

A – Research concept and design
 B – Collection and/or assembly of data
 C – Data analysis and interpretation
 D – Writing the article
 E – Critical revision of the article
 F – Final approval of article

Received: 2023-07-31
 Accepted: 2023-09-13
 Published: 2023-09-14

Comparison of the immediate effects of cervical manipulation and foam roller applications in individuals with non-specific neck pain

Tuğçe Tahmaz^{A-B,D-F} , Hazal Genç^{A,C-E*} , Gamze Demircioğlu^{A,D} 

Bahcesehir University, Turkey

Corresponding author: Hazal Genç; Bahcesehir University, Turkey; email: hazaloksuz@gmail.com

Abstract

Introduction: Non-specific neck pain is a diagnosis that usually describes neck pain of postural and mechanical origin. This study aims to reveal the immediate effects of the application of cervical region manual therapy in patients with non-specific neck pain and to compare the effectiveness of different applications of manual therapy.

Material and methods: 115 patients with non-specific neck pain were randomly divided into a manipulation/mobilization treatment group (n = 58) and a myofascial release treatment group (n = 57). A blinded assessor evaluated patients after a single application session. Before and immediately after the treatment session, the pain level was measured with the Visual Analogue Scale (VAS), spinal alignment with a scoliometer, finger grip strength with a pinchmeter, and grip strength with a Jamar hand dynamometer.

Results: There was a statistically significant difference in the VAS (p = 0.00) right (p = 0.001) and left (p = 0.002) pinchmeter and scoliometer (p = 0.009) measurements of the individuals in the manipulation/mobilization group. A statistically significant difference was also found in the VAS (p = 0.00), Jamar right hand (p = 0.00) and scoliometer measurements (p = 0.00) of those in the myofascial treatment group. When both groups were compared, an improvement in the pinchmeter measurements was observed only in the manipulation/mobilization therapy group.

Conclusions: A single session of myofascial release and manipulation/mobilization therapy has an immediate positive effects on pain, finger grip strength, spine alignment and grip strength. Manual therapy practices can be used for rapid symptom relief in patients with non-specific neck pain.

Keywords: grip strength, manual therapies, myofascial release, pain

Introduction

Non-specific neck pain is a pain syndrome of mechanical origin or caused by regional musculoskeletal structures [1]. The mechanisms underlying why pain occurs, recurs, and progresses are not clear. In 2017,

the global prevalence of neck pain was over 288 million and the age standardized incidence was 3,551 per 100,000 people. The societal burden associated with the high prevalence of neck pain creates a constant need to plan effective management and treatment of non-specific neck pain [2].



This is an Open Access journal, all articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0). License (<http://creativecommons.org/licenses/by-nc-sa/4.0/>).

Further studies combining various approaches in individuals with a patient clinical profile are required, as the optimal physiotherapy intervention is currently unknown. Exercise therapy and manual therapy are two of the most popular approaches to treating neck discomfort [3]. Many studies in the literature examine the effects of manual therapy methods and therapeutic exercises while investigating the effectiveness of the treatment of non-specific neck pain, but the methods applied do not provide sufficient evidence [3,4]. Previous studies have reported that the application of manual therapy leads to a rapid reduction in pain sensation more rapidly than therapeutic exercises, and therapeutic exercises reduce disability more significantly than manual therapy [5,6].

The use of myofascial release for treating fascia restrictions brought on by soft tissue injuries has been reported in the literature [7,8]. A comprehensive assessment of the effectiveness of myofascial release suggests that it may be a helpful strategy to improve muscle performance both before and after exercise and to increase the range of motion [9].

Based on the literature, there is no consensus on the treatment management of high prevalence non-specific neck pain. The literature mostly discusses the long-term management of treatment. There are low-evidence studies regarding the impact of spinal manipulation techniques used in the treatment of neck pain on pain and disability [10]. Due to the lack of a clear consensus on treatment, there is a need to investigate the effectiveness of various interventions in managing neck pain. Within this context, multimodal interventions may be included to enhance the effectiveness of rehabilitation.

The aim of the study was to examine the immediate effects of manual therapy in the cervical region for patients with neck pain. Additionally, the efficacy of different manual therapy approaches for patients with non-specific neck pain is compared.

Materials and methods

Study design

The study was conducted at the Medipol Mega University Hospital in Istanbul, Turkey, between October 2022 and January 2023. Permission was obtained from the hospital's ethics committee under the number E-10840098-772.02-5757. The procedures used for the study were carried out in accordance with the values stated in the Declaration of Helsinki. Our study was registered in the clinical trial system with the code NCT05567302.

Participants

Participants were divided into two groups: manipulation/mobilization treatment group and a myofascial

release treatment group, through balanced randomization in a 1:1 ratio. The randomization sequence were generated using a free software. The study included people between the ages of 20 and 60 who experienced generalized neck pain. The study excluded people with psychological problems, neurological and orthopedic deficits, high blood pressure, cardiac disease, pregnancy, malignancy, a history of neck surgery, injection, etc. during the previous three months, and a history of spinal surgery.

The sample size of the study was calculated as 57 cases for each group by taking the change value of the Visual Analogue Scale (VAS) scores in the study by Yildiz et al. [11], conducted as a reference, setting the effect size as 0.618, and using G*Power software (version 3.1.9.7) with a power of 90% and type 1 error of 0.05.

Procedures

The assessment and therapy were carried out by various physiotherapists. A blinded assessor with 10 years of clinical experience performed patient assessments before and after the single session application.

Manual therapy applications

Corrective manipulation technique was applied in the articular pillar area of the superior vertebra on the restricted side for the lower cervical lateral flexion problems. A rotational maneuver was performed from the posterior part of the articular pillar area of the superior vertebra to the opposite side of the side with restricted movement [3].

Application of myofascial release using a foam roller

Myofascial release is a soft tissue method that enables removal of adhesion and tissue tension developing in tissues due to overload and repetitive use. This adhesion and tissue tension imbalance in tissues can cause muscle weakness, paresthesia, pain, tingling and burning sensation. In order to feel the tissue barrier in the direction of restriction, the physiotherapist palpated the soft tissue and applied pressure directly to the skin. Once the tissue barrier was identified, the fascia complex was worked on for at least 5 minutes without slipping on the skin or pushing the tissue, until a feeling of softening was attained.

Outcome measures

Measurements using the VAS, scoliometer, pinchmeter and Jamar hand dynamometer were taken as evaluation parameters. Measurements were recorded before and immediately after the application.

Visual Analogue Scale (VAS)

VAS was used to assess the level of neck pain. Bijur et al. [12] showed that the use of VAS is a reliable method for measuring pain.

Scoliometer

First, the Adam’s test was performed for evaluating scoliosis. In this test, rotational deformity of the spine was monitored while the patient flexed their trunk forward to a 45-degree angle. The rotation angle of the curvature was checked on the scoliometer according to the highest level of curvature and the evaluation was finalized. A validity and reliability study for the scoliometer was conducted by Amendt et al. [13].

Pinchmeter

Finger grip strength was measured with a pinchmeter in both hands. When they were ready, the participant was asked to squeeze the dynamometer with all their strength for 3 seconds and then release it. They rested for 1 minute between the measurements. The procedure was repeated in the same way after the application and the values were noted [14].

Jamar hand dynamometer

Using a hand dynamometer with both hands in the normal posture, the grip strength of each participant was evaluated. When they were ready, they were asked to squeeze the dynamometer with all their strength for three seconds and then release it. They rested for one minute between the measurements. After the application,

the process was repeated in the same way, and the values were recorded. A validity and reliability study of the pinchmeter and Jamar hand dynamometer was conducted by Mathiowetz et al. [14].

Statistical analysis

The statistical analysis for the study was performed using SPSS 26.0 software, which stands for Statistical Package for Social Sciences, located in Chicago, Illinois, United States. The researchers employed various techniques, including descriptive, comparative, and correlation statistical analyses. For nonparametric data, the Mann Whitney-U test was utilized, while the independent samples t-test was applied for parametric data. Moreover, the Mann Whitney-U test, paired two-sample Wilcoxon test, and Chi-square test were used to compare in-group values before and after the therapy, as well as nonparametric and categorical values. Statistical significance was determined with a p-value of less than 0.05.

Results

Within the parameters of the study, 120 people were evaluated in total. Four of them were disqualified

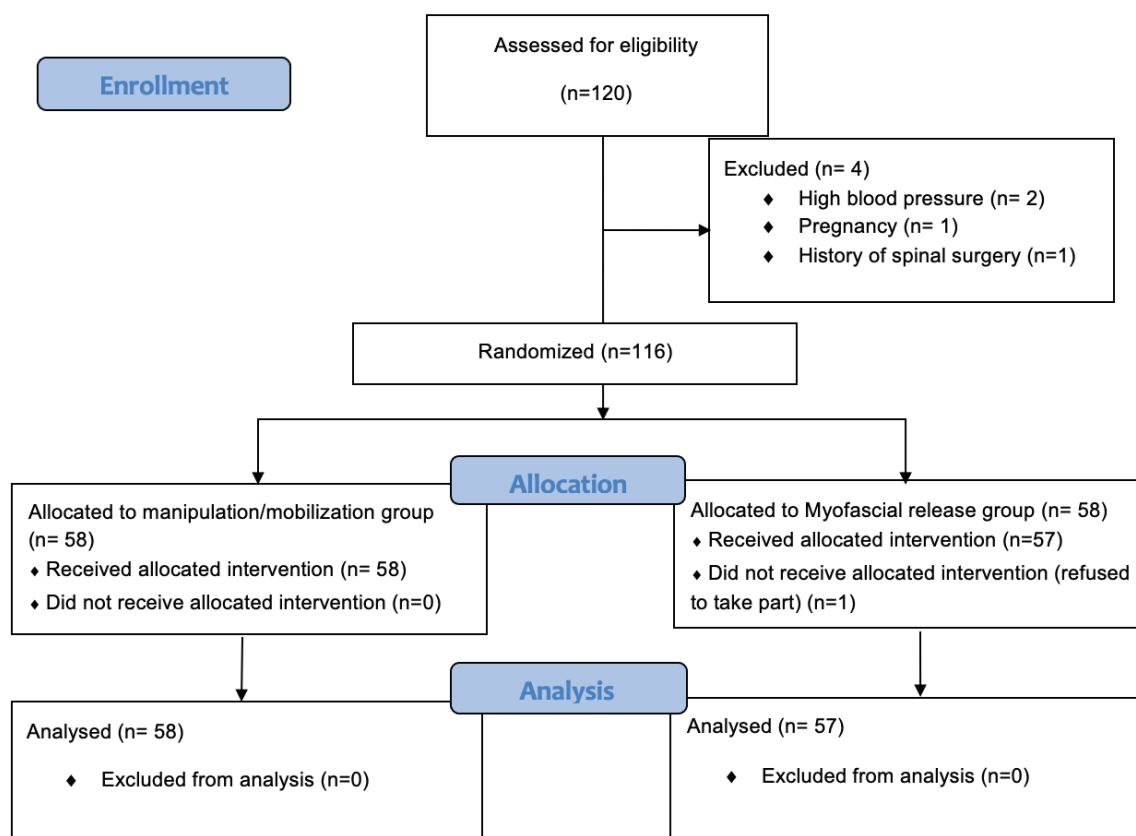


Fig. 1. CONSORT 2010 Flow Diagram

because two of them had high blood pressure, one was pregnant and one had a history of spinal surgery. Thus, a total of 116 participants were included in the study. Due to one participant from the second group refusing to continue the trial, the manipulation/mobilization treatment group completed the study with 58 individuals (Group 1), while the myofascial release treatment group only had 57 (Group 2) (Fig. 1).

There were a total of 65 women and 50 men in the study ($p = 0.162$). Before the treatment, there was a statistically significant difference in age, weight, and BMI between the groups ($p \leq 0.05$). Demographic data are shown in Table 1.

The measurements of the pinchmeters for the right and left hands, the scoliometer, and the VAS in the manipulation/mobilization group showed a statistically significant improvement after the treatment session ($p = 0.001$, $p = 0.002$, $p = 0.009$ and $p = 0.001$). The measurements of the Jamar hand dynamometer right hand, scoliometer, and VAS were different in the myofascial release treatment group ($p = 0.001$, $p = 0.001$, $p = 0.001$).

Pre- and post-treatment, intragroup and intergroup evaluations are presented in Table 2. Between the groups, there was a statistically significant difference in the pinch strength using the right and left hands ($p = 0.048$; $p = 0.005$).

Tab. 1. Demographic data

Variables	GROUP 1 (n = 58) Mean \pm SD	GROUP 2 (n = 57) Mean \pm SD	p
Age [years]	36.15 \pm 9.52	27.14 \pm 12.36	0.001
Height [cm]	173.37 \pm 10.91	170.42 \pm 10.10	0.131
Weight [kg]	79.37 \pm 17.76	66.75 \pm 12.41	0.001
BMI [kg/m ²]	26.15 \pm 3.98	22.92 \pm 3.53	0.001
Gender	29 Female 29 Male	36 Female 21 Male	0.162

BMI – body mass index, p-value ($p < 0.05$), SD – standard deviation.

Tab. 2. Results of the groups' pre- and post-treatment evaluations

	GROUP 1 (n = 58)			GROUP 2 (n = 57)			Between group p-value
	Before Treatment Mean \pm SD	After Treatment Mean \pm SD	p-value	Before Treatment Mean \pm SD	After Treatment Mean \pm SD	p-value	
JAMAR Right Hand	66.84 \pm 33.11	68.19 \pm 28.52	0.415	61.84 \pm 26.57	67.86 \pm 23.73	0.001*	0.071
JAMAR Left Hand	62.09 \pm 32.07	64.59 \pm 27.52	0.203	60.14 \pm 24.06	63.73 \pm 26.74	0.090	0.971
Pinchmeter Right Hand	21.34 \pm 16.12	23.21 \pm 15.49	0.001*	14.31 \pm 4.67	14.97 \pm 3.86	0.750	0.048*
Pinchmeter Left Hand	19.88 \pm 16.21	21.64 \pm 15.38	0.002*	13.85 \pm 3.89	17.15 \pm 21.58	0.980	0.005*
Scoliometer	2.1 \pm 1.46	1.67 \pm 1.46	0.009*	2.05 \pm 1.71	1.54 \pm 1.55	0.001*	0.408
VAS	7.14 \pm 1.5	3.9 \pm 1.76	0.001*	6.33 \pm 2.24	3.00 \pm 1.95	0.001*	0.906

p-value ($p < 0.05$), SD – standard deviation, VAS – Visual Analogue Scale.

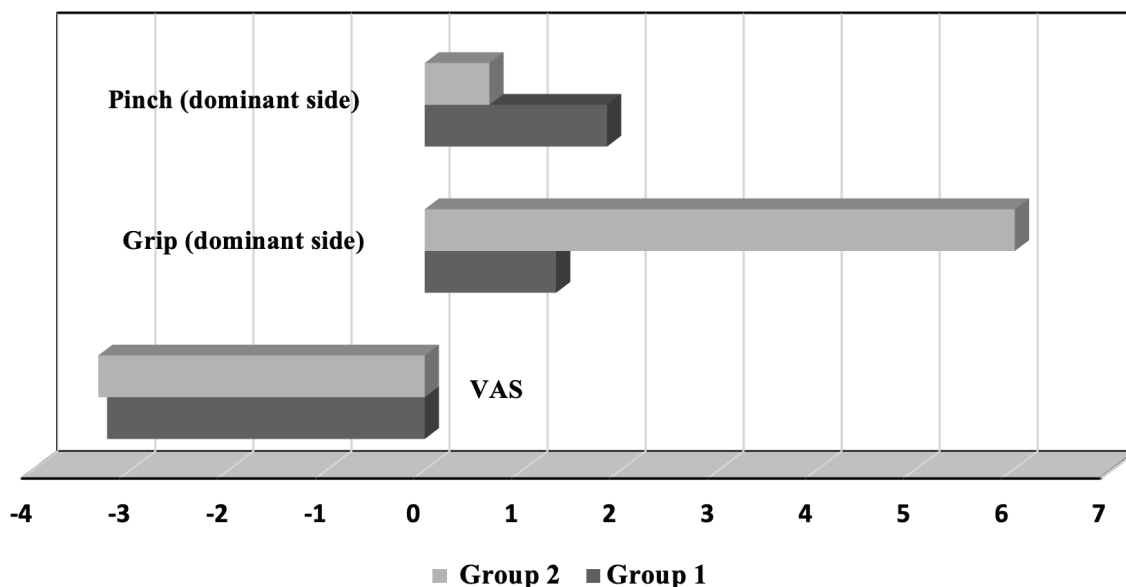


Fig. 2. Mean differences of VAS, Grip Strength and Pinch Strength

VAS - visual analog scale

The differences between the groups are presented in Figure 2.

Discussion

The aim of our study was to examine the immediate effect of manual therapy applications on the cervical region in patients with non-specific neck pain and to compare the effectiveness of different manual therapy applications. Our study examined the immediate effect of manipulation/mobilization and myofascial release on the cervical region in patients with non-specific neck pain. As a result of the treatment, improvements were observed in both scoliometer and pain parameters, but there was no superiority of different manual therapy applications over each other. In the right and left pinchmeter results, a significant improvement was found only in the group in which manipulation and mobilization applications were applied. In the right-hand grip strength measurement, a significant improvement was observed only as a result of form roller application.

Rodríguez-Fuentes et al. [15] examined the effectiveness of cervical stabilization and manual therapy applications. They applied cervical stabilization exercises in both groups and additionally applied cervical manual therapy in the first group. As in our study, the upper cervical spine was subjected to manipulation and mobilization in the manual therapy group. As a result, a significant improvement was observed in the VAS score in the manual therapy group. Similarly, significant improvements were noted in the VAS score in the manual therapy group in our study.

Corum et al. [16] investigated the effect of cervical manipulation and myofascial release techniques in patients with neck pain. They found that the manipulation group was statistically more effective in all parameters, including the VAS score. The individuals with neck pain in our study were divided into two groups as cervical manipulation/mobilization and myofascial release. Similarly, improvements were observed in all parameters in our study. However, their effects on pain are similar.

In the study examining the immediate effect of manual therapy, Kim et al. [17] examined the effectiveness of manual therapy in chronic neck pain. They observed that manual therapy applied to neck pain improved the ability of the muscles to contract during motor tasks. Gorrell et al. [18] examined the effectiveness of a single session of cervical manipulation techniques. Pain and handgrip strength parameters were evaluated in their study. They found that a single session of treatment reduced the pain and increased the grip strength of the hand. Similarly, our study examined the immediate effect of manual therapy in individuals with neck pain and obtained significant improvements in grip strength.

Rodríguez-Fuentes et al. [15] compared the effectiveness of manual therapy applications and myofascial release therapy. They concluded that MRT was cost-effective, although there was no statistical difference in terms of clinical benefit. It was observed that the effects were similar in our study. The only difference was found in the pinchmeter measurements. The reason for this difference was thought to be related to the dominant hand condition.

In a study by Pérez-Martnez et al. [8], 58 patients with non-specific neck discomfort were allocated into

two groups: those who had device-assisted self-myofascial release and those who did not. A single session of five minutes was applied in both groups. A decrease in pain intensity was reported in both groups. We also implemented the myofascial release technique to a group using a foam roller. Similar improvements were noted in pain intensity after the treatment.

Cholewicki et al. [19] separated non-specific neck pain sufferers into two groups at random and administered either immediate osteopathic manipulative treatment or a waiting period initially. They concluded that the post-treatment application is a safe and effective method in reducing pain. Similarly, our study found that cervical region manipulation is a reliable method. Furthermore, it was found to be an effective method in terms of pain, muscle strength, and spine alignment. Bautista et al. [20] applied the manipulation technique in patients with non-specific neck pain. They found that it was no more effective than the placebo in leading to sudden changes in the mechanical sensitivity and grip strength of the upper extremity nerve trunks. Similarly, no statistically significant difference was found in the measurement of grip strength performed after the manipulation.

According to Bergmann and Peterson [21,22], neck pain can result from any incident that alters the way joints move or how muscles contract. Because of this, the majority of complaints are labeled «non-specific» or «mechanical». The primary cause of non-traumatic neck pain is poor posture. It has also been observed that people with neck pain have restricted segmental movement in the cervical and thoracic areas. Through the cervicothoracic connection, the thoracic spinal column supports the cervical spine and affects cervical kinematics. Chronic pain leads to abnormal posture, due to muscle spasms and pain avoidance behaviors. For this reason, we included scoliometer measurements in the evaluation criteria we used after administering myofascial release and manipulation/mobilization to our patients with non-specific neck discomfort.

Tozzi et al. [23] divided patients with non-specific neck and low back pain into four groups, according to their diagnosis, as study and control groups, and applied myofascial release technique. They concluded that myofascial release treatments are a useful manual therapy for treating neck and low back pain patients' short-term sensation of pain perception. We also observed improvements in pain scores as a result of the myofascial release technique applied to a group.

A meta-analysis reported that manual soft tissue therapy has a significant effect on chronic neck pain [24]. We implemented the myofascial release technique, which is one of the manual soft tissue treatments, in our study. A decrease was observed in the pain symptoms after the application.

The duration of neck pain and dominant hand parameters were heterogeneously distributed in our study.

Patients with non-specific neck pain constitute one of the most common patient groups encountered in clinics. The desire for rapid recovery due to the pain experienced by these patients sometimes puts clinicians in a difficult situation. Considering the effect of mood and mental state on pain level in chronic musculoskeletal pain, it is important to create short-term relaxation in patients. In our study, we compared the effectiveness of different manual therapy methods to contribute to short-term pain management and concluded that both methods were effective in pain control. Clinicians should include manual techniques in short-term pain management in patients with non-specific pain.

Limitations

There were some limitations to our study. We examined only the acute efficacy and could not examine the long-term effects. The pain levels of the participants were not homogeneously distributed. We think that future studies will give more reliable results in individuals with neck pain with similar pain levels and duration.

Conclusions

Myofascial release and manipulation/mobilization are both safe treatments that successfully treat non-specific neck pain. We believe that combining numerous treatments would be the most effective way to deal with neck pain.

Funding

This research received no external funding.

Conflict of interest

The authors have no conflict of interest to declare.

References

1. Oksuz H, Atilgan E. Efficacy of electromyography biofeedback with relaxation training on pain, disability, and quality of life in chronic neck pain. *Sağlık Akademisi Kastamonu*. 2019; 4(2): 98–113.
2. Dieleman JL, Cao J, Chapin A, et al. US health care spending by payer and health condition, 1996–2016. *JAMA*. 2020; 323(9) :863–84.
3. Bernal-Utrera C, Gonzalez-Gerez JJ, Anarte-Lazo E, Rodriguez-Blanco C. Manual therapy versus therapeutic exercise in non-specific chronic neck pain: a randomized controlled trial. *Trials*. 2020; 21(1): 1–10.

4. Hidalgo B, Hall T, Bossert J, Dugeny A, Cagnie B, Pitance L. The efficacy of manual therapy and exercise for treating non-specific neck pain: A systematic review. *J Back Musculoskelet Rehabil.* 2017; 30(6): 1149–69.
5. Castellini G, et al. Some conservative interventions are more effective than others for people with chronic non-specific neck pain: a systematic review and network meta-analysis. *J Physiother.* 2022; 68(4): 244–54.
6. Bishop MD, Torres-Cueco R, Gay CW, Lluch-Girbés E, Beneciuk JM, Bialosky JE. What effect can manual therapy have on a patient's pain experience? *Pain Manag.* 2015; 5(6): 455–64.
7. Su H, Chang NJ, Wu WL, Guo LY, Chu IH. Acute Effects of Foam Rolling, Static Stretching, and Dynamic Stretching During Warm-ups on Muscular Flexibility and Strength in Young Adults. *J Sport Rehabil.* 2017; 26(6): 469–77.
8. Pérez-Martínez C, Gogorza-Arroitaonandia K, Heredia-Rizo AM, Salas-González J, Oliva-Pascual-Vaca Á. INYBI: A New tool for self-myofascial release of the suboccipital muscles in patients with chronic non-specific neck pain: A Randomized Controlled Trial. *Spine (Phila Pa 1976).* 2020; 45(21): E1367–75.
9. Cheatham SW, Kolber MJ, Cain M, Lee M. The effects of self-myofascial release using a foam roll or roller massager on joint range of motion, muscle recovery, and performance: A Systematic Review. *Int J Sports Phys Ther.* 2015; 10(6): 827–38.
10. Minnucci S, Innocenti T, Salvioli S, et al. Benefits and Harms of Spinal Manipulative Therapy for Treating Recent and Persistent Nonspecific Neck Pain: A Systematic Review With Meta-analysis. *J Orthop Sports Phys Ther.* 2023; 9: 510–28.
11. Yildiz TI, Turgut E, Duzgun I. Neck and scapula-focused exercise training on patients with nonspecific neck pain: A Randomized Controlled Trial. *J Sport Rehabil.* 2018; 27(5): 403–12.
12. Bijur PE, Silver W, Gallagher EJ. Reliability of the visual analog scale for measurement of acute pain. *Acad Emerg Med.* 2001; 8(12): 1153–7.
13. Amendt LE, Aulsebrook KL, Eybers JL, Wadsworth CT, Nielsen DH, Weinstein SL. Validity and reliability testing of the Scoliometer. *Phys Ther.* 1990; 70(2): 108–17.
14. Mathiowetz V, Weber K, Volland G, Kashman N. Reliability and validity of grip and pinch strength evaluations. *J Hand Surg Am.* 1984; 9(2): 222–6.
15. Rodríguez-Fuentes I, de Toro FJ, Rodríguez-Fuentes G, de Oliveira IM, Meijide-Faílde R, Fuentes-Boquete IM. Is myofascial release therapy cost-effective when compared with manual therapy to treat workers' Mechanical neck pains? *J Manipulative Physiol Ther.* 2020; 43(7): 683–90.
16. Corum M, Aydin T, Medin Ceylan C, Kesiktas FN. The comparative effects of spinal manipulation, myofascial release and exercise in tension-type headache patients with neck pain: A randomized controlled trial. *Complement Ther Clin Pract.* 2021; 43: 101319.
17. Kim DH, Kim SY. Comparison of immediate effects of sling-based manual therapy on specific spine levels in subjects with neck pain and forward head posture: a randomized clinical trial. *Disabil Rehabil.* 2020; 42(19): 2735–42.
18. Gorrell LM, Beath K, Engel RM. Manual and instrument applied cervical manipulation for mechanical neck pain: a randomized controlled trial. *J Manipulative Phys Ther.* 2016; 39(5): 319–29.
19. Cholewicki J, Popovich JM Jr, Reeves NP, et al. The effects of osteopathic manipulative treatment on pain and disability in patients with chronic neck pain: A single-blinded randomized controlled trial. *PM R.* 2022; 14(12): 1417–29.
20. Bautista-Aguirre F, Oliva-Pascual-Vaca Á, Heredia-Rizo AM, Boscá-Gandía JJ, Ricard F, Rodríguez-Blanco C. Effect of cervical vs. thoracic spinal manipulation on peripheral neural features and grip strength in subjects with chronic mechanical neck pain: a randomized controlled trial. *Eur J Phys Rehabil Med.* 2017; 53(3): 333–41.
21. Bergmann TF, Peterson DH. *Chiropractic technique: principles and procedures.* 3rd ed. Western States: Mosby; 2010.
22. Joshi S, Balthillaya G, Raghava Neelapala Y. Thoracic posture and mobility in mechanical neck pain population: A Review of the literature. *Asian Spine J.* 2019; 13(5): 849–60.
23. Tozzi P, Bongiorno D, Vitturini C. Fascial release effects on patients with non-specific cervical or lumbar pain. *J Body Mov Ther.* 2011; 15(4): 405–16.
24. Wang SQ, Jiang AY, Gao Q. Effect of manual soft tissue therapy on the pain in patients with chronic neck pain: A systematic review and meta-analysis. *Complement Ther Clin Pract.* 2022; 49: 101619.