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EFFECTIVENESS OF RELAXATION TRAINING IN ADDITION TO STABILIZATION EXERCISES IN CHRONIC NECK PAIN: A RANDOMIZED CLINICAL TRIAL

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ORIGINAL ARTICLE

ABSTRACT

Purpose: The study aimed to investigate and compare the effects of a 4-week neck stabilization exercise program plus progressive muscle relaxation training (PMRT) to stabilization exercise program alone in patients with chronic neck pain (CNP).

Methods: The patients were randomly divided into two groups: (1) Stabilization Exercise (Exercise) Group (n=30, age=43.20±14.10 years), and (2) Stabilization Exercise combined with PMRT (Relaxation) Group (n=28, age=38.43±12.81 years). The programs were carried out three days per week for four weeks. Before and after the program, pain intensity using Visual Analog Scale, pressure pain threshold using an algometer, cervical range of motion using a goniometer, disability using Neck Disability Index, kinesophobia using Tampa Scale, and quality of life using Short Form-36 were assessed.

Results: After the programs, pain intensity, and disability decreased, cervical flexion, extension, right lateral flexion, and rotation movements increased in the Exercise Group (p<0.05). In the Relaxation Group, pain intensity, disability, and kinesiophobia reduced, and pain pressure threshold, all cervical range of movements, and quality of life scores improved (p<0.05). Intergroup comparisons showed that the pain pressure threshold, cervical flexion, right lateral flexion, the right and left rotation range of movements, and kinesiophobia improvements were better in the Relaxation Group (p<0.05).

Conclusion: The stabilization exercises with and without relaxation were effective in improving pain, movements, and disability in patients with CNP. Addition of relaxation had superiority to improve pain pressure threshold, neck movements, and kinesiophobia.

Key Words: Exercise; Neck Pain; Quality of Life; Relaxation Therapy.

KRONİK BOYUN AĞRISINDA STABİLİZASYON EGZERSİZLERİNE EK OLARAK GEVŞEME EĞİTİMİNİN ETKİNLİĞİ: RANDOMİZE KLİNİK BİR ÇALIŞMA

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Çalışmanın amacı, kronik boyun ağrılı hastalarda dört haftalık boyun stabilizasyon egzersiz programına ek olarak uygulanan ilerleyici kas gevşeme eğitiminin yalnız stabilizasyon egzersiz programına göre etkilerini araştırmak ve kıyaslamaktı.

Yöntem: Hastalar rastgele iki gruba ayrıldı: Stabilizasyon Egzersiz Grubu (Egzersiz) (n=30, yaş=43,20±14,10 yıl) ve Stabilizasyon Egzersizi ile Kombine İlerleyici Kas Gevşeme Eğitim Grubu (Gevşeme) (n=28, yaş=38,43±12,81 yıl). Programlar haftada üç gün, dört hafta süre ile uygulandı. Program öncesi ve sonrası, ağrı şiddeti Görsel Analog Skalası ile, ağrı basınç eşiği algometre ile, servikal eklem hareketi gonyometre ile, yeti yitimi Boyun Özür İndeksi ile, kinezyofobi Tampa Skalası ile ve yaşam kalitesi Kısa Form-36 ile değerlendirildi.

Sonuçlar: Program sonrasında, Egzersiz Grubu'nda ağrı şiddeti ve yeti yitimi azaldı, servikal fleksiyon, ekstansiyon, sağ lateral fleksiyon ve rotasyon hareketleri arttı (p<0,05). Gevşeme Grubu'nda ağrı şiddeti, yeti yitimi ve kinezyofobi azaldı; ağrı basınç eşiği, tüm servikal hareket alanları arttı ve yaşam kalitesi iyileşti (p<0,05). Gruplararası kıyaslama, ağrı basınç eşiği, servikal fleksiyon, sağ lateral fleksiyon, sağ ve sol rotasyon hareket alanı artışları ve kinezyofobideki iyileşmelerin Gevşeme Grubu'nda anlamlı olarak daha iyi olduğunu gösterdi (p<0,05).

Tartışma: Kronik boyun ağrılı hastalarda, gevşeme eğitimi ile birlikte ve tek başına uygulanan stabilizasyon egzersizleri ağrının, hareketlerin ve yeti yitiminin iyileştirilmesinde etkili idi. Gevşeme eğitimi, ağrı basınç eşiği, hareketler ve kinezyofobi iyileşmelerinde üstün bulundu.

Anahtar Kelimeler: Egzersiz; Boyun Ağrısı; Yaşam Kalitesi; Gevşeme Terapisi.

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INTRODUCTION

Chronic neck pain (CNP) defined as continuous pain of more than at least three months' duration. The CNP has been a significant health issue in the modern world because the longer length of pain has been associated to poorer prognosis with personal suffering, disability, impaired quality of life and greater socio-economic burden (1-3).

Several neuromuscular impairments and biomechanical disturbances were reported for CNP to be treated. Greater activation of accessory neck muscles, reduced activation of painful muscles, an altered motor control pattern, reduced the range of neck motion and stiffer spine was discussed in the literature (3-5). In addition, kinesiophobia, pain catastrophizing, cognitive impairments, and insufficient coping strategies were associated with CNP (6,7).

In the rehabilitation process of CNP, exercise has been considered as one of the most evidence-based modalities (8). Specifically, cervical stabilization exercises have been intended to target activating deep muscles and decreasing the over-activity of surface muscles (8,9). In addition, cognitive-behavioral treatment in addition to exercise for sub-acute and chronic neck pain was mentioned in most up-to-date reviews (8,10). However, optimal dosage for the exercise has still been a blind spot (8,10). However, it has always been difficult to persuade painful patients to exercise directly. Classical physiotherapy programs prefer to use of electro-thermal agents or manual therapy applications to break any muscle-tension-pain cycle to prepare the patients. Previous studies showed positive results of these techniques together with various exercise approaches (11,12). However, those passive applications might not be able to help the patients to increase coping strategies. Physiotherapists have taught relaxation therapy as a coping strategy for decreasing muscle tension and pain (13). The therapy has recently become an integral part of the coping strategies of individuals with chronic disease, due to benefits such as reducing anxiety and stress, distracting attention away from the pain, relieving muscle strain and contractions, facilitating sleep, and reducing sensitivity to pain (14). One of the most simple and quickly learned relaxation techniques is progressive muscle relaxation training (PMRT), a widely used procedure initially developed in 1938 by Jacobson (15). The PMRT involves deep breathing and progressive relaxation (tense–release) of major muscle groups. The technique promotes systematic relaxation of the major muscle groups of the body with the goal of physical and mental relaxation, reducing skeletal muscle contractions, reducing the response to stress, and decreasing pain sensations (14). Contradictory evidence was declared about the relaxation techniques. Lauche et al. found no group difference for the Alexander Relaxation Technique compared to local heat for pain intensity. However, the Alexander Technique improved physical quality of life in CNP (16). Gustavsson and von Koch showed better-perceived control over pain at the 20 weeks follow-up for relaxation therapy when compared with the usual group (17). On the other hand, Viljanen showed dynamic muscle training and relaxation training did not have more favorable effects on CNP over advising patients to be active (18). Moreover, clinical utilization of the relaxation technique has been underestimated because of clinical limitations or insufficient knowledge in literature. It is well known that the use of an additional relaxation treatment decreases the pain intensity (14-18), however there is no study how this treatment would change the kinesiophobia and quality of life of the chronic pain patients. Therefore, the current study aimed to investigate and compare the effects of a 4-week neck stabilization exercise program plus PMRT to stabilization exercise program alone in patients with CNP. We hypothesized that the patients with CNP receiving stabilization exercise combined with muscle relaxation training would demonstrate more significant reductions in pain and greater improvements in range of motion, disability, kinesiophobia, and quality of life compared to patients receiving stabilization exercises alone.

METHODS

Study Design

This study was designed as a single-blind, randomized, controlled trial. The study was carried out at İzmir Katip Çelebi University, Physiotherapy and Rehabilitation Department. The patients were recruited from December 2017 to July 2018. Ethics Committee of Ankara Yıldırım Beyazıt University, Yenimahalle Training Research Hospital approved the study (Approval number: 2017/10/03).

Participants

The patients were diagnosed with CNP by a physician and referred to the department were screened for eligibility. The inclusion criteria were as follows: having neck pain for at least 3 to 6 months, being 18 to 65 years of age, and being a volunteer to participate in the study. The exclusion criteria were as follows: having disc herniation, spinal stenosis, cervical surgery history, cancer, inflammatory rheumatologic diseases, severe psychological disorders, being pregnant, having intervention including exercise program or physiotherapy in the last six months. All patients were informed about the aims of the study and written informed consent was obtained.

Patients were assessed at baseline before the randomization. Physical and demographic data including age, gender, height, weight, body mass index, dominant side, occupational information, smoking history, exercise habits, and medical history were recorded. Following the baseline assessments, the patients were randomly divided into two groups using a computer-generated block randomization list: (1) Stabilization Exercise Group (Exercise Group) and (2) Stabilization Exercise combined with PMRT (Relaxation Group). The assessor who was blind to the interventions applied the block randomization.

Outcome Measures

Before and after the program, pain intensity, pressure pain threshold (PPT), the range of motion (ROM), disability, kinesophobia and quality of life of the patients were assessed by the same physiotherapists who were blind to group interventions.

The neck pain intensity during neck movements was evaluated using the Visual Analogue Scale (VAS), whose reliability was studied and established by Clark et al. (19). This scale involves a horizontal line, 10 cm long, such that "0" defines "no pain" and "10" defines "worst imaginable pain." The patient was asked to mark her/his pain intensity on the horizontal line.

The PPT was measured bilaterally while the patient was sitting on a chair without back support using

Table 1: Physical and Demographic Characteristics of the Patients.

Characteristics	Exercise Group (n=28) Mean±SD	Relaxation Group (n=30) Mean±SD	p
Age (years)	43.20±14.10	38.43±12.81	0.183[a]
BMI (kg/m²)	26.50±4.64	27.82±5.25	0.344[a]
Gender (n, %)			
Male	6 (21.4)	5 (16.7)	0.644[b]
Female	22 (78.6)	25 (83.3)	
Dominant Side (n, %)			
Right	27 (96.4)	30 (100.0)	0.296[b]
Left	1 (3.6)	0 (0)	
Occupation (n, %)			
Officer	9 (32.1)	8 (26.7)	0.960[b]
Worker	3 (10.7)	3 (10.0)	
Housewife	13 (46.4)	16 (53.3)	
Student	3 (10.7)	6 (10.0)	
Smoking (n, %)			
No	23 (82.1)	23 (76.7)	0.607[b]
Yes	5 (17.9)	7 (23.3)	
Exercise Habit (n, %)			
No	19 (67.9)	23 (76.7)	0.453[b]
Yes	9 (32.1)	7 (23.3)	

[a]Student's t-test, [b] Chi-square test, BMI: Body Mass Index.

Table 2: Comparison of Pain, Pressure Pain Threshold, Cervical Range of Motion, Disability, Kinesiophobia and Quality of Life of Groups' Before and After the Program.

Parameter	Exercise Group (n=28)		p	Relaxation Group (n=30)		p
	Before Mean±SD	After Mean±SD		Before Mean±SD	After Mean±SD	
Pain (VAS, cm)	6.43±2.41	4.02±2.40	**0.001[c]***	6.31±2.83	3.54±4.62	**0.008[c]***
PPT (R) (kg/cm²)	6.27±2.60	6.68±3.81	0.554[c]	8.94±3.61	11.53±3.12	**0.002[c]***
PPT (L) (kg/cm²)	5.92±2.51	6.31±2.80	0.495[c]	8.20±4.14	10.80±3.09	**0.009[c]***
Cervical ROM (degree)						
Flexion	38.52±7.71	54.82±6.03	**<0.001[c]***	43.10±11.12	62.40±13.02	**<0.001[c]***
Extension	35. 90±9.42	40.80±8.90	**0.037[c]***	34.31±14.51	44.31±11.90	**<0.001[c]***
Lateral Flexion (R)	32.45±7.10	38.43±6.95	**0.007[c]***	32.55±9.03	44.74±10.64	**<0.001[c]***
Lateral Flexion (L)	33.25±7.30	37.54±8.01	0.069[c]	33.48±10.42	44.36±15.93	**<0.001[c]***
Rotation (R)	42.93±10.02	48.02±7.11	**0.034[c]***	57.70±15.25	77.90±9.83	**<0.001[c]***
Rotation (L)	46.51±9.53	49.41±7.53	0.284[c]	62.02±14.51	77.92±11.52	**<0.001[c]***
Disability (NDI)	17.10±8.14	12.00±6.62	**0.006[c]***	19.62±8.41	12.13±9.01	**<0.001[c]***
Kinesiophobia (TSK)	39.63±5.72	40.21±6.98	0.571[c]	40.32±5.60	37.32±6.22	**0.011[c]***
Quality of Life (SF-36)						
PCS	37.85±9.01	42.03±10.04	0.075[c]	34.47±7.92	43.04±8.60	**<0.001[c]***
MCS	41.20±11.92	43.40±11.15	0.457[c]	41.91±10.80	47.61±10.10	**0.016[c]***

*p<0.05. [c]Paired Sample t-test. VAS: Visual Analogue Scale, PPT: Pressure Pain Threshold, R: Right, L: Left, ROM: Range of Motion, NDI: Neck Disability Index, TSK: Tampa Scale for Kinesiophobia, SF-36: Short Form-36, PCS: Physical Component Summary, MCS: Mental Component Summary.

a digital algometer (JTech Medical, Midvale, UT, USA) with a 1 cm^2 surface area at the round tip. The edge of the algometer was placed between acromion and C7 on the middle point of the upper trapezius muscle and pressed perpendicularly on the skin. The patients were instructed to say "stop" at the point where the pressure became painful. The measurement was repeated three times at 30 s intervals, and the average of three measurements was obtained, and all values were expressed as kilograms per square centimeter (20).

Cervical ROM was evaluated using the baseline goniometer (Baseline Evaluation Tools, White Plains, New York, USA) with the participant sitting comfortably on a chair with both feet flat on the floor. Once the goniometer was set in a neutral position, the patient was asked to move the head as far as possible in a standard fashion: flexion, extension, right lateral flexion, left lateral flexion, right rotation, and left rotation. Three trials were recorded as a degree for each direction of movement, and the mean was used in the analysis (21).

Disability was assessed using the Turkish version of the Neck Disability Index (NDI) consisting of 10 questions addressing functional activities. There were six potential responses for each item, ranging from no disability to total disability. The NDI was scored from 0 to 50, with higher scores indicating greater disability (22).

Kinesiophobia was assessed using the Turkish version of the Tampa Scale for Kinesiophobia (TSK) (23). The 17-item TSK questionnaire assesses the subjective rating of kinesiophobia. Each item is scored by using a 4-point Likert-type scale ranging from "strongly disagree" to "agree strongly". A total score is calculated after inversion of the individual scores of items 4, 8, 12, and 16. The total score ranges between 17 and 68. Higher TSK total score means a higher severity of kinesiophobia.

The quality of life was assessed using the Turkish version of Short Form-36 (SF-36) (24). It includes mainly the physical component summary (PCS) and the mental component summary (MCS). The worst score is "0" and the best score is "100". Higher scores indicate better physical or mental functioning. The permissions for all the questionnaires were taken via e-mail.

Intervention

Exercise

The exercise program was carried out three days per week for four weeks by an experienced physiotherapist. Each exercise session took 40 to 45 min. It was composed of 10 min warm-up exercises, 25 min stabilization exercises, 5 to 10

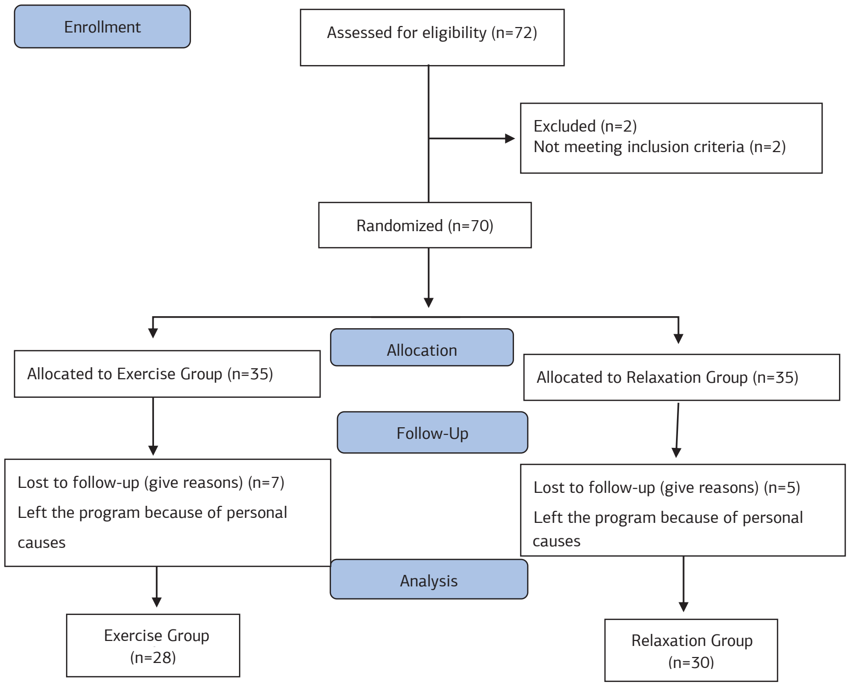

Figure 1: Flowchart Diagram of the Study.

min cool-down exercises. The warm-up and cool-down exercise consisted of stretching exercises including neck and shoulder girdle muscles.

First of all, the craniocervical flexor muscles activated with low load training (9). This exercise targets the deep flexor muscles (longus capitis and longus colli) explicitly while aiming to minimize the activation of the superficial flexor muscles (sternocleidomastoid and anterior scalene). Initially, patients were taught to perform the craniocervical flexion (CCF) movement slowly and in a controlled manner in a supine position, with the head and neck in a neutral position. Once the correct CCF movement was achieved, subjects began to hold progressively increasing ranges of CCF using the Chattanooga Stabilizer Pressure Biofeedback Unit (DJO Global, Vista, CA, USA), placed behind the neck. The patient initially performed CCF to sequentially reach five pressure targets in 2 mmHg increments from a baseline of 20 mmHg to the final level of 30 mmHg. The physiotherapist identified the target level that the patient could hold steadily for 5 s without resorting to retraction, without the dominant use of the superficial neck flexor muscles, and without a quick, jerky CCF movement. Training commenced at this target level. For each target level, the contraction duration was increased to 10 s, and the subject trained to perform 10 repetitions with brief rest periods between each contraction (3–5 s). Once one set of 10 repetitions of 10 s was achieved at one target level, the exercise was progressed to train at the next target level up to the final target of 10 repetitions of 10 s at 30 mmHg. Then, cervical dynamic isometric exercises were performed directly forward, obliquely, toward the right and left, and directly backward by maintaining stable spine with elastic resistive bands with 10 repetitions, each involving 6-10 s holding period. Finally, the patients have also carried out some scapulothoracic exercises including combined scapular retraction with shoulder external rotation, scapular retraction, forward punch, and dynamic hug with elastic resistive bands with 10 repetitions, each involving 6-10 s holding period (11,12).

Progressive Muscle Relaxation Training

Patients were performed Jacobson's PMRT by an experienced physiotherapist at the university's exercise facility, which was clean and comfortable with enough lightening. The temperature was 22-24°C during the training. Jacobson first identified the PMRT in 1934 as tensing and releasing of 16

Table 3: Comparison of Differences between Groups' Before and After the Program (Baseline and the 4th week).

Parameter	Exercise Group (n=28)	Relaxation Group (n=30)	
	Mean±SD	Mean±SD	p
Pain (VAS, cm)	-2.41±3.41	-2.77±5.30	0.793[a]
PPT (R) (kg/cm²)	0.41±3.42	2.59±4.71	**0.037[a]***
PPT (L) (kg/cm²)	0.39±3.01	2.60±5.10	**0.049[a]***
Cervical ROM (degree)			
Flexion	12.30±9.40	19.30±14.12	**0.022[a]***
Extension	4.90±11.81	10.00±12.40	0.118[a]
Lateral Flexion (R)	5.98±10.72	12.19±8.61	**0.019[a]***
Lateral Flexion (L)	4.29±11.72	10.88±13.62	0.053[a]
Rotation (R)	5.09±11.93	20.20±13.93	**<0.001[a]***
Rotation (L)	2.90±14.10	15.90±13.72	**0.001[a]***
Disability (NDI)	-5.10±9.24	-7.49±8.81	0.132[a]
Kinesiophobia (TSK)	0.58±4.95	-3.00±6.07	**0.018[a]***
Quality of Life (SF-36)			
PCS	4.18±11.83	8.57±10.06	0.348[a]
MCS	2.20±15.73	5.70±12.20	0.347[a]

*p<0.05. [a]Student's t-test. VAS: Visual Analogue Scale, PPT: Pressure Pain Threshold, R: Right, L: Left, ROM: Range of Motion, NDI: Neck Disability Index, TSK: Tampa Scale for Kinesiophobia, SF-36: Short Form-36, PCS: Physical Component Summary, MCS: Mental Component Summary.

muscle groups (15). Before the training, relaxation exercises and breathing techniques explained to the patients. The patients lied on a comfortable bed and were supported with cushions. The therapist then instructed them to contract and release different muscle groups. They practiced tensing a muscle group until they felt the slight contraction and then released it, simultaneously relaxing other muscle groups. Practice progressed in the same manner, starting with the muscles in the hands, then the wrists, forearms, elbows, shoulder girdle, and neck and finally face. A session lasted about 20 min (13,15). The relaxation processes of the patients were assessed using palpation and observation of the most affected muscles groups (especially upper trapezius, sternocleidomastoideus and scalene muscles).

Statistical Analysis

Ten patients from each group were randomly recruited for the pilot study. G*Power package software program (G*Power, Version 3.0.10, Franz Faul, Universität Kiel, Kiel, Germany) was used to determine the required sample size for this study. According to the neck pain intensity results of our pilot study, it was calculated that a sample consisting of 56 subjects (28 per group) was needed to obtain 90% power with d=0.80 effect size, α=0.05 type I error, and β=0.10 type II error (25). Due to an expected dropout rate of 20%, we planned to recruit at least 70 patients (35 per group) into the study. Analyses were carried out using IBM SPSS Statistics 21.0 (IBM SPSS Statistics for Windows, Version 21.0. IBM Corp., Armonk, USA). The variables were investigated using visual (histograms, probability plots) and analytical methods (Shapiro-Wilk test) to determine whether they were normally distributed. Descriptive statistics were calculated for all variables, and normally distributed data was showed as mean±standard deviation (SD), non-normal distributions were showed as median (minimum-maximum), and categorical variables were showed as frequency and percentages. The categorical variables were compared using Chi-Square Test. Intra-group and intergroup comparisons were analyzed by Paired Samples t-test and Student's t-test, respectively. Statistical significance was set at $p<0.05$.

RESULTS

Seventy-two patients with CNP were assessed; however, fifty-eight patients completed the study. Details of included and excluded patients in the study were provided as a flowchart (Figure 1). There were no adverse events reported with the program. There were no differences between the groups regarding baseline physical and demographic characteristics (p>0.05, Table 1).

At baseline, there were no differences between groups concerning the VAS scores, cervical flexion, extension, right lateral flexion and left lateral flexion ROM, the TSK, the PCS and the MCS of the SF-36 scores (p>0.05). After the program, pain intensity and disability decreased, cervical flexion, extension, right lateral flexion, and right rotation ROM increased in the Exercise Group (p<0.05, Table 2). In the Relaxation Group, pain intensity, disability, and kinesiophobia reduced, right and left PPT, all cervical ROM and quality of life scores improved (p<0.05, Table 2).

The intergroup comparison showed significant differences in some parameters in favor of the Relaxation Group (Table 3). Right and left PPT scores, cervical flexion, right lateral flexion, right and left rotation ROM increased, kinesiophobia decreased in the Relaxation Group compared to the Exercise Group (p<0.05, Table 3). No differences were found for the other parameters between the groups (p>0.05, Table 3).

DISCUSSION

This study aimed to investigate and compare the effects of a 4-week stabilization exercise program with and without relaxation training on pain and pressure threshold, ROM, disability, kinesiophobia, and quality of life pain in patients with CNP. The study put forward the following findings: (i) pain intensity and disability decreased, cervical movements increased in both groups, (ii) further improvements for kinesiophobia, PPT, and quality of life scores were observed in the relaxation group, (iii) PPT scores, cervical movements, and kinesiophobia improvements were superior in the relaxation group compared to stabilization exercises alone.

Exercise therapy has been declared to be useful for the management of neck pain (8,9). Recently, stabilization exercise alone was reported to be beneficial for neck pain (11,26-28). Dusunceli et al. demonstrated the superiority of the cervical stabilization exercises, with some advantages in the pain and disability outcomes, compared to isometric and stretching exercises in combination with physical therapy agents for the management of neck pain (26). Akkan and Gelecek showed that stabilization exercise training could be an effective intervention for decreasing pain and improving quality of life and posture in patients with cervical radiculopathy (27). Celenay et al. found that cervical and scapulothoracic stabilization exercises reduced pain intensity, the level of anxiety, and increased physical health in patients with CNP (11). Gharedi et al. put forward cervical stabilization exercises decreased pain and disability, and also had an essential role in reducing the activity of superficial muscles in CNP (28).

Similarly, we found that pain intensity and disability decreased, flexion, right lateral flexion, right and left rotation cervical movements increased in patients with CNP in the stabilization exercise group. However, in the stabilization exercise group, it was found that there was no difference concerning cervical left lateral flexion and right rotation ROM, PPT, kinesiophobia, and quality of life. These results may be because of the short-term application of the exercise program. In addition, no changes of all cervical movement may be due to unilateral or bilateral pain in the neck region.

However, in a chronic stage, in addition to pain, the decrease of pressure threshold, disability, fear of movement and fear avoidance beliefs, kinesiophobia and catastrophizing, and, worsening of quality of life occur at different levels (6,7). Therefore, patients' needs and expectations for treatment outcomes may shift from just pain relief to improvements in function and overall well-being. Additional therapies such as various manual therapy applications, taping, electrotherapy, and mind-body therapies' including relaxation, meditation, guided imagery, and cognitive-behavioral therapy are used as adjuvant therapies to enhance well-being and advance the coping strategies (10-12,29,30). In our study, we used PMRT in addition to stabilization exercise and showed better outcomes for cervical movements, pressure threshold, kinesiophobia, and quality of life.

Previous studies showed that the muscle activation patterns differ in subjects with chronic pain (4). The upper trapezius muscle over-activity, perceived tension, and pain, and semispinalis cervicis muscle stiffness was observed in chronic neck pain patients (4,5). This overactivity and absence of sufficient muscle relaxation may cause fatigue of the muscles, inhibit its function (4,5). Therefore, being able to be aware of the muscle tone is essential for self-management and well-being.

Similar to our study, Gustavsson and von Koch applied relaxation treatment for chronic neck pain as a pilot study and showed better outcomes than standard physiotherapy program for pain (17). We observed better disability and kinesiophobia scores in the relaxation group. A possible explanation for this result would be because as the patients learn to relax, the movements might be more accurate, and the pain subsided, concomitantly the fear of movement and disability scores decreased.

Metikaridis et al. mentioned the stress management programs such as relaxation training had positive effects on neck pain (31). Lauche et al. indicated that the PMRT was effective in reducing chronic non-specific neck pain (32). In another study, Lauche et al. compared the Alexander Relaxation Technique with local heat and found that changes in quality of life were better in the relaxation group (16). Viljanen et al. declared that dynamic muscle training and relaxation training did not lead to better improvements in neck pain compared with ordinary activity (18). Although the positive effects of relaxation training are commonly accepted, the evidence of the usage of this technique for chronic neck pain patients is limited (13,16-18,32). We believe, the present study put forward substantial evidence about the superiority of the relaxation training with cervical stabilization exercises in the treatment of CNP. Kobayashi and Koitabashi showed the changes in the cerebral cortex and limbic system during the PMRT session and interrelated the findings with inhibitory neural networks, self-awareness, working memory, attention, and cognitive focus (33). The improvements in PPT scores, kinesiophobia, and quality of life in the present study might be related with the brain activity. Further research is needed to explain brain-muscle and mind-body relations.

Our study revealed that stabilization exercises with PMRT were more effective in improving PPT scores, cervical movements (flexion, right lateral flexion, right and left rotation), and kinesiophobia compared to only stabilization exercise. The PMRT promotes self-awareness of muscle tension and education on principles of muscle relaxation. Therefore, it has caused reducing muscle tension, pain sensations and the response to stress. Consequently, combined treatment including stabilization exercise with PMRT might be a superior approach to treat patients with CNP who had a low pain threshold, hypersensitivity, and fear of movement.

The present study had some limitations. First of all, we designed a 4-week program and presented the short-term effects. Previous studies used a longer duration for the treatment (17,18). The health insurance reimbursement system limited the treatment duration. However, it was observed that 4-week treatment might be a sufficient period to observe the results. The length ensured cost-effectiveness. Secondly, we did not have a long-term follow-up. Further studies needed for the observation of long-term gains after the intervention.

In conclusion, the stabilization exercises with and without PMRT were effective in improving pain, movements, and disability in patients with CNP. However, the PMRT had superiority to improve PPT, neck movements, and kinesiophobia. Therefore, the PMRT may be an alternative therapy for patients with CNP in the clinics.

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