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*Original Research*

# Matrix Rhythm therapy in chronic neck pain: A pilot study

The effect of matrix rhythm therapy in chronic neck pain

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**Abstract**
Aim: The aim of this study was to determine the effects of Matrix Rhythm Therapy (MRT) with combined physiotherapy treatment on pain intensity, muscle spasm, disability level and depressive symptoms in chronic neck pain.
Material and Methods: A total of 26 participants with a mean age of 44,46 ± 9,98 years were randomly divided into two groups (intervention and control group). Each participant was treated with ten sessions of a combined physiotherapy program, including hot pack, transcutaneous electrical nerve stimulation, therapeutic ultrasound and conventional massage, exercises and patient education. Additionally, the intervention group received five sessions of MRT. Pain intensity, muscle spasm, disability level and depressive symptoms were assessed before and after the treatment program.
Results: There was a statistically significant improvement in pain, muscle spasm and disability levels after treatment in both groups ($p<0.05$), except for depression scores ($p>0.05$). The difference in change values in terms of activity pain and muscle spasms was found in favor of the intervention group ($p<0.05$), but there was no difference between the groups in terms of rest pain, disability level and depression scores ($p>0.05$).
Discussion: The findings of the study suggest that both the combined physiotherapy program and the MRT application in addition to the combined physiotherapy program have a positive effect on pain, muscle spasms and disability levels in patients with chronic neck pain. On the other hand, MRT increased the efficiency of the combined physiotherapy treatment in the terms of activity pain and muscle spasm in patients with chronic neck pain.

**Keywords**
Neck pain, Physiotherapy Modalities, Massage, Spasm

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## Introduction

Neck pain is a common health problem. Between 14 and 71 % of adults are experienced pain at some point in their life [1]. Chronic neck pain causes physical problems, disabilities, depression, insomnia and a decrease in quality of life [2].

The non-surgical management for chronic neck pain includes modalities such as medication, spinal injections, physiotherapy. Electrotherapy, exercise, manual therapy, patient education are commonly used as physiotherapy methods [3]. Exercise therapy and patient education as an active therapy constitute a significant part of therapy in chronic neck pain. Heat applications and electrotherapy modalities, which constitute passive physiotherapy are used in order to increase the effectiveness of therapy [1,4]. In the treatment of back pain, both a patient-specific therapy program may be developed and a standard therapy protocol may be preferred in [5].

In chronic neck pain, complementary approaches such as massage, acupuncture, exercise, mechanical traction, herbal medicine, cupping, and electrotherapy are considered alternative therapies due to their benefits and safety [6]. There are different types of massage applications, such as vibration. Vibration massage is used to improve circulation and facilitate muscle relaxation [7]. With mechanical devices, vibration treatment can be applied safely and more locally [8].

Matrix Rhythm Therapy (MRT) is a novel application of the vibro-massage method used in sports clubs, physiotherapy and rehabilitation centers and spas. A few studies and clinical experience indicate the efficiency of MRT [9,10]. The effect of MRT in chronic neck pain is unclear. The aim of this study was to investigate the efficiency of MRT with combined physiotherapy modalities in patients with chronic neck pain.

## Material and Methods

This study was a pilot study. The subjects were assessed and treated in the physical therapy department of a private hospital in Denizli, Turkey.

### *Participants*

The study included 26 participants aged between 25-65 years (mean age: 44,46 ± 9,98 years) who were diagnosed with chronic neck back pain by a specialist physician. The patients were randomly divided into two groups as the intervention and control groups. Randomization was allocated using the numbered envelopes method. Figure 1 shows a flow chart of the study design.

Inclusion criteria were age between 25 and 65 years, the presence of neck pain for at least 3 months. Patients with radiculopathy who had motor findings, who underwent any operations due to neck problems, who had systemic, neurologic and psychiatric diseases, inflammatory or infectious diseases, a history of malignity, congenital anomalies and individuals for whom physical therapy methods were contraindicated (sensory loss, having pacemaker) were excluded from the study. Ethical approval for this study was obtained from University Ethics Committee and registered on https://clinicaltrials.gov/ with ClinicalTrials.gov identifier: NCT04696341. Written informed consent was obtained from the patients.

### *Outcome Measures*

Assessments were made before and after treatments. All assessments were done by the same physiotherapist (FU) before therapy and at the end of treatment sessions according to standardized test protocols and under the same conditions. The physiotherapist who performed the assessments did not know which group the subjects belonged to. Demographic data of the participants were recorded through face-to-face interviews. Pain intensity and muscle spasm were assessed with the Visual Analog Scale (VAS), disability level was assessed with the Neck Disability Index (NDI), and depressive symptoms were assessed with Beck Depression Inventory (BDI).

### *VAS*

Pain intensity was assessed using a Visual Analogue Scale (VAS) measuring 10 cm (0: I have no pain, 10: I have an intolerable pain). Participants were asked to mark the severity of pain they felt during rest and activity on VAS [11]. Muscle spasm in the cervical region was assessed using a VAS measuring 10 cm (0: no spasm, 10: the most severe spasm) [12].

### *NDI*

The Turkish version of the Neck Disability Index (NDI) was used to assess the disability caused by neck pain. NDI is composed of a total of 10 questions of which 4 are about subjective symptoms (pain intensity, headache, concentration and sleeping) and 6 about daily life activities (personal care, lifting, reading, work, driving and recreation). Each section is scored between 0 and 5 [13].

### *BDI*

The Turkish version of BDI [14] was used to assess the depressive symptoms of the participants. Each item of the questionnaire (in total 21 items) is scored between 0 and 3. Depressive symptoms are classified scores between 0 and 9 as “minimal depression”, 10–18 as “mild depression”, 19–29 as “moderate depression”, and scores of 30 and above as “severe depression” [14].

### *Interventions*

The intervention was performed by the same physiotherapist (AOS) who has an MRT certificate. A combined physiotherapy program was applied to both groups 5 days a week (on weekdays) in 10 sessions over a period of 2 weeks. In combined physiotherapy program, hotpack (HP) was applied as a superficial heating agent to the cervical and upper thoracic regions for 20 minutes, and ultrasound (US) was applied as a deep heating agent for 5 minutes (intensity: 1.5 watts/cm2, frequency: 1 MHz), 20 minutes of conventional transcutaneous electrical nerve stimulation (TENS) was applied for relieving pain (frequency: 100 Hz, duration: 50ms) and conventional massage (using stroking, kneading and friction techniques for 5 minutes). After these passive physiotherapy modalities, normal range of motion exercises, posture exercises, stretching exercises and isometric exercises were instructed as part of active physiotherapy. Patients were also given home-based exercise programs and recommendations . This treatment program was a routine therapy program for the patients with chronic neck pain at the study hospital.

Five sessions of MRT (2., 5., 6., 8., 10. sessions) were added at combined physiotherapy to IG. Matrix Rhythm Therapy was applied to the cervical and thoracic regions using 10 Hz frequency for 30 min (15 min for the right and left sides of each). Longitudinal stroking, compression and spooning

techniques are specific methods of MRT. MRT was initiated from the side with less pain. The application was started from occipital region and proceeded towards paravertebral muscles. Longitudinal stroking was done paralleled to muscle fibers for the purpose of superficial relaxation. Applications to paravertebral muscles were proceeded inferiorly segment by segment. Afterwards, upper, middle and lower parts of trapezius muscle were taken and proceeded towards latissimus dorsi muscle. After longitudinal strokings, application was made by keeping the logarithmic probe steady at the points of fibrositis using compression (compression of the tissue between the hand of the physiotherapist and logarithmic probe) and spooning techniques (pulling the logarithmic probe by rotating) in trapezius muscle. Compression technique was applied to the upper part of trapezius muscle, where muscle spasm was severe. The pressure was reduced by changing the direction of the device in the areas where muscle spasms and sensitivity were greater.

*Statistical Analysis*

The data were analyzed with the SPSS (Statistical Package Program for Social Sciences) package program. Continuous variables were expressed as mean, standard deviation, and categorical variables were expressed as numbers and percentages. The normality of data was examined with the Kolmogorov-Smirnov Z test. The Mann–Whitney U test was used to compare differences between independent groups. The Wilcoxon paired sample test was used to compare differences between dependent groups. The effect size (Cohen d value) was calculated based on the pre-treatment and post-treatment values of the groups. Effect size values were classified as small 0.20–0.49, medium 0.50–0.79, large 0.8 and higher.

## Results

In the present study, 26 participants completed evaluation and treatment. The mean duration of disease was 4,45± 3,4 years and 4,36± 3,6 years for the intervention group and control group, respectively. There was no statistical difference between the groups in terms of demographic characteristics and clinical data (p> 0.05) (Table 1).

A statistically significant improvement was found in terms of resting and activity pain, muscle spasms and NDI Index scores after treatment compared to the pre-treatment period in both groups (p<0.05). On the other hand, there was no change in BDI scores after treatment (p>0.05) (Table 2).

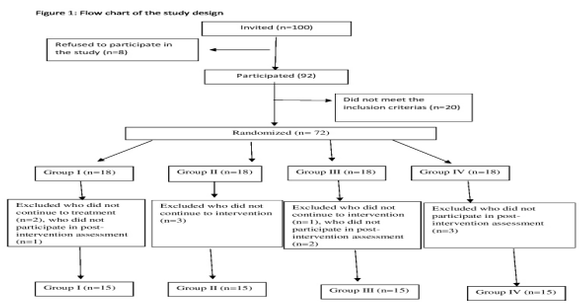


**Figure 1.** Flow chart of the study design

The effect sizes of the rest pain, activity pain and muscle spasm in the intervention group were high.

On the other hand, the effect size of the disability level and depression scores was small. In the control group, the effect size of muscle spasm was large, the effect size of pain scores was medium, and effect size of the disability level and depression scores were small.

When the groups were compared for changes, there were no significant differences between the groups in rest pain, disability level and depression scores (p>0.05). But there were statistically significant differences in activity pain and muscle spasm when the groups were compared for changes (p<0.05) (Table 3).

**Table 1.** Demographics and baseline clinical data of the groups

| | IG (n=13) X±SD | CG (n=13) X±SD | p[a] |
|---|---|---|---|
| Age (yr) | 46,23 ±10,28 | 42,69±9,76 | 0,19 |
| Height (cm) | 161,50±0,37 | 162,15±0,88 | 0,412 |
| Weight (kg) | 74,93±15,15 | 72,64±6,98 | 0,305 |
| BMI (kg/m2) | 28,04±4,32 | 26,34±3,41 | 0,129 |
| Duration of disease (yr) | 4,45±3,40 | 4,36±3,60 | 0,653 |

[a] Mann-Whitney U test; IG: Intervention Group; CG: Control Group

**Table 2.** Comparison of pre- and post-treatment outcome measures in the IG and CG

| IG (n=13) | Pre-treatment X±SD | Post-treatment X±SD | ES | p[a] | Z |
|---|---|---|---|---|---|
| Rest pain | 6,46±1,80 | 1,84±1,04 | 0,84 | 0,001 | -3,194 |
| Activity pain | 9,23±1,01 | 2,84±1,34 | 0,94 | 0,001 | -3,200 |
| Muscle spasm | 8,84±0,98 | 0,38±0,50 | 0,98 | 0,001 | -3,201 |
| NDI | 18,76±6,27 | 14,76±5,00 | 0,33 | 0,017 | -2,383 |
| BDI | 14,38±5,92 | 12,38±7,63 | 0,14 | 0,216 | -1,237 |
| **CG (n=13)** | | | | | |
| Rest pain | 6,07±1,70 | 2,69±2,01 | 0,67 | 0,002 | -3,077 |
| Activity pain | 8,61±0,96 | 4,46±1,85 | 0,81 | 0,001 | -3,192 |
| Muscle spasm | 8,23±1,64 | 3,53±3,23 | 0,67 | 0,005 | -2,818 |
| NDI | 19,23±7,49 | 12,76±8,29 | 0,37 | 0,005 | -2,807 |
| BDI | 14,38±7,24 | 13,23±11,09 | 0,06 | 0,937 | -0,079 |

[a] Wilcoxon Signed Rank Test; IG: Intervention Group; CG: Control Group, ES: Effect Size NDI: Neck Disability Index; BDI: Beck Depression Inventory

**Table 3.** Comparison of changes (delta values) in clinical outcome measures after therapy

| Changes | IG (n=14) X±SD | CG (n=14) X±SD | p[a] | Z |
|---|---|---|---|---|
| Rest pain | 4,61±2,43 | 3,38±1,85 | 0,362 | -0,961 |
| Activity pain | 6,38±1,60 | 4,15±1,90 | 0,005 | -2,775 |
| Muscle spasm | 8,46±1,12 | 4,69±3,79 | 0,012 | -2,502 |
| NDI | 4,00±4,91 | 6,46±8,07 | 0,762 | -0,310 |
| BDI | 2,00±5,70 | 1,15±9,78 | 0,920 | -0,129 |

[a] Mann-Whitney U Test; IT: Intervention Group; CG: Control Group; NDI: Neck Disability Index; Beck Depression Inventory

## Discussion

In the current study, patients with chronic neck pain received active and passive physiotherapy modalities as part of a combined physiotherapy program. Both the combined physiotherapy program and the MRT application in addition to the combined physiotherapy program have been found to have a positive effect on pain intensity, muscle spasms and disability level in patients with chronic neck pain. On the other hand, MRT applied in addition to the combined physiotherapy program, had a greater effect on activity pain and muscle spasm compared with the combined physiotherapy program alone.

In the literature, studies are available indicating the positive effects of combined physiotherapy program composed of active and passive modalities on pain, muscle spasm and level of disability [15-16]. Similar findings were obtained during the study; we found an improvement in pain, muscle spasm, the disability level in the group who received combine physiotherapy program.

Physiotherapy modalities are often included in neck rehabilitation programs. According to Smidt et al., the studies supporting the effectiveness of exercise therapy in neck pain are insufficient, and exercise therapy is widely used in the treatment of chronic neck pain in order to improve physical function and reduce symptoms [17]. Guidelines recommend the use of exercise on its own, or in combination with other non-pharmacological therapies [18]. Hayden et al. found that applying exercise together with other conservative methods was more effective for reducing pain and improving functionality compared to applying exercise alone [19]. According to Skillgate et. al, management of non-specific neck pain disorders often includes massage therapy, as well as exercise therapy, little is known about the effectiveness, side effects and cost-effectiveness of such therapies [3]. Previous studies about the effect of massage on neck pain have been done with different doses and types [20].

MRT is a vibro-massage therapy and is defined as a vibro-massage modality targeted to muscle structure [5]. Studies about the effectiveness of MRT in pain are insufficient. Jager et al. evaluated the effect of MRT on the severity of pain, sleep pattern and spine flexibility in patients with back and low back pain. In this study, it was reported that MRT was superior to conservative treatment [22].

In a study by Özcan et al., they investigated the effect of MRT on pain, disability level and quality of life in chronic low back pain. Both the combined physiotherapy program (hot pack, transcutaneous electrical nerve stimulation, therapeutic ultrasound, home exercise, and patient education program) and the group that received six sessions of MRT in addition to the combined physiotherapy program improved pain, disability level, and quality of life [23].

One of the mechanisms of action of MRT in reducing pain and spasm may be the effect of MRT in increasing blood circulation. Taspinar et al. compared the immediate effect of one 30-minute MRT session and one of 30-minute classical massage session on peripheral blood circulation in the lower extremities. As a result of the study, they found that both massages increased peripheral blood circulation, but MRT led to a greater increase [10].

This study has limitations. The main limitation of the study is that MRT used in a combined physiotherapy program. Tsao states the difficulty of determining the effectiveness of the massage applied together with many therapies [24]. According to Ylinen, studies that used combined therapy carried a risk, additional application was not sufficient for indicating effectiveness if several therapies are working at the same time [25]. Therefore, there is a need for future studies on MRT massage applied alone. The other limitation is the lack of follow- up to find the long-term effects of MRT.

### *Conclusion*

The findings of the study indicated that combined physiotherapy treatment including active and passive physiotherapy modalities was an effective treatment approach in patients with chronic neck pain. MRT also increased the efficiency of combined physiotherapy treatment. Further studies are needed to determine the effectiveness of MRT application without the combination of other physiotherapy treatment methods and objective muscle spasm assessment methods with follow-up in patients with chronic neck pain.

***Scientific Responsibility Statement***

*The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

***Animal and human rights statement***

*All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.*

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***Conflict of interest***

*None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.*

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