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Role of Manual Therapy in Cervical Spondylosis Patients

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Abstract

Cervical spondylosis, a prevalent degenerative condition, is characterized by chronic pain, incapacity, and restricted cervical mobility. Manual therapy is commonly utilized in clinical practice, although its effects beyond exercise treatment are unclear. Assess the effects of cervical manual treatment and exercise on the disabilities, pain sensitivity to thermal and pressure stimuli, cervical spine range of motion, and pain thresholds of individuals with cervical spondylosis. The study was a randomized, double-blind clinical trial that included 28 patients with persistent cervical spondylosis. Manual therapy and exercise were administered to one group, while the other group was provided with exercise exclusively. Over the course of three to five weeks, each group participated in therapy sessions six times. The following assessments were implemented: cervical range of motion (ROM), Numeric Pain Rating Scale (NPRS), Neck Disability Index (NDI), pressure pain threshold (PPT), heat pain threshold (HPT), cold pain threshold (CPT), and assessments at baseline, immediately post-intervention, and the final session. Independent t-tests and mixed-model repeated-measures ANOVA were implemented. In comparison to the comparator group, the experimental group demonstrated substantial improvements in cervical range of motion (ROM), disability (NDI), and pain intensity (NPRS) ($p < 0.05$). The experimental group demonstrated a significant increase in pressure pain threshold, particularly at the cervical spine and C7 dermatome. The categories did not exhibit any substantial differences. The sensitivity to thermal discomfort was consistent across both groups. Significant correlations were observed between improvements in neck dysfunction and reductions in pain severity ($r = 0.82$, $p <= 0.001$). Cervical manual therapy and exercise are superior to exercise alone in alleviating pain, enhancing neck function, and increasing cervical mobility in cervical spondylosis patients, despite the fact that they do not alter thermal pain sensitivity.

Keywords: Cervical spondylosis, manual therapy, neck pain, physiotherapy, cervical mobilization, randomized controlled trial

INTRODUCTION

The biggest cause of disability globally, cervical spondylitis (CS), costs patients and healthcare systems heavily in social, economic, and financial terms. More severe damage and a poorer prognosis are associated with prolonged neck discomfort than low back pain [1]. About 66% of people will have neck pain throughout their lives due to its prevalence [2]. Low back pain was the main reason to seek CIM in 2007, followed by neck pain. Since no anatomical or pathological variables are implicated, most neck pain sufferers have mechanical or non-

specific causes. Non-specific cervical pain is linked to increased healthcare costs, more primary care visits, lost work days, and worse productivity [3,4]. Many persons experience non-specific cervical pain, which may hamper daily activities and functional performance even though most instances do not include neurological deficits or substantial illness [5]. After 12 months of therapy, almost a third of individuals have persistent or recurrent symptoms, which may cause chronic pain [6].

Mechanical neck discomfort may arise from muscle palpation, sustained neck positions, or cervical motions. It may or may not reach the shoulder. Cervical mechanical neck discomfort restricts range of motion (ROM), hinders physical function, and incurs significant expenses [7]. Numerous manual therapy techniques, including manipulation and mobilization, are employed to address soft tissues and joints. Manual therapy alleviates cervical discomfort and enhances functionality in many trials [8–11]. Manipulation employs low-amplitude thrusts at spinal joints, whereas mobilization utilizes slower, regulated rhythmic motions. Cervical spine manipulation offers several advantages in clinical settings; nonetheless, concerns regarding associated dangers need cautious selection of procedures by clinicians [12].

Maitland's joint mobilization theory uses active, rhythmic, oscillatory movements within specified ranges to diagnose and treat joint issues [13]. Mobilizations are divided into five types by patient complaints and joint mobility. Grades I and II use low-amplitude oscillations to relieve discomfort in the early range of motion. Grades III and IV enhance mobility and reduce joint stiffness in the end range. Manipulation thrusts with high velocity and low amplitude are Grade V. Manual treatments are commonly employed in clinical settings, but additional high-quality randomized trials are required to verify their effectiveness with exercise for cervical spondylosis patients. This study examines how exercising and cervical manual therapy improve cervical spondylosis patients' discomfort, disability, pain sensitivity, and mobility.

OBJECTIVES

1. To assess how cervical manual treatment and exercise affect patients with cervical spondylosis in terms of pain, disability, and cervical range of motion.

2. To compare changes in pain sensitivity (pressure and temperature thresholds) between manual treatment with exercise versus exercise alone.

RESEARCH METHODOLGY

Research design

Clinical trials that are randomized and double-blind comply with the CONSORT Guidelines. The study was approved by the Institutional Ethical Committee prior to its commencement, subject to the ethical considerations and principles outlined in the Declaration of Helsinki on research involving human subjects. Participants were not made aware of their assignment or the purpose of study until completion of the research, nor was outcome assessors, who were physical therapists and independent with respect to study investigators and employers. Participant Monitoring at out-patient physiotherapy facilities located in tertiary-level hospitals occurred over a period of 8 months [14].

Sample Size Calculation

The required sample size was determined using the pain intensity variations from the pilot study with patients suffering cervical spondylosis (G*Power, 3.1.9.2 version) as the premise for a sample size estimate. An a priori power analysis was conducted using a.05 alpha level, an 80% power (or.80) to determine statistical significance, two groups (control and experimental), and three distinct occasions to measure the experiment's outcome. A repeated-measures ANOVA (a within-and-between interaction) was employed to conduct the analysis. The effect size of.44 indicated that a total of 28 patients were required in both categories. The subjects were to be recruited at 14 in each of two groups (total n = 28) according to the presumption that subjects may withdraw from the study.

Participants

The participants were adults who had just received a diagnosis of cervical spondylosis, and they were chosen at random. Our criteria for inclusion were:

- Age range of 30 to 65 years
- Chronic cervical discomfort persisting for a length of three months or longer
- Radiological confirmation of cervical spondylosis (X-ray or MRI)
- Diminished cervical range of motion accompanied with mechanical neck discomfort

Exclusion criteria included:

- Cervical myelopathy or acute cervical disc prolapse
- History of cervical spine surgery with fracture.
- Osteoporosis, inflammatory arthritis, or malignancy
- Neurological disorders or systemic disease affecting the musculoskeletal system
- Pregnancy or recent whiplash injury

Informed written permission was acquired from all individuals before to participation.

Randomization and Blinding

A randomized sequence that was created by a computer was used to split the participants into two parallel groups with a ratio of one subject to each other. In order to conceal the allocation, we utilized envelopes that were opaque and sealed. [15] The administration of group assignments was the responsibility of a therapist who was not involved in either the assessment or therapeutic services.

Interventions

Every participant in the study attended six sessions of treatment over the course of three to five weeks. A qualified physiotherapist who has been working in the field for more than five years was responsible for providing all of the services that were rendered.

Experimental Group (Manual Therapy + Exercise)

The experimental group's cervical manual treatment methods were determined by clinical evaluation and administered to the following participants:

- Central and unilateral posterior–anterior cervical mobilization
- Cervical lateral glide mobilization

Mobility exercises were conducted at Grade III oscillations for two minutes during each set, with a total of three sets completed during each session. These exercises were designed to target the cervical segments that were causing the greatest difficulty. Following the completion

of manual therapy, exercises were performed to strengthen the deep neck flexors [16]. These exercises included craniocervical flexion while the individual was flat on their back.

Comparison Group (Exercise Therapy Only)

The comparison group got just exercise treatment immediately after the conclusion of the deep neck flexor strengthening exercises. Rather than relying on manual treatment, this strategy used an organised exercise regimen to focus on the cervical area. Throughout the procedure, all participants got regular instruction on ergonomics, activity moderation, and proper posture.

Outcome Measures

No changes were made to the assessment of outcome measures between baseline, first session, and last session, with the exception of the last session.

Primary Outcomes

- The severity of pain is quantified using the Numeric Pain Rating Scale (NPRS).
- Pressure Pain Threshold (PPT) assessed with a computerized pressure algometer at cervical paraspinal muscles

Secondary Outcomes

- The Neck Disability Index (NDI) was assessed prior to and following treatment.
- The active cervical range of motion (ROM) in flexion, extension, rotation, and lateral flexion is assessed using a cervical goniometer.

Statistical Analysis

A data analysis was performed using IBM SPSS version 20, which was provided. The mean plus or minus the standard deviation was used to depict descriptive statistics for continuous data, while frequency distributions were employed for categorical variables [17]. The Shapiro-Wilk test was implemented to verify the data's normality. In order to evaluate temporal variations, a mixed-model repeated-measures analysis of variance (ANOVA) was implemented both within and across groups. Every scenario that involved multiple comparisons was subjected to the Bonferroni adjustment. The mean alterations between the categories were compared using independent t-tests. The significance criterion employed in this investigation was $p < 0.05$.

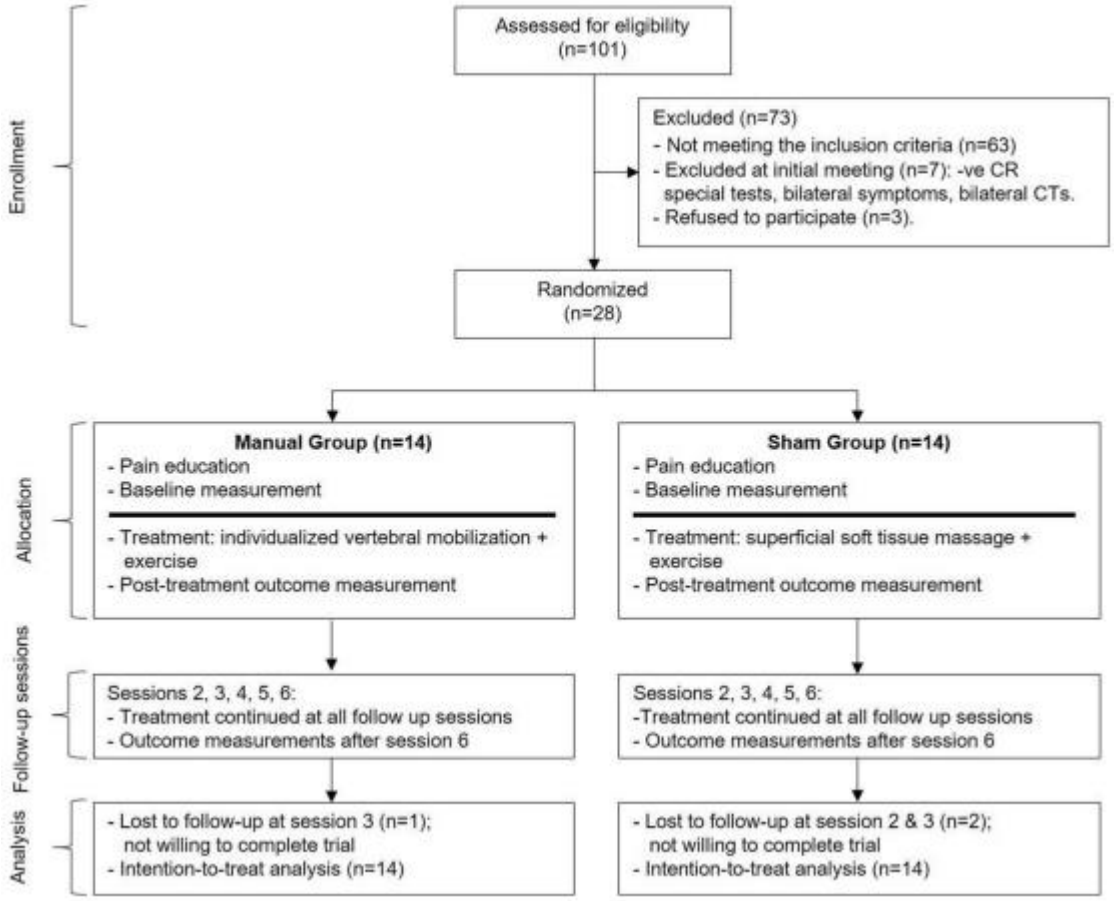

Figure 1. CONSORT flow diagram

RESULT

The methodologies and techniques utilized in the research study are succinctly summarized in Figure 1. A total of 101 patients underwent an eligibility assessment. The inclusion criteria were met by seventy individuals; however, three declined to participate in the study [18]. A total of 28 individuals with a history of persistent cervical radiculopathy were randomly assigned to either the experimental group or the control group. Twenty-five of these individuals were female, while three were male. Two participants from the experimental group and one participant from the control group elected to withdraw from the study. No patient has been taken out of the study due to adverse treatment responses, as far as we are aware. The demographic data of patients is divided into two distinct categories, as illustrated in Table 1.

Table 1. Baseline Characteristics of Participants

Variable	**Investigational Group (n = 14)**	**Assessment Group (n = 14)**
Gender (female/male)	12 / 1	13 / 1
Age (years)	42 ± 6	42 ± 6
Body mass index (kg/m²)	32 ± 4	29 ± 3
Numeric Pain Rating Scale **(0–10)**	6 ± 2	6 ± 1
Neck Disability Index **(0–50)**	36 ± 1	35 ± 13
Duration of cure (weeks)	4 ± 2	3 ± 1
Symptom period (months)	26 ± 24	21 ± 28
Affected side		
Left	5	5
Right	9	9
Dermatome complex		
C5	0	1
C5 & C7	1	0
C6	7	5
C6 & C7	2	2
C7	4	4
C8	0	2
Most painful cervical region		
C4	2	1
C5	4	4
C6	5	4
C7	3	5

Suppository use[a]		
Yes	9	6
No	5	8

Values are presented as mean ± standard deviation or frequency.

Abbreviations:

BMI = Body Mass Index;

NPRS = Numeric Pain Rating Scale;

NDI = Neck Disability Index.

As part of their treatment protocol, both groups were administered standard medical management, which encompassed analgesics, vitamin B-complex supplements, and non-steroidal anti-inflammatory medications (NSAIDs). The mean age of participants in both categories was 42 years, which was less than the 47.6–48.2 years reported in previous studies. This implies that the current investigation involved individuals who were relatively younger and experienced symptoms related to the cervical vertebrae. The control group had a mean symptom duration of 22 ± 29 months, while the experimental group had a mean symptom duration of 27 ± 25 months. These findings suggest that both groups had been experiencing symptoms for a significant period prior to the intervention. This is indicative of the chronic character of cervical spine-related disorders among the study participants. 9 participants in the experimental group and 5 participants in the control group reported symptoms affecting the right side of the cervical spine, indicating a higher prevalence of right-sided involvement in the experimental group. This is in regards to the side of involvement. The C6 dermatome was the most frequently affected level in terms of dermatome distribution, with 7 participants in the experimental group and 5 participants in the control group exhibiting the maximum involvement at this level. Additionally, the patients' most painful regions were identified as the cervical vertebrae segments C4, C5, C6, and C7. These results underscore the fact that the middle and lower cervical spine segments were the most frequently affected regions, which is consistent with the prevalent pattern of cervical spondylotic alterations. Table 2 illustrates the initial comparability of the study groups prior to intervention by providing the baseline mean values and clinical characteristics of both groups[19].

.Table 2. Baseline Outcome Measures for Both Groups

Outcome Degree	Investigational Group (n = 14) Mean ± SD	Assessment Group (n = 14) Mean ± SD	Mean Difference (95% CI)
Pressure Pain Threshold (PPT) (kPa)			
Cervical spine	347 ± 212	292 ± 100	51 (−78.0, 183.0)
C7 hand	474 ± 183.0	435 ± 131	42 (−82.1, 165.4)
Affected dermatome	421 ± 123	424 ± 187.8	−4 (−162.0, 157.8)
Tibialis anterior	517 ± 173.4	475 ± 148.0	43 (−80.2, 166.0)
Heat Pain Threshold (HPT) (°C)			
Cervical spine	44.3 ± 4.0	45.4 ± 4.2	−0.2 (−3.4, 2.6)
C7 hand	44.2 ± 3.0	45.7 ± 3.0	−0.2 (−3.3, 2.0)
Affected dermatome	43.3 ± 3.0	43.8 ± 2.0	0.5 (−1.7, 3.0)
Tibialis anterior	45.2 ± 3.2	45.0 ± 2.4	0.1 (−2.0, 2.3)
Cold Pain Threshold (CPT) (°C)			
Cervical spine	15.2 ± 8.4	16.0 ± 10.0	−0.6 (−8.0, 6.0)
C7 hand	17.1 ± 9.0	18.3 ± 7.0	−1.7 (−8.0, 4.2)
Affected dermatome	18.1 ± 9.1	19.3 ± 7.3	−1.2 (−9.4, 7.0)
Tibialis anterior	12.3 ± 9.2	18.7 ± 10.2	−6.0 (−13.6, 1.2)

Pain and Disability			
NPRS (0–10)	6.2 ± 1.0	6.4 ± 1.7	0 (−1.0, 1.0)
NDI (0–50)	36.3 ± 7.2	35.5 ± 13.9	1.0 (−7.3, 9.7)
Cervical Range of Motion (degrees)			
Flexion	48 ± 10.3	41 ± 11.6	4 (−3.3, 13.9)
Extension	54 ± 16.4	46 ± 15.6	−3 (−18.2, 9.7)
Rotation (affected side)	58 ± 12.0	55 ± 10.6	−3 (−6.0, 13.6)
Rotation (unaffected side)	61 ± 8.3	62 ± 10.4	−1 (−8.8, 5.6)
Lateral flexion (affected side)	33 ± 8.6	32 ± 8.2	−1 (−5.2, 7.5)
Lateral flexion (unaffected side)	34 ± 5.6	39 ± 7.7	5 (−0.7, 9.6)

Values are presented as mean ± standard deviation.

Table 3 shows the different findings of the experimental group and the comparison group during the investigation

Table 3. Mean Intra-Group and Inter-Group Variations from Baseline for Outcome Metrics Immediately Following Intervention and Session 6

Pressure Pain Threshold (PPT) (kPa)

Outcome	**Time**	**Investigational Group (n=14) Mean Alteration (95% CI)**	**Assessment Group (n=14) Mean Alteration (95% CI)**	**Between-Group Mean Change (95% CI)**
Cervical spine	Directly	34 (−4.4, 75.2)	−13 (−52.1, 27.7)	48 (−9.0, 103.0)
	Session 6	122[a] (53.0, 190.2)	68 (−0.42, 133.6)	57 (−37.3, 152.1)

C7 hand	Directly	−3 (−57.9, 62.6)	12 (−47.2, 73.0)	−14 (−101.0, 72.3)
	Session 6	98[a] (3.3, 192.7)	83.4 (−12.0, 178.2)	16 (−114.3, 151.0)
Affected dermatome	Directly	−17 (−96.0, 57.7)	−30 (−105.2, 46.4)	11 (−97.0, 117.9)
	Session 6	74 (−29.3, 176.2)	24 (−79.6, 124.0)	53 (−93.2, 196.2)
Tibialis anterior	Directly	−36 (−118.2, 43.3)	1 (−78.1, 80.9)	−37 (−152.0, 76.1)
	Session 6	78 (−5.8, 161.7)	82 (−1.5, 165.7)	−2 (−124.6, 115.7)

Heat Pain Threshold (HPT) (°C)

Outcome	Time	Experimental Group	Comparison Group	Between-Group Difference
Cervical spine	Directly	0.7 (−1.4, 2.7)	−2.2 (−4.4, −0.1)	3.0 (−0.2, 6.0)
	Assembly 6	0.0 (−2.0, 2.2)	−0.5 (−2.6, 1.3)	0.5 (−2.2, 3.4)
C7 hand	Directly	0.1 (−1.0, 1.1)	−0.2 (−1.4, 0.2)	0.3 (−1.0, 2.2)
	Assembly 6	0.2 (−2.0, 2.3)	−1.3 (−3.5, 0.6)	1.4 (−1.4, 4.7)
Affected dermatome	Directly	−1.2 (−3.2, 3.1)	0.0 (−1.5, 1.6)	−1.0 (−3.6, 1.3)
	Assembly 6	−0.1 (−3.5, 3.1)	−1.0 (−4.3, 2.0)	0.7 (−3.2, 5.6)
Tibialis anterior	Directly	0.2 (−0.7, 1.2)	−0.6 (−1.9, 0.2)	1.0 (−0.1, 2.7)
	Assembly 6	0.3 (−1.0, 1.6)	−0.8 (−1.7, 1.3)	0.4 (−1.6, 2.8)

Cold Pain Threshold (CPT) (°C)

Outcome	Time	Experimental Group	Comparison Group	Between-Group Difference
Cervical spine	Directly	−1.5 (−6.4, 3.0)	−3.2 (−8.2, 1.5)	−1.6 (−8.7, 5.3)
	Assembly 6	1.5 (−3.8, 6.9)	−2.5 (−8.0, 2.0)	−4.2 (−12.0, 2.6)

C7 hand	Directly	−3.3 (−6.9, −0.2)	−1.3 (−4.4, 2.0)	2.2 (−2.0, 6.7)
	Assembly 6	−0.7 (−5.2, 3.2)	−2.0 (−6.0, 2.1)	−1.0 (−7.2, 5.0)
Affected dermatome	Directly	−1.0 (−6.3, 3.7)	−2.1 (−7.2, 2.3)	−0.7 (−8.0, 6.0)
	Assembly 6	0.4 (−4.3, 5.3)	−2.2 (−7.0, 2.1)	−3.0 (−9.7, 4.0)
Tibialis anterior	Directly	−3.0(−5.2, −0.1)	0.2 (−2.3, 3.0)	3.3 (−0.4, 7.1)
	Assembly 6	−2.2 (−5.3, 1.8)	1.7 (−2.0, 5.3)	3.7 (−1.4, 9.0)

Discomfort, Impairment, and Cervical Mobility

Consequence	Time	Experimental Group	Comparison Group	Between-Group Difference
Numeric Pain Rating Scale (0–10)	Directly	1.8[a] (0.7, 2.6)	0.5 (−0.7, 1.2)	−1.4[a] (−2.7, −0.0)
	Session 6	2.9[a] (2.3, 5.1)	1.3 (−0.1, 2.3)	−2.3[a] (−4.5, −0.6)
Neck Disability Index (0–50)	Session 6	16.2[a] (9.3, 22.0)	2.3 (−4.2, 9.0)	−14.0[a] (−23.2, −4.0)
Flexion	Session 6	5 (−2.1, 11.5)	4 (−2.4, 11.2)	0.3 (−9.3, 10.0)
Extension	Session 6	10[a] (1.3, 17.7)	−4 (−12.6, 3.8)	14.0[a] (2.3, 25.5)
Rotation (affected)	Session 6	12[a] (7.7, 17.4)	−3 (−7.9, 1.8)	15.6[a] (8.8, 22.5)
Lateral flexion (affected)	Session 6	8[a] (3.2, 13.4)	−1 (−1.3, 13.4)	9.5[a] (2.3, 16.8)

[a] **Denotes a statistically significant disparity ($p < 0.05$).**

The experimental group revealed considerably higher gains over time in mechanical pressure pain threshold (PPT), self-reported pain intensity, neck disability and cervical range of motion (CROM) than the control group. The analysis demonstrated no significant between-group differences in PPT at the cervical spine ($F = 1.999$, $p > 0.050$), C7 hand dermatome ($F = 0.166$, $p > 0.050$), affected dermatome ($F = 0.433$, $p > 0.050$), and tibialis anterior ($F = 0.280$, $p > 0.050$), but there was a significant improvement over time at the cervical spine ($F = 11.757$, $p < 0.050$) and tibialis anterior ($F = 7.108$, $p < 0.050$). The experimental group had a mean

increase of 124 kPa (95% CI: 57–191.1 kPa) at the cervical spine and 99 kPa (95% CI: 3.6–194.9 kPa) at the C7 dermatome from pre to post evaluation showing greater tolerance to mechanical pressure and lower pain sensitivity. For thermal pain sensitivity, no significant group x time interactions were seen for heat pain threshold (HPT) ($F = 0.460–2.657$, $p \geq 0.080$) or cold pain threshold (CPT) ($F = 0.496–1.852$, $p \geq 0.167$), showing that the intervention had no meaningful effect on thermal hyperalgesia. The temporal effects of HPT were non-significant ($F = 0.292–0.865$, $p > 0.433$). There was no difference in temperature sensitivity with hot pack or high-performance treatment (0.6°C, 95% CI: -3.5°C to 2.3°C) that was not clinically relevant. Patient rotation also did not significantly benefit with HPT, with a mean change of 1.7 °C (95% CI: -4.8 °C to 1.5 °C). However, cold pain threshold (CPT) was able to reduce discomfort in several anatomical regions: cervical spine, C7 hand dermatome, afflicted dermatome and tibialis anterior, with an improvement of 15.6°C (95% CI: 8.9°C to 8.8°C; $p = 0.001$; $F = 5.583$). There was also a 15.6 degree ($p = 0.001$) improvement in cervical range of motion toward the afflicted side. Results showed that the decrease in pain severity was closely related to the enhanced mobility of the neck and functional recovery, and suggested that the intervention was mainly targeting mechanical pain mechanisms and not heat pain sensitivity[20].

Table 4. Pearson correlation coefficient was employed to quantify the strength and direction of the association between the outcome measures.

Outcome Measures	r	r^2	P value
Numeric Pain Rating Scale **vs.**			
Neck Disability Index	0.80	0.67	< 0.000*
Cervical range of motion —Delay	−0.01	0.00	0.918
Cervical range of motion —Adjacent flexion (affected)	−0.04	0.00	0.817
Cervical range of motion —Alternation (affected)	−0.31	0.10	0.100
Pressure pain threshold —Cervical spine	−0.32	0.11	0.086
Pressure pain threshold —Pretentious dermatome	−0.02	0.00	0.906
Heat pain threshold —Cervical spine	0.03	0.00	0.833
Heat pain threshold —Pretentious dermatome	−0.18	0.03	0.475

Cold pain threshold —Cervical spine	0.10	0.01	0.587
Cold pain threshold —Pretentious dermatome	0.11	0.01	0.683
Neck Disability Index **vs.**			
Cervical range of motion —Postponement	−0.21	0.04	0.304
Cervical range of motion —Adjacent flexion (affected)	−0.18	0.04	0.339
Cervical range of motion —Spin (affected)	−0.25	0.07	0.180
Pressure pain threshold —Cervical spine	−0.15	0.03	0.426
Pressure pain threshold —Pretentious dermatome	0.15	0.03	0.538
Heat pain threshold —Cervical spine	0.06	0.00	0.727
Heat pain threshold —Pretentious dermatome	−0.21	0.05	0.362
Cold pain threshold —Cervical spine	−0.02	0.00	0.875
Cold pain threshold —Pretentious dermatome	0.20	0.05	0.370

*Statistically significant correlation ($p < 0.05$)

DISCUSSION

This randomized controlled trial examined if cervical spondylosis patients who exercised with cervical manual therapy had better results. Manual therapy improved clinical outcomes, specifically pain, disability, and cervical range of motion, compared to exercise alone [20]. NPRS showed clinically significant pain intensity reductions immediately after the intervention and during the final session. This shows a positive group-by-time interaction for the experimental group. Other investigations have demonstrated that cervical mobilization activates mechanoreceptors and blocks spinal nociceptive input to alleviate pain. The substantial association between NPRS and NDI supports the therapeutic relevance of pain reduction for cervical spondylosis patients' functional ability. At the end of therapy, the experimental group had a large improvement in the Neck Disability Index score, whereas the comparison group had a little gain. This suggests that hand rehabilitation and exercise might result in better functional recovery. Furthermore, the considerable reduction in NDI scores suggests an increase in cervical mobility and a decrease in discomfort, which allows patients to engage in more everyday activities[21]

The experimental group demonstrated a larger improvement in cervical range of motion (CROM), especially in extension, rotation, and lateral flexion toward the afflicted side, compared to the control group. These findings indicate that joint mobilization treatments may be beneficial in increasing neck mobility in patients with degenerative cervical disorders. These treatments may assist reduce joint stiffness and improve flexibility of movement, which may minimize mobility constraints and allow patients to conduct everyday tasks with more ease and comfort. The results show the potential of joint mobilization as a major therapeutic intervention to restore functional neck motions and improve the quality of life of patients with cervical degenerative illnesses. It may also enhance the efficiency of strength training exercises and therefore increase the potential for beneficial outcomes. An increase in the cervical spine pressure pain threshold in the experimental group suggests that there was a decrease in sensitivity to mechanical pain; however, the overall effect of manual therapy on local pain tolerance was not statistically significant (although there are potential confounding factors such as exercise and time). Additionally, as shown by the lack of change in thermal pain thresholds (CPT & HPT), manual therapy does not appear to have any impact on the central processing of thermal pain, with a much greater impact on the processing of mechanical pain. These findings support previous findings that physical therapies do not significantly influence centrally or globally mediated sensory systems.

Study results indicated no significant changes in temperature sensitivity, suggesting that the observed benefits are related mainly to local biomechanical and neurophysiological changes rather than processes of central pain modulation. In non-technical language, that suggests the therapy may have worked by directly enhancing the function of muscles, joints and surrounding tissues in the afflicted cervical area rather than modifying how the brain perceives pain. This is a significant therapeutic aspect as manual treatment procedures are mainly aimed to reduce mechanical pain by decreasing joint stiffness, enhancing mobility and releasing muscle tension in persons with cervical spondylosis. These findings offer valuable insights for clinical practice in that they reinforce the relevance of manual therapy in the management of mechanical neck pain and functional outcomes. However, several limitations should be taken into account while interpreting these results. The limited sample size may restrict the generalizability of the findings and the short-term follow-up prevents knowing whether the advantages may be sustained over a longer time period. However, the study design is randomized and double-blinded, which increases the reliability of the findings. The consistency in the application of treatment procedures among participants improves the

methodological quality of the study. Further studies with bigger sample sizes and longer follow-up periods are required to validate these results and to further investigate the long-term benefits of manual treatment in patients with cervical spondylosis. Such research would offer greater evidence and help guide more successful treatment choices in clinical practice.

CONCLUSION

This study found that exercising on its own is not as useful as exercising in combination with cervical manual therapy in terms of treating pain, lowering impairments related with the neck, and increasing cervical range of motion in those who have cervical spondylosis. This was the conclusion reached by the researchers. Manual therapy does not have an impact on thermal pain thresholds; however, it does help with mechanical pain sensitivity. This is the case with both thermal and mechanical pain thresholds. The concept that cervical manual therapy, when paired with exercise-based rehabilitation, may be able to aid in the relief of symptoms associated with cervical spondylosis is given legitimacy by the results that have been obtained, such as these.

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