Chattanooga Stabilizatör Basınç biofeedback ünitesi , boyun engellilik düzeyi ve yaşam kalitesi (SF-36) değerleri tedavi öncesi ve sonrası olarak kaydedilmiştir. Katılımcılar haftada 3 toplamda 4 hafta olmak üzere 12 seans tedaviye alınmıştır. Her iki gruba fizik tedavi modaliteleri olan 20 dakika TENS , 5 dakika US ve 20 dakika Hotpack tedavisi uygulanmıştır. Çalışmanın sonucunda , gruplar arası değerlendirmede ağrı (VAS) ve ROM değerlerinden fleksiyon, sağ ve sol rotasyon , sağ ve sol lateral fleksiyonda istatistiksel olarak anlamlı bir farklılık saptanmıştır. ($p<0,05$). Mulligan grubunda çalışmanın sonucunda VAS ve ROM (fleksiyon, sağ ve sol rotasyon , sağ ve sol lateral fleksiyon) plasebo grubuna göre daha anlamlı iyileşme görülmüştür ($p<0,05$). Kas enduransı sonucunda Mulligan grubunda anlamlı iyileşme görüldü ($p<0,05$). Fakat gruplar arası karşılaştırmada anlamlı bir fark gözlemlenmemiştir ($p>0,05$). Boyun özür göstergesi ortalaması Mulligan ve Plasebo grubunda ön test son testten istatistiksel olarak yüksekti ($p<0,05$). Fakat gruplar arası karşılaştırmada anlamlı bir fark bulunmamıştır. SF-36 sonucunda gruplar arası karşılaştırmada anlamlı bir fark saptanmamıştır ($p>0,05$). Sonuç olarak Mulligan mobilizasyon tekniği nedeni belli olmayan kronik boyun ağrılı masa başlı çalışanlarında ağrıyı azaltabilir ve eklem hareket kısıtlılığını iyileştirebilir.

Anahtar Kelimeler: Mulligan Konsept, Spesifik Olmayan Kronik Boyun Ağrısı, Plasebo.

1. INTRODUCTION AND PURPOSE

Neck pain is defined by the Neck Pain Task Force in 2008 as pain in one or both upper limbs of the neck that lasts for at least one day (1). Developed from more than 300 case descriptions, this anatomical definition has regions in the neck (2). In addition to these symptoms, people with neck pain may also complain of head and shoulder pain (3).

Neck pain has become a major problem in modern society. In 2017, the Global Burden of Disease identified neck pain as the 4th leading cause of disability (1). The age-standardized point prevalence and incidence rates of neck pain were found to be 3551.1 and 806.6 per 100.000 people, respectively (4). Neck pain, whose incidence and prevalence increase with age, is more common in women than in men. Up to 70% of people may be expected to experience some neck pain during their lifetime, but in most cases this neck pain does not seriously affects their activities of daily living (5).

The Neck Pain Task Force has classified patients with neck pain into 4 levels. Individuals with neck pain are classified as Grade I and II according to whether their pain affects their activities of daily living, individuals with neck pain with neurological symptoms such as decreased deep tendon reflexes, sensory deficits and weakness, also called cervical radiculopathy, are classified as Grade III, and individuals with neck pain with advanced pathologies are classified as Grade IV. The neck pain of individuals with Grade IV neck pain overlaps with specific neck pain (6,7,8,9,10).

In neck pain, grade I and III are defined as non-specific neck pain (NCNP). Non-specific chronic neck pain (NCNP) can be caused by dysfunction of any structure. This may be due to dysfunction of the discs, muscles, facet joints, ligaments, dura and nerve roots in the cervical region, or it may be a multifactorial disorder with dysfunction of various structures in other parts of the body associated with the cervical region (11). Daily life activities may also affect neck pain. Neck pain may have many different causes; inadequate ergonomics at the workplace, prolonged sitting and keeping the neck in non-physiologic positions are among the main causes (12). In this study, individuals working in the same position at the desk for a long time were targeted and our investigation was limited to these occupational groups.

With the increase in the use of computers by desk workers, staying in the same position for a long time brings musculoskeletal disorders. One of the most common musculoskeletal disorders in desk workers is neck pain. Studies emphasize that working time and continuing to work in the same position are etiologically effective.

There are various evaluations regarding the treatment methods of patients with neck pain. Physiotherapy applications are one of these methods and there are various application techniques. In the literature, treatments for patients with neck pain included. Treatment methods such as hot applications, TENS, ultrasound, traction, laser, massage, exercise, manipulation and mobilizations are applied to patients with neck pain in accordance with their diagnosis. Hot applications, TENS, US, laser modalities are used for pain treatment. Mobilization and manipulation techniques and exercise combinations are used to increase joint range of motion. Research on the diagnosis and treatment of patients with neck pain suggests the combined use of manual therapy, exercise and education as evidence-based physiotherapy practices (13). The two most commonly used treatment modalities for neck pain are exercise therapy (ET) and manual therapy (MT). Commonly used types of manual therapy include spinal manipulation therapy (SMT), joint mobilization and massage (14).

The effects of manual therapy are often described as improvements in the treated tissues, changes in the central nervous system for pain modulation and effects on the gate control mechanisms that regulate pain transmission (15). Mulligan mobilization technique (MMT) is one of the manual therapy options that can be used in the treatment of neck pain. Developed by Brian Mulligan, MMT aims to reduce pain, eliminate limitation in range of motion and increase functionality by focusing on correcting the positional error in the joint. The main aim of this mobilization method, which was developed by considering the arthrokinematic principles in the joint, is to correct abnormal joint biomechanics and to restore joint motion painlessly (16). It includes manual joint mobilizations in the direction of mobility limitation.

MMT has studies on proprioception and balance. Previous studies have examined the effectiveness of Mulligan mobilization technique (MMT) in patients with chronic neck pain, but not enough studies have included a comparison with the placebo effect. The aim of this study is to compare MMT with the placebo group with pain, ROM, quality of life, neck muscle endurance and NDI in desk workers with non-specific chronic neck pain (NCNP) and to add the results to the literature.

H0: There is a significant difference in pain, muscle endurance, neck disability level, ROM and quality of life between the placebo group with classical physical therapy and the mulligan mobilization group with classical physical therapy in desk workers with NCNP.

H1: There is a no significant difference in pain, muscle endurance, neck disability level, ROM and quality of life between the placebo group with classical physical therapy and the mulligan mobilization group with classical physical therapy in desk workers with NCNP.



2. THEORETICAL INFORMATION AND LITERATURE

2.1. Functional Anatomy of The Cervical Region

2.1.1. Cervical Region Vertebral Structures

The smallest and most mobile of all mobile vertebrae are the cervical vertebrae (17). There are 7 cervical vertebrae, which have the smallest structure of the vertebral column. The most important feature that distinguishes the cervical vertebrae from other vertebrae is the presence of transverse foramina in the transverse processes. This feature indicates the presence of a distinctive anatomical structure of the cervical vertebrae. The vertebral artery arises upward through the transverse foramen and travels to the foramen magnum and carries blood to the spinal cord and brain. The third and sixth vertebrae show almost identical features and are considered typical (18).

The cervical spine is flexible and mobile. The great flexibility of the cervical spine allows the head to move freely forward, backward, sideways and around. However, this flexibility can also make the neck area more vulnerable to injury and poor posture. The flexibility of the cervical spine not only increases mobility, but also promotes balance and head uprightness. However, this versatile mobility can lead to musculoskeletal tension and chronic pain due to prolonged incorrect postures or sudden strain. Therefore, the health of the cervical region should be maintained through correct posture and ergonomic habits in daily life activities.

2.1.2. Atlas(C1)

The first task of the atlas is to support the head. Without a body, the atlas is ring-shaped. The atlas lacks a spinous process, pedicle, body, and lamina, and is instead composed of two large lateral masses connected by anterior and posterior arches. The atlas is the vertebra with the most protruding transverse processes among the cervical vertebrae. These serve to connect several important muscles that control the fine movements of the skull. The atlas works with the second vertebra, called the axis (C2), to allow the head to turn left and right. It also allows the passage of nerves that facilitate neural communication between the brain and the body, in addition to protecting the spinal cord (17).

2.1.3.Axis (C2)

The 2nd cervical vertebra, Axis has a high and wide body that serves as a base for the upward extending dens. The dens serves as a rigid vertical axis of rotation for the head and atlas. The axis is easily palpable, with a very broad and bifurcated spinous process that provides an attachment site for muscles such as the semispinalis cervicis muscle. The axis supports the rotational movements of the head by allowing it to rotate over the atlas. It also plays an important protective role as a structure that secures the spinal cord (18).

2.1.4.Vertebra Prominens(C7)

C7 is the most substantial vertebra in the cervical spine and is notably the most prominent vertebra in the neck region. Because this vertebra can have large spinous and transverse processes, it has similar characteristics to the thoracic vertebrae. It is often called “vertebra prominens” because of its large and easily palpable spinous processes (17).

2.1.5. Typical Cervical Vertebrae(C3 to C6)

These vertebrae from C3 to C6 are composed of a body, transverse processes and pedicles and have a strong cortical shell. The vertebrae are similar to each other and have small rectangular bodies. Unlike other cervical vertebrae, typical cervical vertebrae have two unisinate processes (processus uncinatus) on the upper lateral surface of the corpus. In the middle of the uncinat process and the notch on the lateral lower edge of the upper adjacent vertebral body, uncovertrbral joints are formed and are called Luschka joints. These joints, which contribute to the maintenance of stabilization during movements in the cervical region, are located bilaterally between the C2-3 and C6-7 intervertebral joints (19).

2.2. Cervical Region Joint Structures

The cervical spine has a very mobile structure and its structure allows movement in all directions but does not allow all movements at all levels. Joint types are not the same at all levels as in bone structures. Joint structures differ according to the joints of the bones (17).

2.2.1. Atlanto-Occipital Joint

The atlanto-occipital joints, which provide the movement of the skull with the atlas, provide structural stability with a harmonious convex-concave relationship. The basic movement of the atlanto-occipital joints is extension and flexion movement. Lateral flexion and axial rotation movements of this joint are very few (17).

2.2.2. Atlanto-Axial Joint

The atlanto-axial joint complex has two joint components, the medial joint and the apophyseal joint. This anatomical plan allows to maximize the mobility of axial rotation. Approximately half of the total axial rotational motion of the cervical region is provided by the atlanto-axial joint complex (17).

2.2.3. Intracervical joints

Flexion and extension along vertebrae C2 to C7 occur around an arc that follows an oblique plane determined by the articular surfaces of the apophyseal joints. This position of the intracervical joints lies between the frontal and horizontal planes. Intracervical joints have greater freedom of movement in all three planes (17).

2.2.4. Uncovertebral joint

Uncovertebral joints, which are located at a 45-degree angle to the long axis of the spine, can perform all movements because their surfaces are close to the horizontal plane (18).

These structures form as small splits in the lateral parts of the intervertebral disc during development and are completely separated in adulthood. Because they do not contain articular cartilage or synovial fluid, they are susceptible to degenerative changes and should therefore be considered pseudo joints. These secondary “joints” contribute to lateral stability.

Facet joints are classified as diarthrodial joints; the surfaces of these joints are lined with cartilage. In addition, these joints have a synovial membrane and a fibrous joint capsule containing synovial fluid. The line of articulation of the joints is curved and runs at a 45° angle from anteroposterior to posteroinferior at the C2-C3 level. The oblique

line and loose capsule of the joint allow for greater mobility than at the thoracic and lumbar levels (17).

2.3. Ligaments

Many ligaments provide support to the cervical spine. Spinal ligaments stabilize the spine, protect the spinal cord and nerves and help to limit spinal motion. Ligamentous structures have different functions depending on their position in the vertebral column (20). Ligamentous structures are divided into 2 groups, the ligaments of the upper cervical spine (ligaments of the occipitoatlantoaxial complex) and the ligaments of the lower cervical spine.

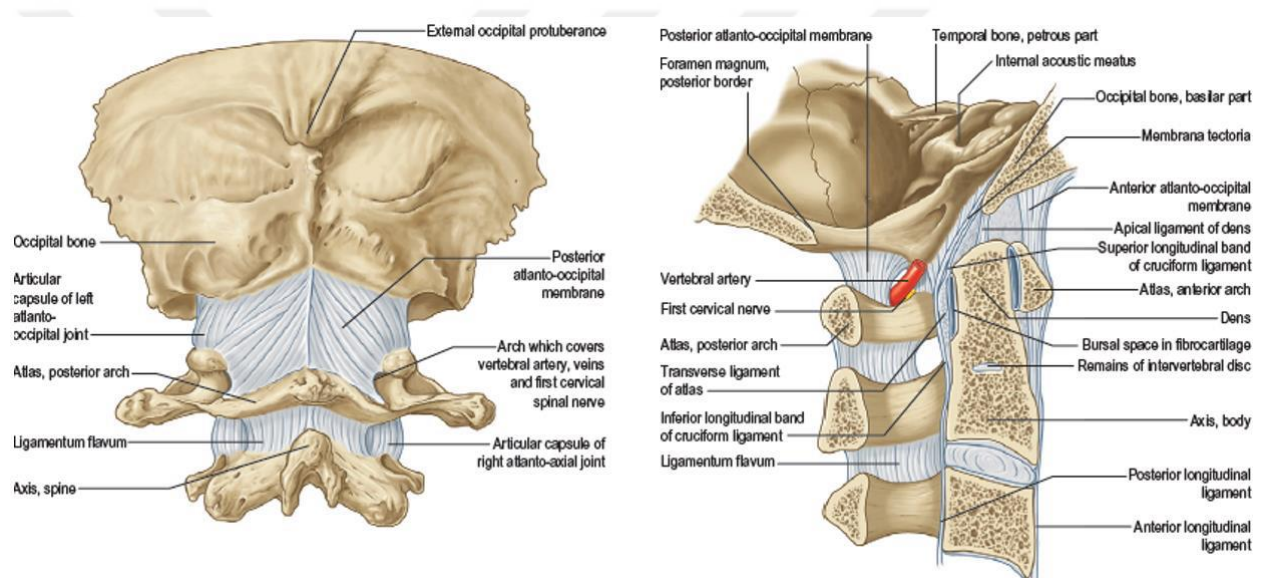


Figure 2.1. A posterior of ligament and joint (20)

Ligaments of the upper cervical region

- Anterior Atlanto-Occipital Membrane
- Posterior Atlanto-Occipital Membrane
- Tectorial Membrane
- Accessory Atlanto-Axial Ligament
- Cruciform Ligament
- Alar Ligament
- Apical Ligament of the Odontoid Process
- Ligamentum Flavum
- Ligamentum Nuchae (21).

Ligaments of the lower cervical region

- Anterior Longitudinal Ligament (ALL)
- Posterior Longitudinal Ligament (PLL)
- Ligamentum Flavum (LF)
- Interspinöz Ligament (İsL)
- Ligamentum Nuchae
- Intertransvers Ligament (İtL)
- Supraspinöz Ligaments (21).

The AAL starts from the skull as the anterior atlanto-occipital membrane and continues to the sacrum. It widens from top to bottom. The PLL is wide at the upper levels of the spine and narrows as it descends towards the sacrum.

The ligamentum flavum connects the laminae from the axis to the sacrum. Ligamentum flavum consists of elastic fibers and loses this feature with advanced age.

The interspinous ligament connects the adjacent spinous processes and lies between the spinous processes. The supraspinous ligament connects the posterior ends of the spinous processes. Since there is no supraspinous ligament at this level, the ligamentum nuchae acts as an extension of the supraspinous ligament. The ligamentum nuchae extends from the external projection of the occipital to C7 and acts as an attachment point for the adjacent muscles (18).

2.4. Cervical Region Muscle and Nerve Structures

Muscles in the cervical region help the mobility of that region by crossing one or more joints. The muscles of the cervical region provide joint movement and stability in the cervical region (22).

The muscles located antero-lateral to the cervical spine are rectus capitis anterior/lateral, longus colli, longus capitis, superficial muscles (platysma, scm, subclavius), supra/infra hyoid muscles, scalene muscles, longus colli and longus capitis act as flexor muscles of the head. The muscles located posterior to the cervical spine are the semispinalis, splenius capitis, trapezius, splenius cervicis, longissimus capitis, oblique capitis inferior, oblique capitis superior, rectus capitis major, rectus capitis minor, levator scapula (23).

Trapezius

The trapezius muscle is the muscle responsible for raising, approaching and lowering the scapula. It is innervated by the 11th cranial nerve and spinal accessory nerve (18).

Splenius Capitis Ve Splenius Cervicis

The splenius capitis and splenius cervicis muscles are located at the back of the cervical region. These muscles produce extension movement when they contract bilaterally and ipsilateral flexion movement when they contract unilaterally in the cervical spine (18).

Erector Spinae

The erector spinae muscle is located in the posterior deep muscle groups of the cervical region and is innervated by the posterior primary rami.

Levator Scapula

It is innervated by the dorsal scapular nerve. It contributes to lateral flexion movement in the cervical region and helps elevation of the scapula (24).

Sternocleidomastoid (SCM)

The SCM is a prominent muscle located superficially on the anterior side of the neck. In the lower part, the muscle is attached with 2 heads, medial and lateral. When the SCM acts unilaterally, it is a dominant lateral flexor of the craniocervical region. When contracted bilaterally, the SCM muscles can flexor extend the craniocervical region (24).

Scaleni Muscles

The function of the scalene muscles varies depending on which skeletal structures are involved. If the cervical spine is stably supported, these muscles help breathing by lifting the ribs up. However, when the first two ribs are well stabilized, the contraction of the scalene muscles moves the cervical spine. When they contract unilaterally, the scalene muscles provide flexion movement by tilting the cervical spine to the side (17).

Longus Colli and Longus Capitis

The longus colli and longus capitis muscles are located on both sides of the cervical spine, deep to the visceral structures in the cervical region. These muscles provide vertical stability to this region. The function of the longus colli in the spine is to reduce cervical lordosis by bringing the anterior fibers into a flexion position of the cervical region. The fibers in a more lateral position contribute to the vertical stability of the region by acting together with the scalene muscles (17).

2.5. Neck Pain (NP)

Pain is a disagreeable emotional and sensory knowledge related with existing or potential tissue damage. It is a common condition with a pleural prevalence ranging from 22% to 70% in the general population and causing serious expenses (25). Neck pain, which is the most common musculoskeletal problem after low back pain, is more common in women than in men. Studies have shown that 54% of individuals experience cervical pain at some point in their lives and almost all of them continue to complain for the first 5 years after the acute period. NP, which is one of the primary causes of absenteeism from work, causes high health costs (26,27,28,29).

The causes of neck pain can be related to the influence of different anatomical structures and various health problems. Tendons, intervertebral discs, ligaments, paracervical muscles, cervical nerve roots and facet joints in the neck can each be a source of pain. Although pain is mostly muscle-related, it is not always possible to identify the exact source. Apart from these, many other diseases may present with pain in the neck (30).

Identifying and evaluating risk factors is of great importance in the diagnosis and treatment of neck pain. It is seen that neck pain studies are not frequently included in current studies. Neck pain, which negatively affects daily life functions, can be caused by various reasons. In the literature, it has been observed that many risk factors may cause neck pain. There have not been enough studies on risk factors involving desk workers. The studies that have been conducted have generally addressed the identified risk factors by dividing them into 2 groups as psychological and biological.

2.5.1. Neck Pain Risk Factors

Neck pain, which is a multifactorial sickness, may be associated with various causes such as psychopathology, genetics, smoking, obesity, previous neck pain, sedentary life, sleep problems, age, being female, low social support. Office workers, manual laborers, healthcare workers and professional drivers are the groups most likely to have neck pain (5).

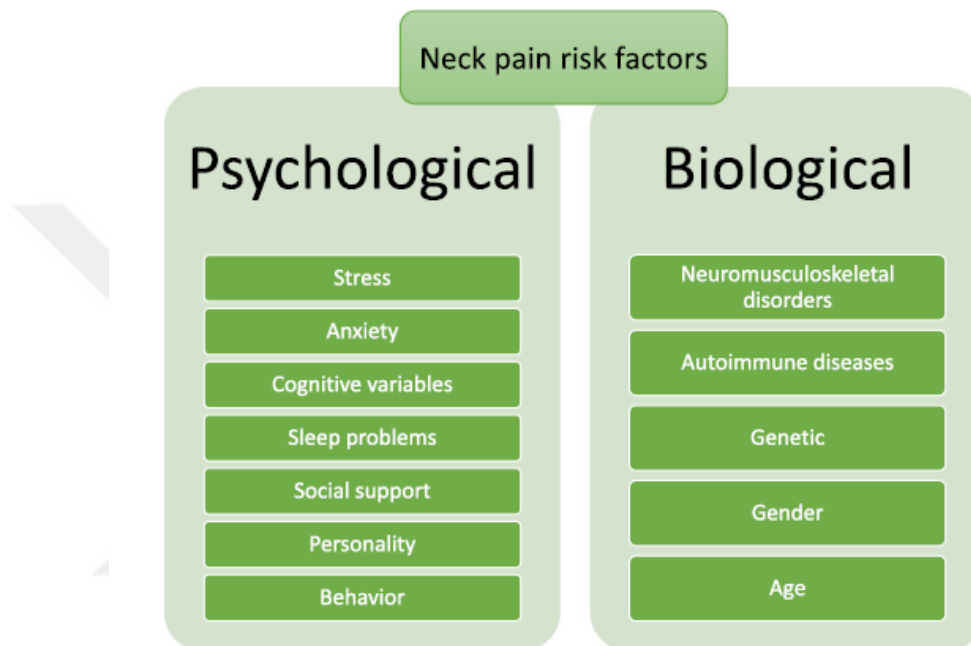


Figure 2.2. Neck Pain Risk Faktors (5)

Demographic factors

The most important risk factor for many chronic pains is aging, and identifying risk factors is of great importance for taking preventive measures and raising awareness of education and treatment interventions. According to the Global Burden of Disease study in 2017, the prevalence of NP peaks in middle age. Advanced age changes the anatomy of the cervical spine. This can result in neck pain and disability (31).

Most systematic reviews have found that gender is an uncertain risk factor. Previous studies have found that being female is a significant risk factor for the development of neck pain. However, recent epidemiologic studies have found that gender does not make a significant difference in the incidence and pleural status of neck pain. However, point pleuralization was found to be higher in women in all age groups(31). Therefore, more studies are needed to examine and evaluate the effect of gender on neck pain.

Genetics

Modern medicine faces great challenges in identifying genetic predisposition and understanding the relationship. Twin studies and genome-wide association studies (GWAS) can benefit unravel the link between genetics and disease (32).

Twin cohort studies have compared concordance between dizygotic (DZ) and monozygotic (MZ) twins. MZ twins were more similar than DZ twins, suggesting a genetic influence to the development of NP. More evidence-based studies are desirable to elucidate the connection between neck pain and genetic factors (33,34,35).

Neuromuscular Disorders

There are many neuromuscular diseases and disorders that contribute to NP. Neuromuscular disorders affecting the bones, nerves and muscles can occur in various forms. Conditions such as fibromyalgia, cervical radiculopathy and post-impact disorders (WADs) and cervical spondylosis are among the most common causes of neck pain (36).

Cervical Radiculopathy

Cervical radiculopathy due to compression of the nerve roots in the cervical spine is a serious neck disease and causes NP. It can be caused by spondylosis, trauma, presence of tumors or cervical instability. Neck pain is the primary complication of cervical radiculopathy (37).

Post-impact disorders (WADs)

Post-impact disorders affecting the neck and caused by sudden acceleration-deceleration movements include a variety of symptoms. WADs present with clinical symptoms such as neck pain, vague headache, temporomandibular joint pain and dizziness caused by a sudden force stretching the neck muscles and tendons. Long-term neck pain often develops after injuries sustained in motor vehicle accidents, such as whiplash injuries. WADs continue with chronic pain in 50% of patients. Therefore, the incidence of post-impact disorders in neck pain pleura is high (38).

Autoimmune Diseases

Autoimmune diseases, a clinically heterogeneous disease, are seen in individuals with a weakened immune system. Autoimmune diseases that can affect various structures and organs in the body can also affect muscles, joints and nerves. The most common

autoimmune diseases include rheumatoid arthritis, systemic lupus erythematosus, polymyalgia rheumatica, multiple sclerosis (36).

Psychological Factors

Prospective studies have identified that psychological variables are linked to the onset and severity of pain. Stress, mood disturbance, anxiety, cognitive functioning and pain have been found to have significant effects on the development of neck pain. In literature studies, these variables have a strong link with neck pain. In addition to these psychological variables, additional factors such as alcohol use and poor sleep quality may alter central pain dispensation at the brainstem, spinal or cortical levels, which may manifest as increased sensitivity to pain.

Anxiety, which is associated with different types of chronic pain and disability, has been found to be the second most common comorbidity when related with NP.

The relationship between depression and poor sleep quality and neck pain is bidirectional and both conditions can trigger each other. Identifying these factors can help reduce pain sensitivity and determine a treatment program (39,40).

Work-related Factors

Habitual and long-term same positions are among the most common risk factors. Long working hours, workload and improper position are among the causes of neck pain. Long-term computer use is among the occupational conditions that can cause neck pain. The relationship between computer and neck pain includes posture disorder, time spent at the computer, stress, repetitive movements, eye strain and psychosocial effects of the working environment. Our study includes and examines these causes in desk workers (41,42,43).

2.6. Non-Specific Chronic Neck Pain

NCNP is called non-specific neck pain when no pathologic disorder is detected in the cervical region and the cause of the pain is not found. There are very few clinical studies for non-specific neck pain, which is used for cases where the pain is not based on a specific cause, and treatments are usually determined based on studies for back pain (44).

2.7. Prognosis

A 2008 study by the Neck Pain Task Force found that 50% to 85% of individuals with neck pain do not experience complete recovery and have a recurrent nature (45). In addition, a systematic review found that 45% of people with acute neck pain experienced a 45% reduction in pain within 6.5 weeks, after which there was little change in pain. Patients with cervical radiculopathy have a better prognosis than patients with neck pain without radiculopathy. In literature studies, it has been reported that poor prognosis is associated with previous episodes of neck pain, poor health status, head and back pain associated with neck pain, psychological factors, and work-related factors. (46,47)

2.8. Diagnosis and Evaluation of Neck Pain

Diagnostic evaluation in physiotherapy consists of history taking, physical examination and, if necessary, diagnostic imaging procedures. The purpose of taking a history is to gain insight into the patient's prognosis and whether the patient needs a different evaluation perspective (48,49,50).

2.9. Treatment of Neck Pain

Various treatment approaches are used in the treatment of neck pain, which is very common in the general population and ranks 4th in disability. These approaches can be classified as medical, conservative treatment and surgery(51). Paracetamol or non-steroidal anti-inflammatory drugs (NSAIDs) can be used in the treatment of people with neck pain. There are several clinical trials evaluating NSAIDs for people with neck pain; these studies have found that NSAIDs are better than placebo, muscle relaxants are effective, but less beneficial than spinal manipulation and exercises. The treatment of choice for neck pain is usually conservative(52,53,54). Mostly rehabilitation practices and medical treatments are used. Commonly used physiotherapy applications include electrotherapy agents, manual therapy methods, traction, therapeutic exercise approaches, massage. The combination of manual therapy, exercise and education is recommended as the preferred evidence-based physiotherapy treatments for patients with neck pain (55,56).

Exercise therapy has been found to be an effective treatment method in patients with neck pain. The patient's functional status and parameters such as pain are evaluated and an appropriate exercise program is created. Cervical stabilization exercises are the

type of exercise with a good level of evidence. Appropriate exercise programs can be determined and home exercise programs can also be created with patient education. Studies have suggested determining the appropriate exercise method for the patient (56).

2.10. TENS

Transcutaneous Electrical Nerve Stimulation (TENS), a non-invasive and non-pharmacological procedure, is used to treat a wide range of pain types (57). These pain types include back and neck pain, post-surgical pain, neuropathic pain, migraine. TENS is used by health personnel working in many clinical areas, especially physiotherapists. The mechanism of action of TENS can be applied according to the appropriate types of pain types treated, including acute and chronic pain. The effective application of transcutaneous electrical nerve stimulation is based on Shealy's studies of neuromodulation techniques (58). TENS, which is explained by the Gate Control Theory, is thought to reduce pain by using applications such as electrical stimulation or vibration and temperature applied to the painful area. According to the gate control theory, stimulation of peripheral A beta fibers increases the activation of inhibitors in the substantia gelatinosa in the posterior horn of the spinal cord. This weakens the transmission of noiceptive signals transmitted by small diameter A delta and small unmyelinated C fibers. According to this theory, the gate controls the transmission of pain upward and downward to the brain for central processing. In this way the perceived pain is reduced (59,60,61,62).

Used in clinics to treat various types of pain, TENS current intensity 1-80 mA, frequency 1-150 Hz, wave width (current passage time) 300 microseconds and its use varies according to the models. Conventional TENS is the most commonly used model. We used the conventional TENS model in our study. This type, which is characterized by low intensity and high frequency, is used in the form of tingling and questioning the patient's sensation without causing pain(63).

2.11. US (Ultrasound)

US, one of the modalities applied in physiotherapy, is a deep temperature agent. It is the name given to sound waves above 20,000 hz, which is far above the sound frequency we can hear. Ultrasound is used in many medical fields together with physical therapy and varies between 0.75-3.3 sound waves. US, which is widely preferred in

physiotherapy applications, is effective in acute and chronic pain. US, which is divided into 2 as continuous and intermittent, gives heat to the body in continuous application and during this thermal application, the amount of collagen in the tissue, protein production and blood circulation increase. In intermittent application, the pulses are in the form of short waves in order not to increase the heat while the mechanical effect is mostly utilized(64,65,66,67).

US, which is a frequently used electrotherapy agent, has mechanical effects such as decreasing muscle spasm and increasing joint temperature, as well as increasing the temperature in deep tissues. The US agent, which causes a change in the physiological structure of the tissue, causes the fibrous tissue to stretch more easily, an increase in blood circulation due to dilatation in the vessels, an increase in the rate of substance exchange between the membranes in the cell, a decrease in pain sensation and edema. At the same time, the US mechanic effect causes a pressure change in the tissues and thus has a micromassage effect (68).

2.12. HOTPACK

Hotpack (HP) agent, which transmits heat to a depth of 1 cm by conduction, is a modality frequently used in physiotherapy. It is effective in reducing muscle spasm and pain sensation and increasing joint range of motion by accelerating local circulation in the body with vasodilation effect. Hot packs made of materials such as silicon dioxide, which absorb heat for a long time in high temperature boilers, are wrapped in a towel and applied by avoiding direct contact with the skin (69,70).

Skin contact should be avoided during application. It should be applied to the patient with intermediate materials such as towels. The patient should be checked frequently during Hotpack application which increases local circulation (70).

2.13. Mobilization and manipulation

There are various manual therapy methods that aim to increase spinal joint mobility and reinstate ROM. MT applications include a variety of techniques, including mobilizations and manipulations. Manipulation is defined as the application of a high-velocity, low-amplitude force to a specific cervical segment near the end of the patient's ROM, which is beyond the patient's control. Mobilizations are defined as the use of low-

speed, small-amplitude or large-amplitude passive movement techniques within the patient's ROM and under the patient's control. (71,72)

Today, there are many mobilization and manipulation techniques used in physical therapy for patients. Joint mobilizations used in neck pain are used to correct movement limitation, reduce pain and increase functionality. One of the most basic features of mobilizations is that they do not cause pain in the patient during application. There are many mobilization techniques with proven efficacy. Mulligan Mobilization technique is among the mobilization techniques used. This technique, invented by Brian Mulligan, is used on patients with NP.

2.13.1. Mulligan Mobilization Technique (MMT)

Mulligan Mobilization is a manual therapy technique developed by Brian Mulligan. The Mulligan concept of mobilizations with movement (mobilizations with movement-MWM) is a specific therapeutic intervention designed to combine accessory mobilization with physiological movement (73). This concept was developed based on the clinical experience of Brian Mulligan and the influence of well-known physiotherapists Freddy Kaltenborn, Geoff Maitland, Robin McKenzie and other manual therapists. In the Mulligan mobilization technique, mobilization is performed parallel to the facet joint and in a weight transfer position, such as sitting or standing. According to this concept, all mobilization in the spinal region aims to take into account the treatment plane of the facet joints. This plane of treatment is along the surface of the concave joint. According to Mulligan, it is the positional error that causes the joint to be misplaced, and this error is caused by thinning of the cartilage, incompatibility of the ligaments and distortion at the joint level. Mulligan emphasizes that if the positional error is not corrected, symptoms such as pain and limitation of movement in the joint will continue. For this reason, MMT is a MT concept applied to eliminate functional disorders, correct pain and limitation of movement in the joint, and increase muscle function. In this mobilization approach, mobilizations with movement (MWM) for the extremities; natural apophyseal glides (NAGS) and sustained natural apophyseal glides (sustained natural apophyseal glides-SNAGS) methods are discussed for the spinal region (74,75,76)

NAGS (Natural Apophyseal Gliding) technique is an oscillatory mobilization that can be applied to the facet joints between the 2nd and 7th vertebrae in the cervical region (74). NAGS are mobilizations applied to the facet joints between the middle and end

angle and in the antero-cranial direction compatible with the treatment plane. While the intensity of mobilization is determined according to the patient's tolerance, it should never cause pain. It is applied to reduce pain by increasing spinal mobility. Oscillatory NAGS can be applied in combination with Reverse NAGS or SNAGS. Reverse NAGS technique, which is the opposite of NAGS mobilizations, is usually used for the lower cervical and upper thoracic region. According to Mulligan, this technique should be used if the NAGS technique fails(77,78,)

SNAGS (Sustained Natural Apophysial Sliding) refers to the Natural Apophysial Sliding that occurs in the facet joints and is maintained throughout the movement with the mobilization movement. Mobilization with motion (MWM) is also defined as the mobilization of one joint surface relative to the adjacent joint surface and the maintenance of this mobilization throughout a movement or function. During the application of SNAGS, mobilization should be applied in the direction that reduces the patient's symptoms and the mobilization applied to the joint should be maintained while the patient performs active joint movement. The pressure applied at the end point of the joint movement (overpressure) should be painless (79,80,81).

The Mulligan concept uses an abbreviation called PILL to evaluate the results of the treatment.

The letter P stands for pain free technique (Pain free).

The letter I indicates that the result is obtained during the application (Instant result).

L The letters L indicate that the healing continues for a long time (Long Lasting).

There are many resources and studies on manual therapy in the spine and extremity joints, but none of these resources have combined mobilizations with movement in the whole body. This is the biggest feature that distinguishes MMT from other manual therapy methods and studies (82,83,84).

3. MATERIAL AND METHODS

3.1. Subjects

This study was conducted as a single-center, prospective, randomized, placebo-controlled study on individuals with NCNP with a 4-week treatment plan. The study was conducted with 32 participants consisting of individuals with NCNP. While the study was being conducted, 2 participants wanted to leave the study. The study continued with 30 participants and individuals with NCNP were divided into 2 groups as Mulligan mobilization group (n=15) and placebo group (n=15). The aim of this study was to examine the effectiveness of the Mulligan mobilization technique on pain VAS, ROM, muscle endurance, NDI and quality of life (SF-36) compared to the placebo group.

The study protocol was approved by Yeditepe University Ethical Committee (protocol number: E.83321821-805.02.03-373). The sample size of our study was calculated using G*Power 3.1.9.7 7 (Heinrich-Heine-Universität Düsseldorf, Düsseldorf Germany). This study was approved by the University Clinical Research Ethics Committee. 3.1 Participants Individuals with non-specific chronic neck pain were included in the study. A total of 20 cases for an initial investigation was determined with a power independent of 0.80 and an alpha (α) error of 0.05. The participants were randomly divided into 2 groups: Mulligan group (n=15, mean age $X \pm SD = 31.40 \pm 7.92$ years) placebo. The plan and purpose of the study were explained to the 30 patients included in the study. Written informed consent was obtained from each patient who accepted the study.

3.1.1. Inclusion criteria

- To be a helper for the education
- To be amid the ages of 18-60
- To have at least 5 on the NDI
- To be a desk worker
- To have neck pain for more than 6 months

3.1.2. Exclusion criteria

- Patients with diagnosed pathologies in the cervical region
- Patients with cervical region surgery or who have undergone surgery
- Patients with systemic disorders in the cervical region

- Patients with cervical region trauma

3.1.3. Study Duration And Protocol

Patients with non-specific chronic neck pain who applied to Alanya Lazergöz Medical Center and agreed to volunteer were selected. Patients with neck pain were evaluated and patients who were outside the inclusion criteria were excluded. The study included 32 patients. Before the start of the study, 2 patients withdrew from the study. After exclusion of ineligible patients, a total of 30 patients were enrolled in the study. All patients were informed about our study before starting their treatment. Patients selected for the study were asked to fill out a voluntary consent form, demographic information form, VAS, Neck disability index, SF-36 (quality of life) documents. Afterwards, deep flexor muscle endurance was measured using the 'Chattanooga pressure biofeedback' device and neck range of motion measurements were taken before treatment. The duration of treatment in both groups included in the study was planned as 4 patients and 3 days a week. TENS, US and Hotpack treatment methods were applied to all participants. SNAGs application was planned in the treatment of the Mulligan group and was applied as 10 repetitions and 3 sets in the direction that reduces symptoms. In the placebo group, mobilization was performed without giving manual pressure to the patient during the technique. The study was conducted between November 2023 and September 2024.

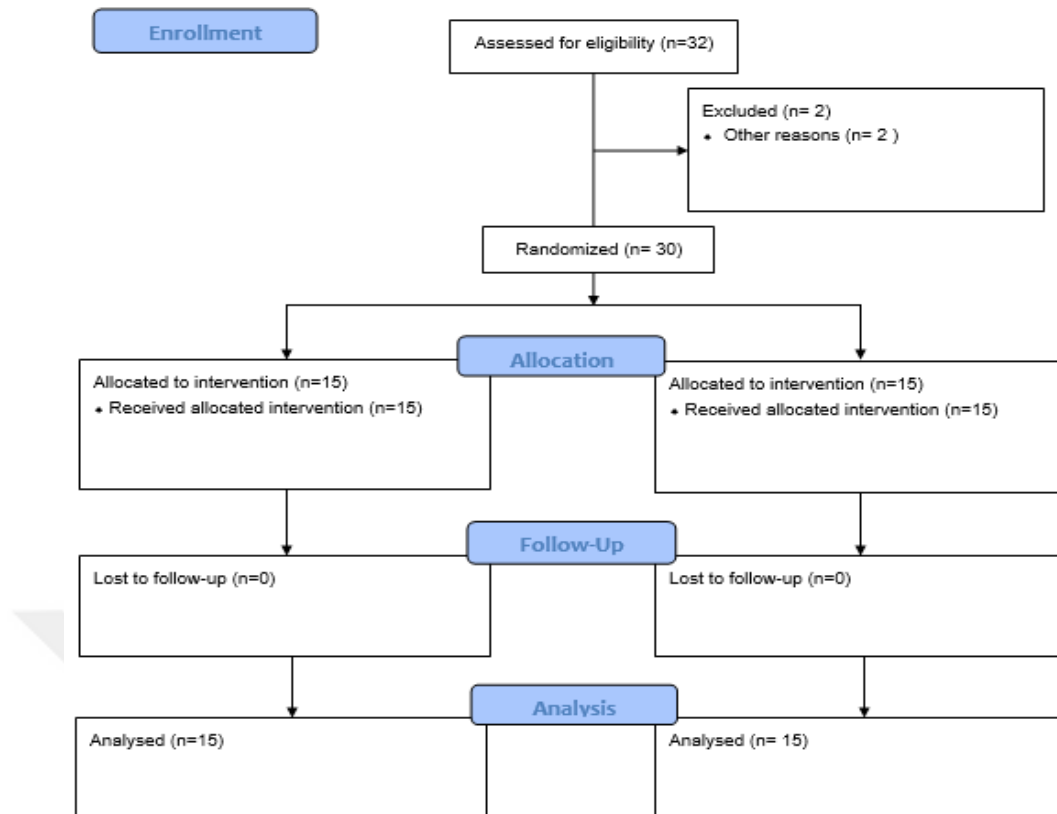


Table 3.1. Flow Chart

3.2. Evaluation Methods

3.2.1. Demographic Information Form

The demographic information questionnaire was prepared to evaluate the demographic information of the participants. It includes questions such as age, gender, socio-demographic status, previous surgeries and existing systemic diseases of the participants.

The questionnaire was administered to the patients before they were admitted to treatment. Patients were given information about the questionnaire. The aim of this questionnaire is to better evaluate patients with neck pain and to determine the duration and course of the treatment program. Studies examining the effects of age and gender on patients with neck pain are available but not sufficient.

3.2.2. Pain assessment

The pain intensity of the participants was evaluated with a visual analog scale (VAS). The scale was applied to the patients using a 10 cm scale, with 0 indicating no pain and 10 indicating the most severe pain. Patients were asked to select their pain level.

Pain levels were recorded before and after treatment. VAS, which is frequently used in academic and clinical studies, is valid and reliable in assessing pain levels in musculoskeletal disorders (85).

3.2.3. Range of Motion Assessment

ROM of the cervical vertebrae was measured with a universal goniometer. The measurements before and after treatment were evaluated with reference to the American Medical Association (AMA) criteria. Pivot points were determined and the patients were measured in sitting position. Flexion, extension, right-left rotation and right-left lateral flexion movements were measured in the cervical region.



Figure 3.1. Goniometer pivot point for flexion measurement



Figure 3.2. Goniometer pivot point for extension measurement

The patient was seated on a chair. A goniometer was placed on the head of the humerus with a pivot point for flexion and extension movement. The patient was asked by the physiotherapist to tilt his head forward and backward. The movement was repeated 3 times and averaged.

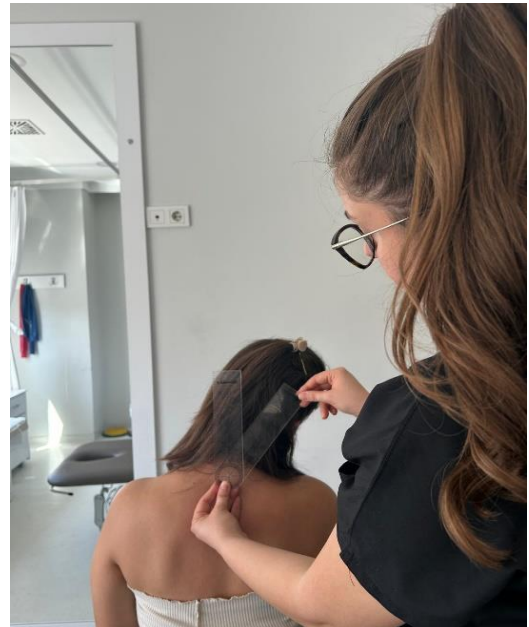


Figure 3.3. goniometer pivot point for right and left lateral flexion measurement

The patient was seated on a chair. A goniometer was placed at C7, the pivot point for right and left lateral flexion movement. The patient was asked by the physiotherapist to tilt his head to the right and left. The movement was repeated 3 times and averaged.

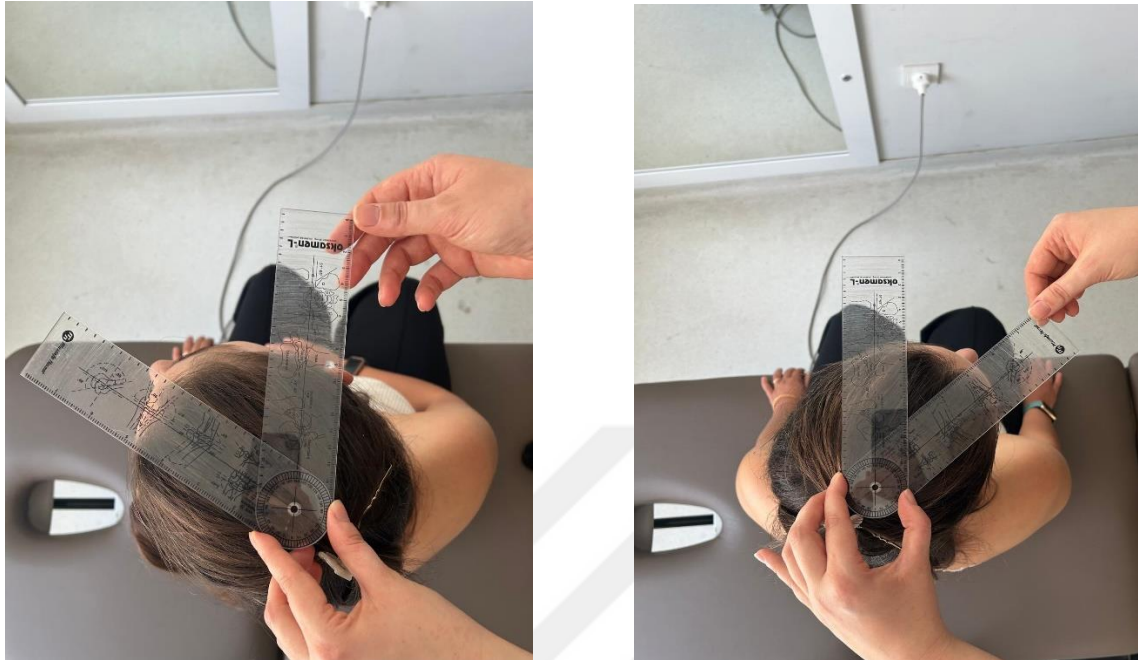


Figure 3.4. Goniometer pivot point for right and left rotation measurement

The patient was seated on a chair. A goniometer was placed on the top of the head, which is the pivot point for right and left rotation movement. The patient was asked by the physiotherapist to turn his/her head to the right and left. The movement was repeated 3 times and averaged.

3.2.4. Neck Muscle Endurance Assessment

Activation and static endurance of deep cervical flexor muscles were assessed with the Stabilizer Pressure Biofeedback device (Chattanooga Medical Supply Inc, Chattanooga, TN). The intraclass correlation coefficients for the biofeedback device unit and the performance measurements of the deep neck flexor muscles and muscle activation were 0.93 and 0.81, respectively. It is a device invented by Gwendolen Jull that records the pressure difference in the cell by filling it with air. This device can also be used to train and strengthen muscles. In this study, activation score and performance index values were measured to evaluate muscle endurance. Patients were taught the posterior cervical tilt movement (head acknowledgment movement) before the measurement. Patients were placed in the supine hook position while using the device. The head was positioned in the

neutral position and a cushion-shaped pressure unit was placed under the neck and inflated to 20 mmHg. And the patients were asked to perform a posterior cervical tilt movement. The patients were asked to hold the pressure for 10 seconds at the maximum pressure they could press during the pressure. This result was recorded as activation score (86).

The deep neck flexor muscle performance value was calculated by multiplying the amount of upsurge from 20 mmHg by the number of repetitions they could hold at the maximum level (Ex: The deep neck flexor muscle performance value of an individual who could perform a maximum of six repetitions at 28 mmHg pressure value was calculated as $[(28-20) \times 6=48]$). If the individual is 30 mmHg and can do this value for 7 repetitions, it is calculated as $[(30-20) \times 7=70]$ (87). Patients' scores were recorded before and after treatment.

Each patient was informed before the application and after the treatment before the measurements were performed. Patients were given a trial before the measurement to understand the measurement. Measurements were taken to examine the effect of the Mulligan technique on muscle activation in patients.

3.2.5. Neck Disability Index

Participants' level of disability due to neck pain was evaluated using the most commonly used Neck Disability Index. This questionnaire was developed by Vernon and Mior and is reliable and valid in many musculoskeletal dysfunctions associated with neck pain, such as cervical radiculopathy and whiplash injury (88). The questionnaire assesses and reports the specific functional status of people with neck pain. This questionnaire, which is used to assess functional status, reports the level of disability of individuals. The 10-item questionnaire includes topics such as pain, personal care, driving, concentration, sleep, headache, working, lifting. A score of 0 is calculated by giving a score between 0 and 5. A score of 0 indicates no disability and a score of 5 indicates the highest level of disability. Individuals give points according to the degree to which the relevant topic affects their function. The total score is calculated with a result between 0-50. The higher the score at the end of the questionnaire, the higher the level of disability of the patient. In the results, between 0-4 is considered as no disability. Scores between 15 and 24 indicate a moderate level of disability. If the disability score is above 35 points, it means that the patient has a very severe level of disability. (89,90,91,92).

3.2.6. Quality of Life (SF-36)

The Short Form36 is used to determine patients' quality of life by mental score (intraclass correlation coefficient (ICC) = 0.68) and SF-36 physical score (ICC = 0.65). The SF-36 was also used to test the association between health-related quality of life and related factors (gender, age, physical functioning and daily functioning) assessed on a 5-point scale. This scale consists of 36 items and 8 scales. At the end of the test, scores are determined from 0 to 100. A high score means good quality health. The clinically important minimum difference for quality of life is 10 points for neck pain (93,94,95).

The test was evaluated on a 5-point scale and the test results were recorded before and after the treatment. Our aim in using this form was to measure and evaluate the effect of neck pain in daily life.

4. INTERVENTION

4.1. Mulligan Manual Therapy Technique

Mulligan emphasizes that if the positional error is not corrected, symptoms such as pain and limitation of movement in the joint will persist. Therefore, the MMT is a manual therapy concept applied to eliminate functional disorders, correct pain and limitation of movement in the joint and increase muscle function. SNAGS (Sustained Natural Apophysial Glides) refers to the Natural Apophysial Sliding that occurs in the facet joints and is maintained throughout the movement with the mobilization maneuver (96).

The technique was achieved with the patients in a sitting position and the patient was informed about the method of application. SNAG technique was applied to the patients in the Mulligan group. SNAGS applications were applied in the direction and direction that reduced the symptoms of the participants with 10 repetitions and 3 sets. The patient was given 30 seconds rest time between each set. The range of motion of the patients was noted before the application. Patients were asked in which direction they had pain while performing neck joint movements. Mobilizations were applied in the direction of the patient's painful joint movement direction. Without causing pain in the patients, the thumb was placed on the tip of the spinous process of the vertebrae and a mobilizing movement was performed in the direction of the treatment plane and upwards. At the end of the patient's range of motion, overpressure was applied.

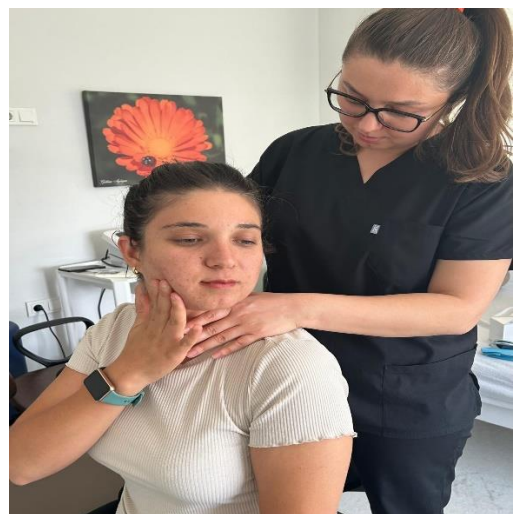


Figure 4.1. Application of Mulligan mobilization technique to the patient

4.2. Chattanooga Stabilizer Pressure Biofeedback

In this study, activation score and performance index values were measured to assess muscle endurance.

When using the device, the patients were placed in the supine hook position. The head was positioned in neutral position and a pillow-shaped pressure unit was placed under the neck and inflated to a pressure of 20 mmHg. And the patients were asked to perform a posterior cervical tilt movement.

The patients were asked to hold the pressure for 10 seconds at the maximum pressure they could press during the pressure. This result was recorded as activation score. The deep neck flexor muscle performance value was measured by multiplying the amount of increase from 20 mmHg by the number of repetitions at the maximum level they could hold at the maximum level.



Figure 4.2. Application of Chattanooga Stabilizer Pressure Biofeedback

4.3. TENS

TENS application was applied to relieve the patient's pain. Patients were placed prone in a comfortable position. The patient was informed about how the application would be performed. The patient was asked to release his/her arms comfortably. We checked whether the patient felt pain during the TENS application. 2 channels and 4 electrodes were applied to the patient's neck area. We planned the duration of treatment

as 20 minutes. The frequency of TENS application was determined as 60-120 Hz. Conventional TENS was applied without causing discomfort to the patient.

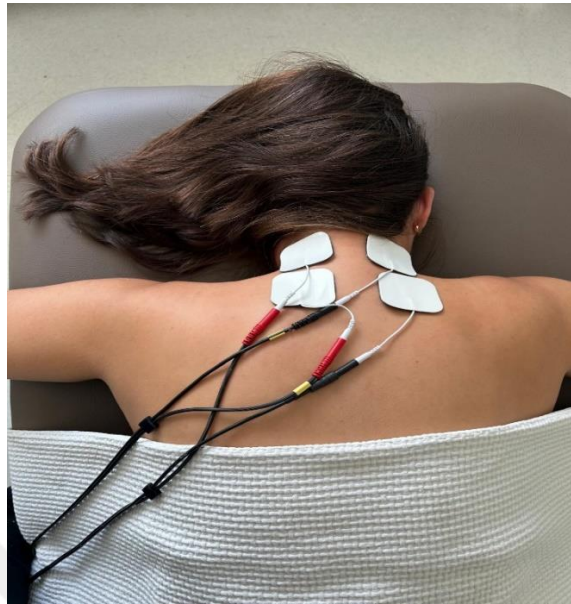


Figure 4.3 Application of Tens

4.4. Ultrasound

US, which is widely preferred in physiotherapy applications, is effective in acute and chronic pain. US, which is a frequently used electrotherapy agent, has mechanical effects such as decreasing muscle spasm and increasing joint temperature, as well as increasing the temperature in deep tissues. The US agent, which causes a change in the physiological structure of the tissue, causes the fibrous tissue to stretch more easily, an increase in blood circulation due to dilatation in the vessels, an increase in the rate of substance exchange between the membranes in the cell, a decrease in pain sensation and edema.

Ultrasound application was applied to reduce the patient's pain. The patient was informed about the procedure. The patient was placed face down on an empty bed. A comfortable position was ensured during the application. Gel was used for US application. A small US head was used for the neck region. Chattanooga Intelect Neo Ultrasound device was used. The treatment time was planned as 8 minutes. 4 minutes was applied to the right side of the neck and 4 minutes to the left side of the neck. US application was performed at a power of 1.5 w/cm² and a frequency of 1 MHz. The application was performed without causing discomfort to the patient during the application.



Figure 4.4. Application of US

4.5. Hotpack

Hotpack application was applied to reduce the patient's pain. It is effective in reducing muscle spasm and pain sensation and increasing joint range of motion by accelerating local circulation in the body with vasodilation effect. Hot packs made of materials such as silicon dioxide, which absorb heat for a long time in high temperature boilers, are wrapped in a towel and applied by avoiding direct contact with the skin. The patient was informed about the procedure. The patient was placed face down on an empty bed. A comfortable position was ensured during the application. During the hotpack application, the patient was checked to prevent burning. Hotpack application was planned and applied for 20 minutes. The patient's feeling of discomfort was questioned during the treatment.



Figure 4.5. 3 Application of HOTPACK

5. RESULTS

The study included 30 desk workers with chronic neck pain who applied to Alanya Lazergöz Medical Center physical therapy and rehabilitation department. The participants were analyzed in 2 groups as placebo group 15 and Mulligan group 15. The treatment period for each patient included in the study was planned to be 4 weeks. In the study, VAS, ROM, muscle endurance, NDI and SF-36 values were examined before and after 12 sessions of treatment and the results were analyzed. The study was conducted between November 2023 and September 2024.

Data Analysis

Data were analyzed using the statistical package program IBM SPSS Statistics Standard Concurrent User V 26 (IBM Corp., Armonk, New York, USA). Descriptive statistics were given as number of units (n), percentage (%), mean (X), standard deviation (SD), median (M), minimum (min) and maximum (max) values. At the decision stage, if the absolute skewness (Skewness) value is below ± 2.0 and kurtosis (Kurtosis) value is below 7.0, it is decided that the data are normally distributed (93). Accordingly, the skewness and kurtosis values of the variables used in the study are given in Table 8 and it was found that the data conformed to normal distribution. Since the numerical descriptive characteristics and variables were normally distributed, parametric tests were used. Independent Sample t Test was used for intergroup comparisons of numerical descriptive characteristics of the patients. Dependent Sample t Test was used for intra-group comparisons in measurement times, while Independent Sample t Test was used for inter-group comparisons. $p < 0.05$ was considered statistically significant.

Table 5.1 Comparison of descriptive characteristics of participants according to groups.

	Group		Test (<i>p</i>)
	Placebo <i>n</i> =15	Mulligan <i>n</i> =15	
Age, (years)			
<i>X</i> ± <i>SS</i>	32.73 ± 10.96	31.40 ± 7.92	<i>t</i> =0.382
<i>M</i> (min-max)	29 (19-58)	30 (22-56)	<i>p</i> =0.705
Gender, <i>n</i> (%)			
Male	5 (%33.3)	3 (%20)	χ^2 =0.682
Female	10 (%66.7)	12 (%80)	<i>p</i> =0.409
Height, (cm)			
<i>X</i> ± <i>SS</i>	167.20 ± 8.17	167.27 ± 8.96	<i>t</i> =-0.021
<i>M</i> (min-max)	165 (150-180)	165 (155-190)	<i>p</i> =0.983
Body weight, (kg)			
<i>X</i> ± <i>SS</i>	69.60 ± 16.85	70.40 ± 14.81	<i>t</i> =-0.138
<i>M</i> (min-max)	68 (50-101)	68 (50-102)	<i>p</i> =0.891
Body mass index, (kg/m²)			
<i>X</i> ± <i>SS</i>	25.11 ± 7.27	25.16 ± 4.76	<i>t</i> =-0.020
<i>M</i> (min-max)	24.4 (16-44.9)	25.1 (17.7-35.8)	<i>p</i> =0.984
Marital status, <i>n</i> (%)			
Single	9 (%60)	4 (%26.7)	χ^2 =3.394
Married	6 (%40)	11 (%73.3)	<i>p</i> =0.065
Education status, <i>n</i> (%)			
High school	3 (%20)	2 (%13.3)	χ^2 =0.240
University	12 (%80)	13 (%86.7)	<i>p</i> =0.624
Profession, <i>n</i> (%)			
Private sector	10 (%66.7)	12 (%80)	χ^2 =0.682
Public sector	5 (%33.3)	3 (%20)	<i>p</i> =0.409

Independent Sample *t* Test (*t*); Chi-Square Test (χ^2); Descriptive statistics are given as mean (*X*), standard deviation (*SD*), Median (*M*), minimum (*min*), maximum (*max*), number (*n*), percentage (%), kilogram (kg) square meter (*m*²).

Table 5.1 shows the distribution of the descriptive characteristics of the participants according to the groups. A total of 30 participants, 15 in the Placebo group and 15 in the Mulligan group, took part in the study. The median age was 29 years in the Placebo group and 30 years in the Mulligan group. There were 5 (33.3%) male participants in the Placebo group and 3 (20%) in the Mulligan group. The mean height was 167.20 ± 8.17 cm in the Placebo group and 167.27 ± 8.96 cm in the Mulligan group.

Mean weight was 69.60 ± 16.85 kg in the Placebo group and 70.40 ± 14.81 kg in the Mulligan group. The mean body mass index was 25.11 ± 7.27 kg/m² in the Placebo group and 25.16 ± 4.76 kg/m² in the Mulligan group. There were 3 (20%) high school graduates in the Placebo group and 2 (13.3%) in the Mulligan group. The descriptive characteristics of the participants in the Placebo and Mulligan groups had a similar (homogeneous) distribution ($p>0.05$). No significant difference was found between the two groups.

Table 5.2 Comparison of health characteristics of participants according to groups.

	Group		Test (<i>p</i>)
	Placebo <i>n</i> =15	Mulligan <i>n</i> =15	
Cigarette smoking, <i>n</i> (%)			
Yes	7 (%46.7)	5 (%33.3)	$\chi^2=0.556$
No	8 (%53.3)	10 (%66.7)	$p=0.456$
Alcohol use, <i>n</i> (%)			
Yes	7 (%46.7)	9 (%60)	$\chi^2=0.536$
No	8 (%53.3)	6 (%40)	$p=0.464$
Systemic disease, <i>n</i> (%)			
Yes	3 (%20)	1 (%6.7)	$\chi^2=1.154$
No	12 (%80)	14 (%93.3)	$p=0.283$
Regular medication use, <i>n</i> (%)			
Yes	3 (%20)	1 (%6.7)	$\chi^2=1.154$
No	12 (%80)	14 (%93.3)	$p=0.283$
History of surgery, <i>n</i> (%)			
Yes	5 (%33.3)	2 (%13.3)	$\chi^2=1.677$
No	10 (%66.7)	13 (%86.7)	$p=0.195$
Pain sensation, <i>n</i> (%)			
Yes	14 (%93.3)	14 (%93.3)	$\chi^2=0.001$
No	1 (%6.7)	1 (%6.7)	$p=0.999$
Duration of pain, (<i>ay</i>)			
<i>X</i> ± <i>SS</i>	17.67 ± 22.05	14.80 ± 15.90	$t=0.408$
<i>M</i> (<i>min-max</i>)	12 (0-72)	12 (0-60)	$p=0.686$

Independent Sample t Test (*t*); Chi-Square Test (χ^2); Descriptive statistics are given as mean (*X*), standard deviation (*SD*), Median (*M*), minimum (*min*), maximum (*max*), number (*n*), percentage (%).

Table 5.2 shows that there were 7 (46.7%) smokers in the Placebo group and 5 (33.3%) in the Mulligan group. There were 7 (46.7%) alcohol users in the Placebo group and 9 (60%) in the Mulligan group. There were 3 (20%) people in the Placebo group and 1 (6.7%) person in the Mulligan group with systemic diseases. There were 3 (20%) people in the Placebo group and 1 (6.7%) person in the Mulligan group who used regular medication. There were 5 (33.3%) people in the Placebo group and 2 (13.3%) people in

the Mulligan group who had undergone surgery. There were 14 (93.3%) people in the Placebo and Mulligan groups who felt pain. The median duration of pain sensation was 12 months in the Placebo group and 12 months in the Mulligan group. The health characteristics of the participants in the Placebo and Mulligan groups had a similar (homogeneous) distribution ($p>0.05$).

Table 5.3. Comparison of measurements between groups before treatment.

	Group		<i>t</i>	<i>p</i>	<i>d</i>
	Placebo <i>n</i> =15	Mulligan <i>n</i> =15			
Pain-VAS	6.87 ± 1.68	6.67 ± 1.72	0.322	0.750	0.118
ROM-Flexion	44.13 ± 4.49	44.33 ± 4.22	-0.126	0.901	-0.046
ROM-Extension	51.53 ± 5.78	52.27 ± 5.92	-0.343	0.734	-0.125
ROM-Rotation (Right)	62.80 ± 8.88	63.00 ± 5.87	-0.073	0.943	-0.027
ROM-Rotation (Left)	61.47 ± 7.18	63.93 ± 5.48	-1.057	0.299	-0.386
ROM-Lateral Flexion (Right)	36.40 ± 6.08	35.13 ± 4.60	0.644	0.525	0.235
ROM-Lateral Flexion (Left)	35.67 ± 5.30	36.07 ± 4.23	-0.228	0.821	-0.083
Muscle Endurance-AS	28.80 ± 6.18	26.27 ± 2.60	1.463	0.154	0.534
Muscle Endurance-Pİ	32.53 ± 24.14	22.27 ± 11.85	1.479	0.150	0.540
Neck Disability Index	21.07 ± 7.63	21.60 ± 7.98	-0.187	0.853	-0.068
SF-36 Physical function	72.00 ± 20.94	69.67 ± 23.03	0.290	0.774	0.106
SF-36 Role limitations due to physical health	40.00 ± 43.09	33.33 ± 41.90	0.430	0.671	0.157
SF-36 Role limitations due to emotional problems	37.73 ± 43.42	24.40 ± 32.08	0.957	0.347	0.349
SF-36 Energy-fatigue	38.33 ± 16.55	46.33 ± 20.04	-1.192	0.243	-0.435
SF-36 Emotional well-being	47.47 ± 13.51	49.07 ± 16.46	-0.291	0.773	-0.106
SF-36 Social functioning	47.07 ± 11.02	39.33 ± 15.50	1.575	0.126	0.575
SF-36 Pain	40.20 ± 20.42	35.87 ± 22.82	0.548	0.588	0.200
SF-36 General health	45.00 ± 16.37	47.67 ± 18.41	-0.419	0.678	-0.153

Independent Sample t Test (*t*), Cohen's *d* (*d*), Descriptive statistics are given as mean (*X*), standard deviation (*SD*) values.

When Table 5.3 was analyzed, the mean VAS before treatment was 6.87 ± 1.68 in the placebo group and 6.67 ± 1.72 in the Mulligan group. The pre-treatment flexion mean was 44.13 ± 4.49 in the placebo group and 44.33 ± 4.22 in the Mulligan group. The

pre-treatment mean extension was 51.53 ± 5.78 in the placebo group and 52.27 ± 5.92 in the Mulligan group. The mean right rotation before treatment was 62.80 ± 8.88 in the placebo group and 63.00 ± 5.87 in the Mulligan group. The mean left rotation before treatment was 61.47 ± 7.18 in the placebo group and 63.93 ± 5.48 in the Mulligan group. . The mean pre-treatment right lateral flexion was 36.40 ± 6.08 in the placebo group and 35.13 ± 4.60 in the Mulligan group. The mean left lateral flexion before treatment was 35.67 ± 5.30 in the placebo group and 36.07 ± 4.23 in the Mulligan group. There were no differences between the groups in neck disability index, muscle endurance and quality of life values. When Table 5.3 is examined, the measurements obtained before treatment in the study did not show a statistically significant difference between the groups ($p>0.05$).

Table 5.4 Intragroup comparison of measurements in the placebo group

Placebo	<i>Pre-test</i>	<i>Post-test</i>	<i>t*</i>	<i>p</i>	<i>d</i>
Pain-VAS	6.87 ± 1.68	4.53 ± 1.19	5.857	0.000	1.512
ROM-Flexion	44.13 ± 4.49	44.53 ± 4.78	-0.530	0.604	-0.137
ROM-Extension	51.53 ± 5.78	53.73 ± 6.01	-2.252	0.041	-0.581
ROM-Rotation (Right)	62.80 ± 8.88	66.27 ± 7.75	-6.394	0.000	-1.651
ROM-Rotation (Left)	61.47 ± 7.18	65.07 ± 6.01	-4.129	0.001	-1.066
ROM-Lateral Flexion (Right)	36.40 ± 6.08	38.87 ± 4.70	-3.138	0.007	-0.810
ROM-Lateral Flexion (Left)	35.67 ± 5.30	38.87 ± 4.37	-4.092	0.001	-1.057
Muscle Endurance-AS	28.80 ± 6.18	30.00 ± 6.32	-1.871	0.082	-0.483
Muscle Endurance-PI	32.53 ± 24.14	39.07 ± 24.85	-2.051	0.060	-0.529
Neck Disability Index	21.07 ± 7.63	12.80 ± 4.72	5.151	0.000	1.330
SF-36 Physical function	72.00 ± 20.94	75.67 ± 15.45	-1.280	0.221	-0,330
SF-36 Role limitations due to physical health	40.00 ± 43.09	46.67 ± 36.43	-1.468	0.164	-0,379
SF-36 Role limitations due to emotional problems	37.73 ± 43.42	42.13 ± 40.80	-0.807	0.433	-0,208
SF-36 Energy-fatigue	38.33 ± 16.55	42.67 ± 13.61	-2.101	0.054	-0,542
SF-36 Emotional well-being	47.47 ± 13.51	49.07 ± 12.69	-1.193	0.253	-0,308
SF-36 Social functioning	47.07 ± 11.02	48.67 ± 10.40	-1.468	0.164	-0,379
SF-36 Pain	40.20 ± 20.42	57.60 ± 20.17	-4.476	0.001	-1.156
SF-36 General health	45.00 ± 16.37	57.00 ± 13.20	-4.000	0.001	-1.033

Dependent Sample t Test (t^*), Cohen's d (d), Descriptive statistics are given as mean ($\bar{X}$), standard deviation (SD) values. Bolded sections are statistically significant ($p<0.05$).

When Table 5.4 was examined, the mean VAS in the Placebo group was 6.87 ± 1.68 points in the pre-test and 4.53 ± 1.19 points in the post-test and the pre-test was statistically higher than the post-test ($p < 0.05$).

The mean extension in the Placebo group was 51.53 ± 5.78 points in the pretest and 53.73 ± 6.01 points in the posttest, which was statistically lower than the pretest-posttest ($p < 0.05$).

The mean right side rotation in the Placebo group was 62.80 ± 8.88 points in the pretest and 66.27 ± 7.75 points in the posttest, which was statistically lower than the pretest-posttest ($p < 0.05$). Left side rotation mean in the Placebo group was 61.47 ± 7.18 points in the pre-test and 65.07 ± 6.01 points in the post-test, which was statistically lower than the pre-test post-test ($p < 0.05$).

The mean right lateral flexion in the placebo group was 36.40 ± 6.08 points in the pre-test and 38.87 ± 4.70 points in the post-test, while the pre-test was statistically lower than the post-test ($p < 0.05$).

The mean left lateral flexion was 35.67 ± 5.30 points in the pre-test and 38.87 ± 4.37 points in the post-test in the Placebo group, which was statistically lower than the pre-test ($p < 0.05$). The mean of neck disability indicator in the Placebo group was 21.07 ± 7.63 points in the pre-test and 12.80 ± 4.72 points in the post-test, statistically higher than the pre-test post-test ($p < 0.05$).

The mean of quality of life pain dimension in the Placebo group was 40.20 ± 20.42 points in the pre-test and 57.60 ± 20.17 points in the post-test, statistically lower than the pre-test post-test ($p < 0.05$). In the placebo group, the mean overall health quality of life was 45.00 ± 16.37 points in the pre-test and 57.00 ± 13.20 points in the post-test, which was statistically lower than the pre-test post-test ($p < 0.05$). In the placebo group, other measurements did not show a statistically significant difference between groups ($p > 0.05$).

Table 5.5. Intragroup comparison of measurements in the Mulligan group.

Mulligan	<i>Pre-test</i>	<i>Post-test</i>	<i>t*</i>	<i>p</i>	<i>d</i>
Pain-VAS	6.67 ± 1.72	2.67 ± 0.90	9.941	0.000	2.567
ROM-Flexion	44.33 ± 4.22	48.60 ± 2.87	-4.051	0.001	- 1.046
ROM-Extension	52.27 ± 5.92	56.00 ± 3.74	-2.956	0.010	- 0.763
ROM-Rotation (Right))	63.00 ± 5.87	71.67 ± 4.51	-4.921	0.000	- 1.271
ROM-Rotation (Left)	63.93 ± 5.48	73.20 ± 2.51	-7.189	0.000	- 1.856
ROM-Lateral Flexion (Right)	35.13 ± 4.60	42.67 ± 2.06	-5.923	0.000	- 1.529
ROM-Lateral Flexion (Left)	36.07 ± 4.23	42.93 ± 2.49	-5.548	0.000	- 1.432
Muscle Endurance-AS	26.27 ± 2.60	28.13 ± 3.81	-3.108	0.008	- 0.803
Muscle Endurance-PI	22.27 ± 11.85	30.00 ± 13.67	-3.399	0.004	- 0.878
Neck Disability Index	21.60 ± 7.98	11.00 ± 3.98	5.209	0.000	1.345
SF-36 Physical function	69.67 ± 23.03	79.67 ± 12.88	-2.815	0.014	- 0.727
SF-36 Role limitations due to physical health	33.33 ± 41.90	40.00 ± 39.87	-1.740	0.104	- 0.449
SF-36 Role limitations due to emotional problems	24.40 ± 32.08	31.00 ± 29.50	-1.135	0.276	- 0.293
SF-36 Energy-fatigue	46.33 ± 20.04	50.00 ± 14.76	-1.434	0.174	- 0.370
SF-36 Emotional well-being	49.07 ± 16.46	53.07 ± 11.16	-1.421	0.177	- 0.367
SF-36 Social functioning	39.33 ± 15.50	46.80 ± 8.75	-2.074	0.057	- 0.536
SF-36 Pain	35.87 ± 22.82	49.40 ± 15.51	-3.465	0.004	- 0.895
SF-36 General health	47.67 ± 18.41	61.67 ± 16.11	-5.137	0.000	- 1.326

Dependent Sample t Test (*t**), Cohen's d (*d*), Descriptive statistics are given as mean (*X*), standard deviation (*SD*) values. Bolded sections are statistically significant (*p*<0.05).

When Table 5.5 was analyzed, the mean VAS in the Mulligan group was 6.67 ± 1.72 points in the pre-test and 2.67 ± 0.90 points in the post-test and the pre-test was statistically higher than the post-test (*p*<0.05). The mean flexion score in the Mulligan group was 44.33 ± 4.22 points in the pre-test and 48.60 ± 2.87 points in the post-test, while the pre-test was statistically lower than the post-test (*p*<0.05). The mean extension

score in the Mulligan group was 52.27 ± 5.92 points in the pre-test and 56.00 ± 3.74 points in the post-test, while the pre-test was statistically lower than the post-test ($p < 0.05$). The mean right side rotation in the Mulligan group was 63.00 ± 5.87 points in the pre-test and 71.67 ± 4.51 points in the post-test, which was statistically lower than the pre-test post-test ($p < 0.05$). The mean left side rotation in the Mulligan group was 63.93 ± 5.48 points in the pre-test and 73.20 ± 2.51 points in the post-test, while the pre-test was statistically lower than the post-test ($p < 0.05$). The mean right lateral flexion in the Mulligan group was 35.13 ± 4.60 points in the pre-test and 42.67 ± 2.06 points in the post-test, while the pre-test was statistically lower than the post-test ($p < 0.05$). Left side Lateral Flexion mean was 36.07 ± 4.23 points in the pre-test and 42.93 ± 2.49 points in the post-test in the Mulligan group, which was statistically lower in the pre-test than the post-test ($p < 0.05$).

Flexor Muscle Endurance AS mean in the Mulligan group was 26.27 ± 2.60 points in the pre-test and 28.13 ± 3.81 points in the post-test, while the pre-test was statistically lower than the post-test ($p < 0.05$). Flexor Muscle Endurance PI mean was 22.27 ± 11.85 points in the pre-test and 30.00 ± 13.67 points in the post-test in the Mulligan group, while the pre-test was statistically lower than the post-test ($p < 0.05$). In the Mulligan group, the other measurements did not show a statistically significant difference between the groups ($p > 0.05$).

The mean neck disability indicator was 21.60 ± 7.98 points in the Mulligan group in the pre-test and 11.00 ± 3.98 points in the post-test, while the pre-test was statistically higher than the post-test ($p < 0.05$). The quality of life physical function dimension mean was 69.67 ± 23.03 points in the Mulligan group in the pre-test and 79.67 ± 12.88 points in the post-test, while the pre-test was statistically lower than the post-test ($p < 0.05$).

The mean pain dimension of quality of life was 35.87 ± 22.82 points in the Mulligan group in the pre-test and 49.40 ± 15.51 points in the post-test, while the pre-test was statistically lower than the post-test ($p < 0.05$). In the Mulligan group, the mean overall health quality of life was 47.67 ± 18.41 points in the pre-test and 61.67 ± 16.11 points in the post-test, while the pre-test was statistically lower than the post-test ($p < 0.05$).

Table 5.6. Comparison of pre-test post-test differences of measurements between groups

	Group		<i>t</i>	<i>p</i>	<i>d</i>
	Placebo <i>n</i> =15	Mulligan <i>n</i> =15			
Pain-VAS	-2.33 ± 1.54	-4.00 ± 1.56	2.943	0.006	1.075
ROM-Flexion	0.40 ± 2.92	4.27 ± 4.08	-2.984	0.006	-1.090
ROM-Extension	2.20 ± 3.78	3.73 ± 4.89	-0.960	0.345	-0.351
ROM-Rotation (Right)	3.47 ± 2.10	8.67 ± 6.82	-2.822	0.009	-1.030
ROM-Rotation (Left)	3.60 ± 3.38	9.27 ± 4.99	-3.641	0.001	-1.330
ROM-Lateral Flexion (Right)	2.47 ± 3.04	7.53 ± 4.93	-3.389	0.002	-1.237
ROM-Lateral Flexion (Left)	3.20 ± 3.03	6.87 ± 4.79	-2.504	0.018	-0.914
Muscle Endurance-AS	1.20 ± 2.48	1.87 ± 2.33	-0.759	0.454	-0.277
Muscle Endurance-PI	6.53 ± 12.34	7.73 ± 8.81	-0.307	0.761	-0.112
Neck Disability Index	-8.27 ± 6.22	-10.60 ± 7.88	0.900	0.376	0.329
SF-36 Physical function	3.67 ± 11.09	10.00 ± 13.76	-1.388	0.176	-0.507
SF-36 Role limitations due to emotional problems	6.67 ± 17.59	6.67 ± 14.84	0.001	0.999	0.001
SF-36 Role limitations due to emotional problems	4.4 ± 21.12	6.60 ± 22.53	-0.276	0.785	-0.101
SF-36 Energy-fatigue	4.33 ± 7.99	3.67 ± 9.90	0.203	0.841	0.074
SF-36 Emotional well-being	1.60 ± 5.19	4.00 ± 10.90	-0.770	0.448	-0.281
SF-36 Social functioning	1.60 ± 4.22	7.47 ± 13.94	-1.560	0.130	-0.570
SF-36 Pain	17.40 ± 15.06	13.53 ± 15.13	0.702	0.489	0.256
SF-36 General health	12.00 ± 11.62	14.00 ± 10.56	-0.493	0.626	-0.180

Independent Sample t Test (*t*), Cohen's *d* (*d*), Descriptive statistics are given as mean (*X*), standard deviation (*SD*) values.

When Table 5. 6 was analyzed, the mean VAS decreased 2.33 ± 1.54 points in the Placebo group and 4.00 ± 1.56 points in the Mulligan group, while the Placebo group decreased statistically less than the Mulligan group ($p < 0.05$).

The mean flexion increased 0.40 ± 2.92 points in the Placebo group and 4.27 ± 4.08 points in the Mulligan group, while the Placebo group increased statistically less than the Mulligan group ($p < 0.05$). The mean right side rotation increased by 3.47 ± 2.10 points in the Placebo group and 8.67 ± 6.82 points in the Mulligan group, while the Placebo group

increased statistically less than the Mulligan group ($p < 0.05$). The mean left side rotation increased by 3.60 ± 3.38 points in the Placebo group and 9.27 ± 4.99 points in the Mulligan group, while the Placebo group increased statistically less than the Mulligan group ($p < 0.05$). The mean right side rotation increased by 2.47 ± 3.04 points in the Placebo group and 7.53 ± 4.93 points in the Mulligan group, while the Placebo group increased statistically less than the Mulligan group ($p < 0.05$). The mean left side rotation increased by 3.20 ± 3.03 points in the Placebo group and 6.87 ± 4.79 points in the Mulligan group, while the Placebo group increased statistically less than the Mulligan group ($p < 0.05$). The pretest-posttest differences of the other measurements did not show statistically significant differences between the groups ($p > 0.05$).



6. DISCUSSION

We evaluated pain, ROM, muscle endurance, NDI and SF-36 measurements in our study in which we examined the effectiveness of MMT in desk workers with non-specific chronic neck pain. The findings of this study showed that there were significant differences in pain, range of motion (ROM), muscle endurance, NDI and SF-36 values in the group in which we applied Mulligan mobilization technique in addition to classical physical therapy in desk workers with NCNP compared to the placebo group. In addition, in the placebo group applied with classical physical therapy, pain decreased, ROM values increased, and a significant improvement was observed in NDI and SF-36 values. The most important finding of this study is the significant improvement in pain and significant increase in ROM values in the group in which we applied MMT. However, there was no significant difference in most parameters of quality of life in the desk workers who participated in the study in both groups. A positive difference was observed in muscle endurance and neck disability index in the Mulligan group. In the placebo group, a significant difference was observed in the NDI measurement. However, no significant difference was found between the groups in these values. In the literature, there are many studies involving the Mulligan mobilization technique, but there are not many studies evaluating neck pain. And the literature studies we have done do not address desk workers with non-specific chronic neck pain.

MMT is a coseption to correct functional impairment, pain and limitation of joint motion, and to increase muscle function. Mulligan emphasizes that if the positional error is not corrected, symptoms such as pain and restriction of joint motion will persist. Therefore, MMT aims to improve pain and restriction of joint motion by correcting the positional error.

A study in an athletic population with NP aimed to examine the treatment efficacy of the SNAGs technique, one of the MMT. SNAGs technique was applied in 10 young patients with mechanical neck pain aged between 15 and 18 years. Pain, Numerical Rating Scale (NRS), ROM, Patient Specific Functional Scale (PSFS), NDI, Disability in the Physically Active (DPAS) and Fear-Avoidance Based Questionnaire-Physical Activity (FABQPA) measurements were evaluated. After the treatment, a significant difference was found in pain in NRS and improvement was observed. An increase was found in the ROM measurements of flexion, extension, left rotation and right rotation. As a result of the study, despite the small sample size, positional SNAGs application showed

significant improvements in pain after 1 treatment and ROM after 3 treatments in young patients with mechanical pain. The small sample size of this and similar studies shows that more studies are needed. However, it can be used as a preliminary step in the effectiveness of SNAGs application (98).

In a quasi-experimental study on patients with non-specific neck pain, the effectiveness of the muscle energy technique and mulligan mobilization technique was examined. The study included 56 patients with neck pain between the ages of 20-40 years who applied to Mayo Hospital between March and September 2017. The 56 patients with a mean age of 36.89 ± 9.28 years were divided into 2 groups using even and odd numbered randomization method. Group 1 was applied muscle energy technique (MET) after post-isometric relaxation and Group 2 was applied mulligan mobilization technique. During the study, VAS, ROM and functional status of the neck, NDI values were measured before and after treatment. As a result of the study, there was a significant improvement in the extension measurement of pain, functional status and ROM measurements in the Mulligan group (99).

There are studies showing that we have high levels of pain in desk workers and that pain and ROM affect activities of daily living. ROM values may be one of the limiting reasons for having pain. This may affect the level of disability and quality of life of workers. In our study, as in the group in which we applied Mulligan mobilization, we think that the decrease in pain and the increase in ROM values will have positive results in the daily lives of these employees.

The Mulligan mobilization technique creates a neurophysiological effect in the nervous system by stimulating proprioceptors around the joint, and the stimulated mechanoreceptors cause inhibitory signals in the brain and spinal cord that reduce pain. Thus, we know that pain sensation decreases during movement and mobility increases. Therefore, we think that we could not reduce pain in the placebo group because we could not increase ROM values much. Therefore, recent studies have shown that Mulligan mobilization technique reduces pain, increases ROM and improves quality of life in patients with non-specific chronic neck pain.

In the literature studies examining the Mulligan Concept, there is not much research on the effect of SNAGS and NAGS techniques on muscle strength and endurance. In our study, we evaluated muscle strength measurement in Mulligan and placebo groups using the Stabilizer Pressure Biofeedback unit. In our study results, in our flexor muscle endurance measurements, the mean AS(activation score) in the Mulligan

group was 26.27 ± 2.60 points in the pre-test and 28.13 ± 3.81 points in the post-test, while the pre-test was statistically lower than the post-test. The mean of Flexor Muscle Endurance PI was 22.27 ± 11.85 points in the Mulligan group in the pre-test and 30.00 ± 13.67 points in the post-test, while the pre-test was statistically lower than the post-test. Although there was an improvement in our muscle endurance values in the Mulligan group, no significant difference was found in the comparison of both groups.

In a literature study, 36 patients with chronic neck pain were randomly assigned to home exercise (mean age: 31.67 ± 9.89 years), Mulligan mobilization (mean age: 35.67 ± 13.55 years) and cervical stabilization (mean age: 34.50 ± 10.07 years) groups to compare the effectiveness of Mulligan mobilization technique and cervical stabilization training in patients with chronic neck pain. Participants in all groups received a total of 14 sessions of treatment 5 days a week. At the end of the study, pain intensity, range of motion (ROM), proprioception, head posture, deep neck flexor (DBF) muscle endurance, disability level and neck awareness were evaluated as outcome measures. It was determined that Mulligan mobilization and cervical stabilization applications were more effective than home exercise in pain intensity, DBF muscle endurance and disability level parameters ($p < 0.05$), but not superior to each other ($p > 0.05$). Mulligan mobilization technique was found to be more effective in increasing ROM in patients with chronic neck pain ($p < 0.05$). In addition, cervical stabilization training was more effective in improving head posture in this patient population ($p < 0.05$).

In our study, we did not include an application that would affect the muscle endurance value and sufficient time in the study. Therefore, we think that there is no significant difference in muscle endurance value. More literature studies and longer follow-ups are needed to evaluate the effect of Mulligan mobilization technique on muscle endurance.

Neck pain, which is a common musculoskeletal disorder, can cause joint movement limitation and disability due to pain in the neck and shoulder. In our study, the disability levels of the participants due to neck pain were evaluated using the Neck Disability Index, which is the most widely used in the neck region. In our study, a significant improvement was observed in the Neck Disability Index measurement in the Mulligan and placebo groups ($p < 0.05$). Although more improvement was found in the Mulligan group in the results, no significant difference was observed in the comparison of both groups.

In a local clinical study, 40 patients aged 25-50 years with mechanical neck pain were included. The study investigating the effectiveness of MMT in patients with mechanical neck pain was randomly divided into 2 groups as Mulligan mobilization and control group. Patients in both groups were given home exercise programs. Participants were treated for 2 weeks and 10 sessions in total. Muscle endurance (stabilizer pressure biofeedback, pain VAS, ROM,), disability level (Neck Disability Scale), quality of life (Nottingham Health Profile), depression status (Beck Depression Scale), cervical performance level (cervical performance tests) were measured before treatment, after treatment, 1 month and 3 months after the end of treatment. As a result of the study, a significant improvement was noted in pain, muscle endurance, disability level, ROM, quality of life and quality of performance in both groups. In the study, no significant difference was found in muscle strength except for the infraspinatus and supraspinatus muscles at the pain threshold. In the study, a significant difference was observed in the Mulligan group in all parameters except pain threshold measurement in intergroup comparison (100).

In a literature study conducted in 2018 with a placebo control group similar to our study, 40 participants with mechanical neck pain were randomly divided into 2 groups. NAG, SNAG and self SNAG techniques were applied to the control and experimental groups. While the techniques were applied to the experimental group in a nine-session treatment program, the Sham-Mulligan technique was applied to the control group. Pain and disability levels were measured on these groups. Pain was measured with the Numerical Pain Rating Scale (NPRT) and disability was measured with the Neck Disability Index (NDI). Changes between group factors and time were evaluated with a 1-month follow-up, pre- and post-test. As a result of the study, there was a significant improvement in NPRT and NDI scores in the post-test compared to the baseline results in the Mulligan group. No significant difference was found in the time evaluation of the control group (101).

Neck pain negatively affects the quality of life of patients. In our study, we evaluated the quality of life with SF-36. Although improvements were observed in intra-group values in our study, the pre-test and post-test results of Mulligan and Placebo groups were not found to be superior to each other ($p>0.05$).

In a literature study, 42 older adults with neck pain were divided into 2 groups as physical therapy (TP) group and traditional physical therapy-Mulligan mobilization (TPMM) group. The treatment program was planned as 10 sessions. Participants were

evaluated for pain, ROM, functional level, kinesiophobia, depression and QoL before and after treatment. Both groups showed improvement in pain, ROM, functional level, kinesiophobia, depression and QoL after treatment ($p < 0.05$). When the effects of these two treatment programs were compared, it was observed that the TPMM group had a better outcome in terms of ROM, kinesiophobia, depression and QoL ($p < 0.05$). In conclusion, it was found that MMT had significant effects on pain, ROM, functional level, kinesiophobia, depression and QoL in elderly individuals with neck pain as long as it was applied by a specialist (102).

In our study, NDI and quality of life values were not significantly different between the Mulligan mobilization group and placebo groups. We attribute this to the fact that our study was conducted in a young population, so the disability levels were not bad at the beginning of the study and our study period was short.

When we examined the literature studies, it was found that low back pain ranked 1st in musculoskeletal disability. Although neck pain was found to be the 4th most common disability in the same study, there are more literature studies on low back pain than neck pain. The Mulligan technique is a technique used in neck pain and significant improvements in pain, ROM and disability levels have been found. However, there are not many literature studies on patients with neck pain. In the Mulligan technique studies with neck pain that we examined, we did not come across the evaluation of desk workers.

The fact that our study examined and evaluated the Mulligan mobilization technique on patients with desk-based neck pain is the first time in the literature studies. While conducting our study, our aim was to examine the effectiveness of Mulligan Mobilization technique in patients with neck pain. However, the fact that our study was conducted with a treatment plan of 3 sessions per week, 4 weeks duration and 12 sessions in total shows that our study is limited. In our study, we could have observed the changes in the long-term pain, ROM, muscle endurance, NDI, SF-36 parameters of the Mulligan technique on patients in longer follow-ups. The study we conducted needs long-term follow-ups. The fact that we evaluated our study on 30 desk workers with neck pain shows that our study has a relatively small sample size. Our study needs a larger sample size and long-term follow-up.

7. CONCLUSION

In conclusion, as far as we know, this is the first study in the literature to investigate the Mulligan mobilization technique in desk workers with non-specific neck pain. This study evaluated the effectiveness of the Mulligan mobilization technique (MMT) in desk workers with non-specific chronic neck pain (NCNP) by assessing pain, range of motion (ROM), muscle endurance, NDI, and SF-36 measures. The Mulligan mobilization technique was found to be effective in reducing pain and increasing ROM values. Considering that it reduces pain in a short time in desk workers with non-specific chronic neck pain with high short-term pain intensity, we think that it is an effective method to increase joint range of motion and functionality in addition to pain management methods. Therefore, we consider the use of this technique to be a novel approach for individuals with neck pain. The Mulligan mobilization technique may improve pain and joint mobility limitations in desk workers with non-specific neck pain.

8. SOURCES

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APPENDIX A: ETHICAL COMMITTEE APPROVAL



T.C.
YEDİTEPE ÜNİVERSİTESİ REKTÖRLÜĞÜ
Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu



Sayı : E.83321821-805.02.03-373
Konu : Etik Kurul Karar Yazısı

Sayın Dr. Öğr. Üyesi Elif DEVELİ

Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kuruluna etik onay için başvuru yapılmış olan araştırma önerisinin başlığı, araştırmacılar, başvuru numarası, sunulan belgeler ve toplantı bilgileri aşağıda yer almaktadır. İlgili araştırma önerisi, etik kurulumuz üyeleri tarafından değerlendirilmiş olup, etik ve bilimsel açıdan UYGUN olduğuna karar verilmiştir.

Araştırma Başlığı:	Spesifik olmayan kronik boyun ağrılı masa başı çalışanlarında uygulanan Mulligan mobilizasyon tekniğinin plasebo etkisi ile karşılaştırılması.
Araştırmacılar:	Fzt Aslıhan SEZEN, Dr. Öğr. Üyesi Elif Develi
Başvuru Numarası:	202302Y0565

TOPLANTI BİLGİLERİ			
Toplantı Tarihi:	09.02.2024	Toplantı Yeri:	Çevirim içi (Google Meet)

SUNULAN BELGELER	
Islak imzalı başvuru dosyası, CD veya USB belleğe kaydedilmiş başvuru dosyası ve elektronik başvuru	
Araştırma başlığı ve araştırmacıların isimleri	
Başvuru dilekçesi	
Başvuru formu	
Araştırmanın;	
• Niteliği	
• Önemi ve özgün değeri	
• Amaç ve hedefleri	
• Yöntemi	
• Yönetimi	
• Yaygın etkisi	
• Araştırma bütçesi (Mevcutsa)	
• Süresi ve uygunluğu (Zaman cetveli)	
• Kaynakları	
Bilgilendirilmiş Gönüllü Olur Formu (yapılan araştırmaya özel olarak hazırlanmış)	

Bu belge, güvenli elektronik imza ile imzalanmıştır.

Belge Doğrulama Adresi : <http://belgedogrulama.yeditepe.edu.tr/?q=agm?id=8B35FA57-4018-4FF9-AB14-5B7624008742>

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Uzman Yardımcısı

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APPENDIX B: INFORMED WRITTEN CONSENT



Araştırmanın adı: Spesifik Olmayan Kronik Boyun Ağrılı Masa Başı Çalışanlarında Uygulanan Mulligan Mobilizasyon Tekniğinin Plasebo Etkisi İle Karşılaştırılması

Sayın katılımcı,

Yukarıda adı yazılı araştırmaya katılmak üzere davet edilmiş bulunmaktasınız. Çalışmaya katılıp katılmama kararı tamamen size aittir. Katılmak isteyip istemediğinize karar vermeden önce çalışmanın neden yapıldığını, bilgilerinizin nasıl kullanılacağını, çalışmanın neler içerdiğini, olası yararlarını ve risklerini ya da rahatsızlık verebilecek yönlerinizi anlamamız önemlidir. Lütfen aşağıdaki bilgileri dikkatlice okumak için zaman ayırınız. Sorularınız var ise sorunuz ve açık yanıtlar isteyiniz.

Bu araştırma spesifik olmayan (herhangi bir nedene bağlı olmayan) kronik boyun ağrılı masa başı çalışanlarında Mulligan mobilizasyon tekniğinin etkinliğini incelemeyi amaçlamıştır. Çalışmamızda Mulligan mobilizasyon tekniğini ağrı , eklem hareket açıklığı, boyun engellilik indexi (boyun ötür göstergesi) , yaşam kalitesi ve boyun kası dayanıklılığı (Chattanooga basınç biofeedback cihazı ile ölçülecektir) değerlendirmeleri hastalar üzerindeki plasebo etkisi ile karşılaştırılacaktır. Tedavi sürecinden önce ve 4 hafta sonra ölçümler alınacaktır. Bu çalışma için Yeditepe Üniversitesi'nden izin alınmıştır. Araştırmaya sizin dışınızda 29 kişi daha katılacaktır. Sizden bu çalışmaya 4 hafta haftada 3 gün ve geldiğiniz günler 1 saat vakit ayırmanız istenecektir. Bunun size ve yakınlarınıza hiçbir zarar olmayacaktır. Çalışmaya katılmakla parasal yük altına girmeyeceksiniz ve size de herhangi bir ödeme yapılmayacaktır.

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

Yukarıda yer alan ve araştırmaya başlamadan önce katılımcılara verilmesi gereken bilgileri içeren metni okudum (ya da sesli 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.

Katılımcı:
İmza/Tarih:
Adı-Soyadı
Adres:
Telefon

Araştırma Yürütücüsü
İmza/Tarih:
Adı-Soyadı
Adres
Telefon

Tanık:
İmza/Tarih:
Adres:

Adı-Soyadı:
Telefon:

APPENDIX C: DEMOGRAPHIC INFORMATION

Demografik Bilgi Anketi

Tarih:....../....../.....1)Hastanın Adı Soyadı:

2)Yaş:

3) Cinsiyet: Kız Erkek

4) Boy uzunluğu (cm):

5) Vücut ağırlığı (kg) :

6) Dominant taraf:

El Sağ Sol

Ayak Sağ Sol

7)Medeni Durumunuz:

- Hiç evlenmemiş
- Evli
- Boşanmış
- Ayrı yaşıyor
- Eşi ölmüş

8)Eğitim durumunuz

- Okuryazar değil
- İlköğretim
- Lise
- Üniversite ve üzeri

9) Mesleğiniz:

10) Varsa kaç çocuğunuz var

- Yok

11) Sigara kullanıyor musunuz?

a)Hiç içmedim

b)Sigara içtim ama bıraktım

c)Halen içiyorum

b) Günde kaç adet sigara içiyorsunuz?.....adet/gün

12) Alkol kullanıyor musunuz?

- Evet Hangi sıklıkla?.....
- Hayır

13) Doktor tarafından teşhisi konulmuş herhangi bir sistemik rahatsızlığınız var mı?

- Evet
- Hayır

Cevabınız evet ise teşhis edilen hastalığınız aşağıdakilerden hangisi / hangileridir? (birden fazla seçim yapabilirsiniz.)

- Kalp damar hastalıkları
- Şeker hastalığı
- Yüksek tansiyon
- Kanser
- Sindirim sistemi hastalıkları (karaciğer, mide, safra kesesi,...)
- Solunum sistemi hastalıkları (akciğer)
- Ruhsal sorunlar (depresyon, aşırı yeme, kusma,...)
- Endokrin (hormonal) hastalıklar
- Vitamin ve mineral yetersizlikleri (Demir, B12, D vitamini,...)
- Diğer :

14) Düzenli olarak kullandığınız bir ilaç var mı?

- Evet Nedir ?
- Hayır

15)Şu an herhangi bir ağrı kesici ilaç kullanıyor musunuz?

Evet Ne zamandır?

Hayır

16)Herhangi bir diz ameliyat geçirdiniz mi? Evet..... Belirtiniz Hayır

17)Hiç kaza geçirdiniz mi ? Evet.....Belirtiniz Hayır

18)Spor yapıyor musunuz? Yapıyorsanız ne sıklıkta?

Yapmıyorum

Ayda bir kez den az

Ayda 2 kez ve fazla

Haftada 1 kez

Haftada 2-3kez

Haftada 4-5 kez

Her gün

19) Egzersiz yapanlar için yaptığınız egzersiz her seferinde kaç dakika sürüyor ?

20 dk az

20-30 dk

30 – 60 dk

60 dk. dan fazla

20) Vücudunuzda ağrı hissediyor musunuz?

- Evet Nerede?.....Ne Zamandır?
- Hayır

APPENDIX D: VISUAL ANALOG SCALE

0	1	2	3	4	5	6	7	8	9	10
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Ağrı
Yok

Ağrı
En Şiddetli



APPENDIX E: QUALITY OF LIFE (SF-36)

Hastanın Adı Soyadı: _____		Tarih: ____/____/____	
Aşağıdaki sorular sizin kendi sağlığınız hakkındaki görüşünüzü, kendinizi nasıl hissettiğinizi ve günlük aktivitelerinizi ne kadar yerine getirebildiğinizi öğrenmek amacıyla. Size en uygun yanıtı verin.			
B1	1) Genel olarak sağlığınız için aşağıdakilerden hangisini söyleyebilirsiniz?		
	Mükemmel ☐ 1	Çok iyi ☐ 2	İyi ☐ 3
		Orta ☐ 4	Kötü ☐ 5
B2	2) Bir yıl öncesi ile karşılaştığınızda şu anki genel sağlık durumunuzu nasıl değerlendirirsiniz?		
	Bir yıl öncesi ☐ 1	Çok daha iyi ☐ 2	Biraz iyi ☐ 3
		Hemen hemen aynı ☐ 4	Biraz daha kötü ☐ 5
Aşağıdaki sorular bir gün içinde yapabileceğiniz işlerle (aktivitelerle) ilgilidir. Sağlığınız bu aktiviteleri kısıtlıyor mu? Eğer kısıtlıyorsa, ne kadar?			
B3		Evet, Çok Kısıtlı ☐ 1	Evet, Biraz Kısıtlı ☐ 2
	3) Koşmak, ağır kaldırmak, ağır sporlara katılmak gibi ağır etkinlikler	☐ 3	Hayır, Hiç Kısıtlı Değil ☐ 4
	4) Bir masayı çekmek, elektrikli süpürGESİni itmek ve ağır olmayan sporları yapmak gibi orta dereceli etkinlikler	☐ 1	☐ 2
	5) Market poşetlerini kaldırmak veya taşımak	☐ 1	☐ 2
	6) Birkaç kat merdiven çıkmak	☐ 1	☐ 2
	7) Bir kat merdiven çıkmak	☐ 1	☐ 2
	8) Eğilmek, diz çökmek, çömelmek, diz çökmek	☐ 1	☐ 2
	9) Bir kilometreden fazla yürümek	☐ 1	☐ 2
	10) Birkaç yüz metre yürümek	☐ 1	☐ 2
	11) Yüz metre yürümek	☐ 1	☐ 2
	12) Kendi başına banyo yapmak ve giyinmek	☐ 1	☐ 2
Son 4 hafta boyunca bedensel sağlığınızın sonucu olarak, işiniz veya diğer günlük etkinliklerinizde, aşağıdaki sorunlardan biriyle karşılaştınız mı?			
B4		Evet ☐ 1	Hayır ☐ 2
	13) Çalışma yaşamınızda veya diğer aktivitelerinizde geçirdiğiniz zamanı kısalttınız mı?	☐ 1	☐ 2
	14) Arzu ettiğinizden daha az şeyi mi tamamlayabildiniz?	☐ 1	☐ 2
	15) Çalışma veya diğer yaptığınız işlerin çeşidinde kısıtlama yaptınız mı?	☐ 1	☐ 2
	16) Çalışma yaşamınızda veya diğer aktivitelerinizi yapmada güçlük çektiniz mi? (Aşırı efor - çaba sarf ettiniz mi?)	☐ 1	☐ 2
Son 4 hafta boyunca, duygusal sorunlarınızın (örneğin çökkünlük veya kaygı) sonucu olarak işiniz veya diğer günlük etkinliklerinizle ilgili aşağıdaki sorunlarla karşılaştınız mı?			
B5		Evet ☐ 1	Hayır ☐ 2
	17) Çalışma yaşamınızda veya diğer aktivitelerinizde geçirdiğiniz zamanı kısalttınız mı?	☐ 1	☐ 2
	18) Arzu ettiğinizden daha az işi mi tamamlayabildiniz?	☐ 1	☐ 2
	19) İşinizle veya diğer aktivitelerinizle ilgili işleri her zamanki kadar dikkat vererek yapamadınız mı?	☐ 1	☐ 2

SF-36 (Kısa Form 36) Sayfa-2

B6

20) Son 4 hafta boyunca bedensel sağlığınız veya duygusal sorunlarınız, aileniz, arkadaş veya komşularınızla olan olağan sosyal etkinliklerinizi ne kadar etkiledi?

Hiç Etkilemedi ☐₁ Çok Az ☐₂ Orta Derecede ☐₃ Epeyce ☐₄ Çok Fazla ☐₅

B7

21) Son 4 hafta içinde vücudunuzda ne kadar ağrı oldu?

Hiç Olmadı ☐₁ Çok Az ☐₂ Hafif ☐₃ Orta ☐₄ Çok ☐₅ Pek Çok ☐₆

B8

22) Son 4 hafta boyunca ağrınız, normal işinizi (hem ev işlerinizi hem ev dışı işinizi düşününüz) ne kadar etkiledi?

Hiç Etkilemedi ☐₁ Biraz etkiledi ☐₂ Orta Derecede ☐₃ Epey Etkiledi ☐₄ Çok Etkiledi ☐₅

Aşağıdaki sorular sizin son 4 hafta boyunca neler hissettiğinizle ilgilidir. Her soru için, sizin duygularınızı en iyi karşılayan yanıtı, son 4 haftadaki sıklığını göz önüne alarak seçiniz.

B9

	Sürekli	Çoğu zaman	Epey zaman	Bazen	Ara sıra	Hiç bir zaman
23) Kendinizi yaşam dolu olarak hissettiniz mi?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
24) Çok sınırlı biri oldunuz mu?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
25) Hiçbir şeyin sizi neşelendiremeyeceği kadar moraliniz bozuk ve kötü oldu mu?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
26) Kendinizi sakın ve huzurlu hissettiniz mi?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
27) Çok enerjik oldunuz mu?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
28) Kendinizi kalbi kırık ve üzgün hissettiniz mi?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
29) Kendinizi yıpranmış, bitkin hissettiniz mi?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
30) Mutlu, sevinçli bir insan oldunuz mu?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
31) Yorgunluk hissettiniz mi?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆

B10

32) Son 4 hafta boyunca bedensel sağlığınız veya duygusal sorunlarınız sosyal etkinliklerinizi (arkadaş veya akrabalarınızı ziyaret etmek gibi) ne sıklıkta etkiledi?

Sürekli ☐₁ Çoğu zaman ☐₂ Bazen ☐₃ Ara sıra ☐₄ Hiç bir zaman ☐₅

Aşağıdaki her bir ifade sizin için ne kadar doğru veya yanlıştır? Her bir ifade için en uygun olanını işaretleyiniz.

B11

	Kesinlikle doğru	Çoğunlukla doğru	Emim değilim	Çoğunlukla yanlış	Kesinlikle yanlış
33) Ben diğer insanlara göre daha kolay hastalanıyorum	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅
34) Tanıdığım kişiler kadar sağlıklıyım.	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅
35) Sağlığımın kötüleşmekte olduğunu sanıyorum.	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅
36) Sağlığım mükemmeldir.	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅

APPENDIX F: 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 yanıt kendinize yakın hissetseniz bile, şu anki durumunuza en yakın olan seçeneği işaretleyiniz.	
1	6
Boyunda Ağrı Yoğunluğu	Konsantrasyon
A - Şu anda hiç boyun ağrım yok.	A - İstediğim zaman dikkatimi hiç zorlanmadan istediğim kadar toplayabiliyorum.
B - Şu anda çok hafif derecede boyun ağrım var.	B - Hafifçe zorlanarak dikkatimi toplayabiliyorum.
C - Boyun ağrım orta derecede ve gelip gidiyor.	C - İstediğim zaman biraz zorlanarak dikkatimi toplayabiliyorum.
D - Boyun ağrım orta şiddette ve değişkenlik göstermiyor.	D - İstediğim zaman epeyce zorlanarak dikkatimi toplayabiliyorum.
E - Boyun ağrım şiddetli fakat gelip gidiyor.	E - İstediğim zaman dikkatimi toplamakta çok fazla zorlanıyorum.
F - Boyun ağrım şiddetli ve değişkenlik göstermiyor.	F - Dikkatimi hiç toplayamıyorum..
2	7
Kişisel Bakım (giyinme ve temizlenme)	İş (Herhangi bir işte çalışmıyorsanız lütfen G seçeneğini işaretleyiniz)
A - Ek bir ağrıya neden olmadan kendime bakabiliyorum.	A - İstediğim kadar iş yapabiliyorum.
B - Kendime normal olarak bakabiliyorum fakat bu ek bir ağrıya neden oluyor.	B - Her günlük işlerimi yapabiliyim, ama daha fazlasını yapamam.
C - Kendi bakımımı yaparken ağrım artıyor, yavaşlıyorum ve dikkatli oluyorum.	C - Her günlük işlerimin çoğunu yapabiliyim, daha fazlasını yapamam.
D - Biraz yardıma ihtiyacım var fakat kişisel bakımımın çoğunu yapabiliyorum.	D - Her günlük işlerimi yapamam.
E - Kişisel bakımım ile ilgili işlerin çoğunda her gün yardıma ihtiyacım var.	E - Herhangi bir işi zorlukla yapabiliyim.
F - Giyinemiyorum. Zorlukla yıkanıyorum ve yataktan çıkmıyorum.	F - Hiçbir iş yapamam
3	8
Yük Kaldırma (boyun ağrınız olmadığı zamanlarda kaldırdığınız ağır yüklere eşit ağırlıkta)	Araba Kullanma
A - Ek bir ağrı hissetmeden ağır yükleri kaldırabiliyorum.	A - Boyun ağrısı hissetmeden araba kullanabiliyorum.
B - Ağır yükleri kaldırabiliyorum, fakat ek bir ağrıya neden oluyor.	B-Boynumda hafif bir ağrı hissi ile istediğim kadar araba kullanabiliyorum.
C - Ağrı yükleri yerden kaldırmama engel oluyor, fakat yükler, örneğin masa üstü gibi uygun bir yere yerleştirilirse kaldırabiliyorum.	C - Boynumda orta derecede ağrı nedeni ile istediğim kadar araba kullanamıyorum.
D - Ağrı ağır yük kaldırmama engel oluyor, fakat hafif ve orta ağırlıktaki yükler örneğin masa üstü gibi uygun bir yere yerleştirilirse kaldırabiliyorum.	D - Orta derecede bir boyun ağrısı nedeniyle istediğim kadar araba kullanamıyorum.
E - Çok hafif yükleri kaldırabiliyorum.	E - Boynumda şiddetli ağrı nedeniyle güçlükle araba kullanabiliyorum.
F - Hiçbir şeyi kaldıramıyorum ve taşıyamıyorum.	F - Boyun ağrısı nedeniyle hiç araba kullanamıyorum.
4	9
Okuma	Uyku
A - Hiç boyun ağrısı hissetmeden istediğim kadar okuyabiliyorum.	A - Uyku problemim yok.
B - Hafif bir boyun ağrısı hissederek istediğim kadar okuyabiliyorum.	B - Uykum çok hafif bozuk (bir saatten az süreyle biraz bozuk).
C - Orta derecede boyun ağrısı hissederek istediğim kadar okuyabiliyorum.	C - Uykum hafif bozuk (1-2 saat uykusuzluk).
D - Boynumda orta derecede ağrı nedeniyle istediğim kadar okuyamıyorum.	D - Uykum orta derecede bozuk (2-3 saat kadar süren uykusuzluk).
E - Boynumda şiddetli ağrı nedeniyle istediğim kadar okuyamıyorum.	E - Uykum çok bozuk (3-5 saat süreyle uykusuzluk).
F - Boyun ağrısı nedeniyle hiç okuyamıyorum.	F-Uykum tamamen bozuk (5-7 saat süresince uykusuzluktur).

5	10
Baş ağrıları	Boş zaman aktiviteleri
A - Hiç baş ağrım yok.	A - Tüm boş zaman aktivitelerine boynumda ağrı hissetmeden katılabiliyorum.
B - Sık olmayan hafif baş ağrılarım var.	B - Tüm boş zaman aktivitelerine boynumda biraz ağrı hissederek katılabiliyorum.
C - Orta derecede baş ağrılarım var.	C-Boynumdaki ağrı nedeni ile tüm boş zaman aktivitelerinin bir kısmına katılabiliyorum.
D - Sık gelen orta derecede baş ağrılarım var.	D-Boynumdaki ağrı nedeni ile boş zaman aktivitelerinin çok az bir kısmına katılabiliyorum.
E - Sık gelen ağır derecede baş ağrılarım var.	E-Boynumdaki ağrı nedeni ile boş zaman aktivitelerine hemen hemen hiç katılamıyorum.
F - Hemen hemen her zaman baş ağrılarım var.	F - Hiç bir aktiviteye hiç bir şekilde katılamıyorum.

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APPENDIX G: CURRICULUM VITAE

Kişisel Bilgiler

Adı	Aslıhan	Soyadı	SEZEN
Doğum Yeri		Doğum Tarihi	
Uyruğu		TC Kimlik No	
E-mail		Tel	

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora			
Yüksek Lisans	Fizyoterapi ve Rehabilitasyon	Yeditepe Üniversitesi	2024
Lisans	Fizyoterapi ve Rehabilitasyon	İstanbul Arel Üniversitesi	2020
Lise	Fen Matematik	Alanya Anadolu Lisesi	2013

Bildiği Yabancı Dilleri	Yabancı Dil Sınav Notu (#)
İngilizce	B1 seviyesi

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
Fizyoterapist	Sante Tıp Merkezi	Mart 2019-Nisan 2021
Fizyoterapist	Alanya Başkent Hastanesi	Nisan 2021-Haziran 2022
Fizyoterapist	Alanya Lazergöz Tıp Merkezi	Kasım 2023 - Halen

Bilgisayar Bilgisi

Program	Kullanma becerisi
Office Programları	Orta

*Çok iyi, iyi, orta, zayıf olarak değerlendirin.

**APPENDIX H: BRIAN MULLIGAN'S CONCEPTS NAGS, SNAGS, MWMS
UPPER QUADRANT MULLIGAN MANUAL THERAPY CONCEPT
CERTIFICATE OF ATTENDANCE**

