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ORIGINAL ARTICLE

Effectiveness of Pilates Versus Therapeutic Exercise for Pain and Function in Chronic Neck Pain- A Comparative Study

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ABSTRACT
Chronic neck pain is a prevalent musculoskeletal condition that interferes with daily functioning and quality of life. Exercise therapy is a common treatment, but limited research compares Pilates and therapeutic exercises directly. To compare the effectiveness of Pilates and therapeutic exercises on pain and functional disability in individuals with chronic neck pain. Comparative interventional study. Thirty participants with chronic neck pain were randomly assigned to two groups: Group A received therapeutic exercises, and Group B received Pilates. Both groups followed a 6-week intervention, with four sessions per week. Pain and function were measured before and after the program. Numeric Pain Rating Scale (NPRS) and Neck Disability Index (NDI). Both groups showed significant improvement, but the Pilates group had a greater reduction in pain and disability scores with statistically significant results (p < 0.05). Pilates is more effective than therapeutic exercises in reducing pain and improving function in chronic neck pain.
Keywords; *Chronic neck pain, Pilates, therapeutic exercise, NPRS, NDI.*

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INTRODUCTION

The neck refers to the collection of structures that connect the head to the torso. It is a complex structure of many bones, muscles, nerves, blood vessels, lymphatics, and other connective tissues. The cervical spine is the bony part of the neck. Its primary function is to support the skull while still allowing for movement. It is the most flexible part of the spine. This flexibility allows for large movements to scan our surroundings. Most sensory inputs occur at the head; thus, proper neck movement is vital to survival [1]. The neck is the bridge between the head and the rest of the body. It is located in between the mandible and the clavicle, connecting the head directly to the torso, and contains numerous vital structures. It contains some of the most complex and intricate anatomy in the body and is comprised of numerous organs and tissues with essential structure and function for normal physiology. Structures contained within the neck are responsible for breathing, speaking, swallowing, regulation of metabolism, support and connection of the brain and cervical spine, and circulatory and lymphatic inflow and outflow from the head.[2]. The neck can be envisioned very simply as a pathway (or connection) between the head and the rest of the body. It is home to the proximal esophagus, trachea, thyroid gland, and the parathyroid glands. It provides conduits for blood flow to the brain and head, supports the head and moves it accordingly, and transmits nervous signals from the brain to the rest of the body. It is an intricate part of the body with many different planes and compartments. The neck separates into two triangles: anterior and posterior, with these divided into additional triangles and anatomic areas.[3]

STRUCTURE AND FUNCTION

The cervical spine is composed of seven vertebrae. Cervical vertebrae C1 and C2 are known as "atypical" vertebrae due to the presence of unique bony structures designed to support and move the skull. While the cervical spine can undergo flexion, extension, rotation, and side-bending, each individual cervical joint has a primary motion.C1, the atlas, has no spinous process and articulates with the occipital condyles of the occiput bone of the skull, forming the occipital-atlanto (OA) joint. The OA joint connects the skull to the neck, providing attachment points for some neck muscles. It also functions to bear the weight of the skull, providing support. The primary motions of the OA joint are flexion and extension.C2, the axis, articulates superiorly with C1 via a unique bony structure called the dens or odontoid process. The dens project up from the vertebral body and articulates with the atlas. The dens permit pivoting motion and allows a greater range of motion in rotating the head laterally. Vertebrae C3 through C7 are known as "typical" cervical vertebrae. The primary motion of the upper portion of the lower cervical unit (C2-C4) is rotation. The primary motion of the lower portion of the lower cervical unit is side-bending. The description of all spinal and vertebral movements is relative to motions of their anterior and superior surfaces.[4]

- Cervical flexion: bending the head forward towards the chest.
- Cervical extension: bending the head backward with the face towards the sky.
- Cervical rotation: turning the head to the left or the right.
- Cervical side-bending: tipping the head to the side or touching an ear to the ipsilateral shoulder.

The function of the cervical spine is to stabilize and maintain the head in a position that allows our eyes to be parallel to the ground.[5]

Anterior Neck Muscles

Superficial Muscles

- Platysma: Depression of mandible and angle of the mouth, the tension of skin of the lower face and anterior neck
- Sternocleidomastoid: Head and neck extension at the atlanto-occipital joint and superior cervical spine; neck flexion at the inferior cervical vertebrae; elevation of the clavicle and sternal manubrium at the sternoclavicular joint; ipsilateral flexion and contralateral rotation of the neck at the cervical spine
- Subclavius: Anchoring and depression of the clavicle at the sternoclavicular joint

Suprahyoid Muscles

- Digastric: Depression of the mandible, elevation of the hyoid bone during swallowing and speaking.
- Mylohyoid: The muscular floor of the oral cavity, elevation of the hyoid bone and floor of the mouth, depression of the mandible
- Geniohyoid: elevation and drawing of hyoid bone anteriorly
- Stylohyoid: elevation and drawing of hyoid bone posteriorly

Infrahyoid Muscles

- Sternohyoid: depression of the larynx
- Sternothyroid: depression of the larynx
- Thyrohyoid: depression of hyoid bone, elevation of the larynx
- Omohyoid: depression of the hyoid bone

Scalene Muscles

- Anterior: neck flexion, lateral flexion of the neck (ipsilateral), neck rotation (contralateral), elevation of the first rib
- Middle: lateral flexion of the neck, elevation of the second rib
- Posterior: lateral flexion of the neck, elevation of the second rib

Lateral Neck Muscles

- Rectus capitis anterior: head flexion at the atlanto-occipital join
- Rectus capitis lateralis: lateral head flexion (ipsilateral) at the atlanto-occipital joint
- Longus capitis: head flexion by bilateral contraction, ipsilateral head rotation by unilateral contraction
- Longus colli: neck flexion and lateral neck flexion (ipsilateral) by bilateral contraction, contralateral rotation of the neck by unilateral neck contraction

Posterior Neck Muscles

Superficial Muscles

- Splenius capitis: extension of head and neck by bilateral contraction, ipsilateral lateral flexion and rotation of the head by unilateral contraction

- Splenius cervicis: extension of the neck by bilateral contraction, ipsilateral lateral flexion and rotation of the neck by unilateral contraction

Suboccipital Muscles

- Rectus capitis posterior major, rectus capitis posterior minor, obliquus capitis superior, and obliquus capitis inferior: all result in the same action - head extension at the atlanto-occipital joint by bilateral contraction, ipsilateral head rotation at the atlantoaxial joint by unilateral contraction

Transvers spinalis Muscles

- Semispinalis capitis and cervicis: extension of the head, cervical, and thoracic spine by bilateral contraction; ipsilateral lateral flexion of the head, cervical, and thoracic spine by unilateral contraction; contralateral rotation of the head, cervical, and thoracic spine by unilateral contraction
- Rotators cervicis: extension of the spine by bilateral contraction, lateral flexion of the spine by unilateral contraction
- Interspinales: extension of the cervical and lumbar spine
- Intertransversarii: assisting in lateral flexion of the spine, stabilization of the spine. [1]

Chronic neck pain is a major public health problem in the society [6,7]. In the general population, 71% of adults are affected by neck pain at some time in their life, and its annual prevalence in the general and working population varies between 30% and 50% [8].The neck extensor muscles (from superficial to deep: trapezius, splenius capitis, semispinalis capitis, semispinalis cervicis and multifidus) connect the head/neck to the trunk. Postural control requires passive muscle properties for support/protection against non-physiological joint translations/overstretching, whereas broad-range movement necessitates muscular flexibility [9].Neck pain has been observed to alter the activation of neck muscles, increasing the recruitment of superficial cervical flexor muscles, and reducing the function (e.g., coordination and endurance) of deep cervical flexor muscles [10,11,12].As cervical muscles contribute to breathing, these sensorimotor changes may also contribute to respiratory dysfunction [10,13]. Particularly, superficial neck muscles (e.g., scalene, the sternocleido-mastoid, and the trapezius) participate in inspiration [10,13]. In addition, breathing training was found beneficial in short-term pain reduction and improved muscle activity of superficial neck muscles, cervical range of motion, and enhanced chest mobility in persistent neck pain [14].There are Multiple interventions have been used in the management of neck pain [15]. like low endurance exercises for the deep cervical flexor muscles, scapular muscle retraining [16], neck and upper limb strengthening rehabilitative exercise [12][17], stretching and aerobic[18].Pilate's exercise was founded by Joseph Pilates during the 1920s[19,20]. An emphasis is placed on control of body position and movement, as suggested by its original name "Contrology".[21] Exercises are floor-based, or involve the use of specialized equipment which provide adjustable spring resistance. [20,21] Traditional principles of Pilates exercise include centering, concentration, control, precision, flow, and breathing [22]. The NDI has sufficient support and usefulness to retain its current status as the most commonly used self-report measure for neck pain [23]. The Numeric Pain Rating Scale (NPRS) is a widely used, simple, and reliable tool for measuring a patient's self-reported pain intensity. It is typically structured as an 11-point scale ranging from 0 to 10, where 0 represents "no pain" and 10 represents the "worst pain imaginable." The NPRS is easy to administer and takes less than a minute, making it practical in both clinical and research settings. It can be used to assess current, average, or worst pain over a defined period, such as the past 24 hours. The interpretation of the scores generally follows these ranges: 1–3 indicates mild pain, 4–6 indicates moderate pain, and 7–10 indicates severe pain. The scale has demonstrated strong validity and reliability across a range of patient populations, including those with musculoskeletal and chronic pain conditions [24]. The Neck Disability Index (NDI) is a ten-item questionnaire based on the Oswestry Low Back Pain Index that assesses disability associated with neck pain and whiplash (Vernon and Mior 1991). There are four items that relate to subjective symptomatology (pain intensity, headache, concentration, sleeping) and six items that relate to activities of daily living (lifting, work, driving, recreation, personal care, reading). The questionnaire requires only 5–10 minutes to complete and score, and requires no special training to administer. Instructions to the client and scoring Clients select from one of six potential responses for each item ranging from no disability (0) to total disability (5). The ten items are summed to gain the total score thus ranging from 0 (no disability) to 50 (maximum disability). Some authors convert this score to a percentage. Vernon and Mior (1991) propose that a score of less than 4 indicates no disability, 5–14 mild disability, 15–24 moderate disability, 25–34 severe disability, and scores greater than 35 complete disabilities.[25]

NEED AND SIGNIFICANCE OF STUDY

Chronic neck pain significantly impairs daily activities. Multiple interventions have been used in the management of neck pain. Some studies demonstrate a long-term effect from exercise while other studies

show exercise to be effective in the short-term only. A range of different types of exercise have been available including specific endurance exercises for the deep cervical flexor muscles, scapular muscle retraining, neck and upper limb strengthening, stretching, aerobic exercise. The Pilates method has been shown to have positive effects in the treatment of low back pain. However, although widely used in clinical practice, evidence on the effectiveness of the Pilates method in people with neck pain has not been adequately summarised. This huge variety is an indication of the lack of general consensus concerning the most effective exercise in the management of neck pain. There is not a single study that shows the direct comparisons between Pilates and therapeutic exercise. So, need of my study is to determine if Pilates focus on core stability offers pain relief and functional improvement in chronic neck pain.
To Compare the Effectiveness of Pilates and therapeutic exercise in subjects with chronic neck pain on pain & Neck function.

HYPOTHESIS
NULL HYPOTHESIS [H0]
[H01]: - There is no significant effect of Pilates on pain and neck function in subjects with chronic Neck Pain.
[H02]: - There is no significant effect of Therapeutic Exercises on pain and function in subjects with chronic Neck Pain.
[H03]: - There is no significant difference of Pilates and Therapeutic Exercises on pain and function in subjects with chronic Neck Pain.
ALTERNATIVE HYPOTHESIS [H1]: -
[H11]: - There is significant effect of Pilates on pain and neck function in subjects with chronic Neck Pain.
[H12]: - There is significant effect of Therapeutic Exercises on pain and function in subjects with chronic Neck Pain.
[H13]: -There is significant difference of Pilates and Therapeutic Exercises on pain and function in subjects with chronic Neck Pain.

MATERIAL AND METHODS
Type Of Research: Intervention Study
Research Design: Comparative Study
Sample Design: Convenient Sampling
Study Population: Participants with Chronic Neck Pain
Sample Size: 30 Participants [Group A: 15 Therapeutic Exercise, Group B: 15 Pilates]
Study Setting: Orthopaedic Opd-1, Nootan College Of Physiotherapy & Nootan General Hospital, Visnagar, Gujarat.
Study Duration: 4 Months
Treatment Duration: 6 Weeks
SELECTION CRITERIA [34]
Inclusion Criteria: -
- Participants age group between 18 to 45 years
- Both male and female.
- Pain onset at least 3 weeks ago.
- Participants who are willing to be part of study.

Exclusion criteria: -
- Patient who has undergone any neck surgical procedure.
- Inflammatory Condition.
- Recent Trauma related to Neck.
- Orthopedic conditions.
- History of Neurological conditions.

Tools
- Pen
- Paper
- Consent form
- Assessment form
- Laptop
- Plinth
- Pillow
- Towel

- Mat
- Functional outcome index

OUTCOME MEASURES

- Functional Disability: Neck Disability Index (NDI) to assess the impact on daily activities. [33,35]
- Pain Intensity: Numeric Pain Rating Scale (NPRS) to quantify pain levels. [32,36]

DATA COLLECTION AND PROCEDURE

- The Participants for the present study were identified from the Orthopedic Department (OPD) at Nootan College of Physiotherapy, Sankalchand Patel University.
- All participants were informed about the nature and purpose of the study and were requested to provide written informed consent.
- Once consent was obtained, participants underwent a pre-evaluation.
- The pre-evaluation included assessment using the Neck Disability Index (NDI), Numeric Pain Rating Scale (NPRS).
- Based on the inclusion and exclusion criteria, eligible participants were selected for the study.
- The selected participants were divided into two groups using a conventional randomization method:
- Group A received Therapeutic Exercises
- Group B received Pilates
- The intervention protocol for both groups consisted of 4 sessions per week for a duration of 6 weeks.
- At the end of the 6th week, following the last session, all participants underwent a post-**evaluation**, which was identical to the pre-evaluation.

Table 1: Group A (Therapeutic Exercises) treatment protocol

GROUP A THERAPEUTIC EXERCISE [37]					
WEEK 1	**WEEK 2**	**WEEK 3**	**WEEK 4**	**WEEK 5**	**WEEK 6**
Stretching [15 sec hold for 3 reps]	Stretching [15 sec hold for 3 reps]	Stretching [15 sec hold for 3 reps]	Stretching [15 sec hold for 3 reps]	Stretching [15 sec hold for 3 reps]	Stretching [15 sec hold for 3 reps]
Active range of motion exercise [5 reps each]	Active range of motion exercise [5 reps each]	Active range of motion exercise [5 reps each]	Active range of motion exercise [5 reps each]	Cervical isometrics [3-5 reps each]	Cervical isometrics [5 reps each]
	Cervical isometric [3-5 reps each]	Cervical isometric [3-5 reps each]	Cervical isometric [5 reps each]	Lateral bending with chin tucked in [5 reps each]	Lateral bending with chin tucked in [5 reps each]
		Chin tuck in [5 reps with 10 sec holds]	Chin tuck in [5 reps with 10 sec holds]	Neck curl with chin tuck in [5 reps each]	Neck curl with chin tuck in [5 reps each]

Table 6.2: Group B (Pilates) treatment protocol

GROUP B PILATES [38]					
WEEK 1	**WEEK 2**	**WEEK 3**	**WEEK 4**	**WEEK 5**	**WEEK 6**
Hip twist level 1 [5 reps]	Hip twist level 1 [5 reps]	Hip twist level 1 [3 reps]	Hip twist level 1 [3 reps]	Hip twist level 1 [3 reps]	Hip twist level 1 [3 reps]
One leg stretches level 1 [5 reps]	One leg stretches level 1 [5 reps]	One leg stretches level 1 [3 reps]	One leg stretches level 1 [3 reps]	One leg stretches level 1 [3 reps]	One leg stretches level 1 [3 reps]
Double leg stretches level 1 [5 reps]	Double leg stretches level 1 [5 reps]	Double leg stretches level 1 [5 reps]	Double leg stretches level 1 [3 reps]	Double leg stretches level 1 [3 reps]	Double leg stretches level 1 [3 reps]
	Double leg stretches level 2 (5 reps)	Double leg stretches level 2 (5 reps)	Double leg stretches level 2 (5 reps)	Double leg stretches level 2 (5 reps)	Double leg stretches level 2 (5 reps)
	Clam level 1 (5 reps)	Clam level 1 (5 reps) Shoulder bridge level 1 [5 reps]	Clam level 1 (5 reps) Shoulder bridge level 1 [5 reps]	Clam level 1 (5 reps) Shoulder bridge level 1 [5 reps]	Clam level 1 (5 reps) Shoulder bridge level 1 [5 reps]
			Arm openings level 1 [3reps]	Arm openings level 1 [3reps]	Arm openings level 1 [3reps]
				Scissors level 1 (5 reps)	Scissors level 1 (5 reps)
				Breaststroke prep level 1 (S reps)	Breaststroke prep level 1 (S reps)
					Breaststroke prep level 2 (S reps)

PLAN FOR STATISTIC ANALYSIS

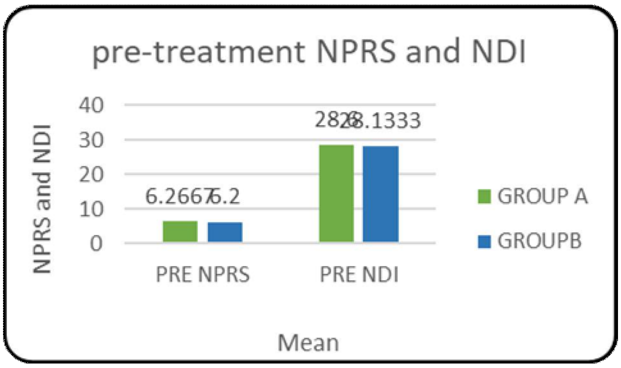
- SPSS (Statistical Package for Social Science) will be used to analyze the data.
- Descriptive analysis was done. (Mean, median< and SD)
- The data follows the normal distribution curve parametric test was done independent and paired t test.
- The data does not follow the normal distribution curve non parametric test was done Mann-Whitney U-test and the Wilcoxon signed-rank test.
-

RESULT

INTER-GROUP COMPARISON OF PRE-TREATMENT NPRS (NUMERIC PAIN RATING SCALE) AND NDI (NECK DISABILITY INDEX)

Table3: Inter-group comparison of pre-treatment NPRS and NDI

OUTCOME	GROUP	t-test for Equality of Means			
		Mean	SD	P value	t value
NPRS PRE	GROUP A	6.2667	0.88372	0.828	0.220
	GROUP B	6.2000	0.77460	0.828	0.220
NDI PRE	GROUP A	28.6000	3.13506	0.673	0.427
	GROUP B	28.1333	2.85023	0.673	0.427



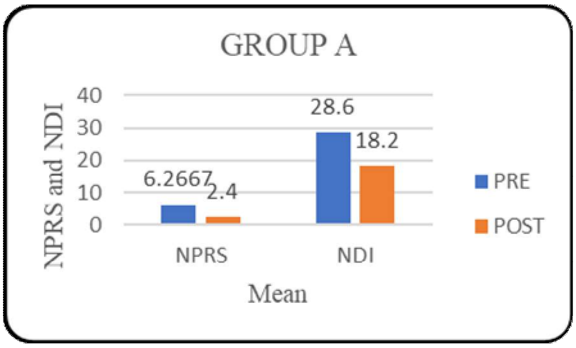
Graph1: Inter-group comparison of pre-treatment NPRS and NDI

Table 3 & Graph 1 shows the inter-group comparison of pre-treatment NPRS and NPRS. The p-value is <0.05. It shows that there is no statistically significant difference between the pre-treatment. NPRS and NDI between groups A and B. Hence it proves that the groups are homogenous.

INTRAGROUP COMPARISON OF PRE AND POST TREATMENT OF NPRS (NUMERIC PAIN RATING SCALE) AND NDI (NECK DISABILITY INDEX) FOR GROUP-A

Table 4: Intragroup comparison of pre and post treatment of NPRS and NDI for GROUP-A

OUTCOME	Pre-Treatment		Post-Treatment		p-value	t-value
	Mean	SD	Mean	SD		
NPRS	6.2667	0.88372	2.4000	0.82808	0.000	29.000
NDI	28.6000	3.13506	18.2000	3.40588	0.000	54.668



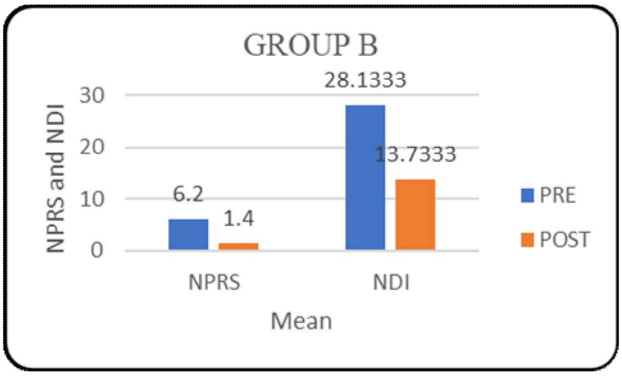
Graph 2: Intragroup comparison of pre and post treatment of NPRS and NDI for GROUP-A

Table 4 & Graph 2 show an intra-group comparison of pre- and post-treatment NPRS and NDI score in Group A, where the p-value is <0.01. A statistically significant difference was found between the pre- and post-treatment NPRS and NDI scores, with a significant improvement in NPRS and NDI score after treatment.

INTRAGROUP COMPARISON OF PRE AND POST TREATMENT OF NPRS (NUMERIC PAIN RATING SCALE) AND NDI (NECK DISABILITY INDEX) FOR GROUP-B

Table 5: Intragroup comparison of pre and post treatment of NPRS and NDI for GROUP-B

OUTCOME	Pre-Treatment		Post-Treatment		p-value	t-value
	Mean	SD	Mean	SD		
NPRS	6.2000	.77460	1.4000	.73679	.000	27.495
NDI	28.1333	2.85023	13.7333	1.98086	.000	25.764



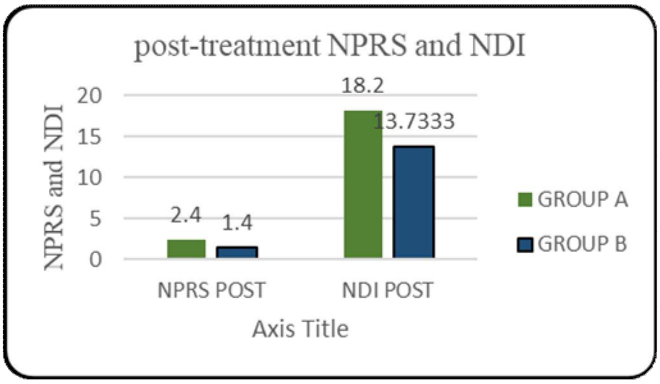
Graph 3: Intragroup comparison of pre and post treatment of NPRS and NDI for GROUP-B

Table 5 & Graph 3 show an intra-group comparison of pre- and post-treatment NPRS and NDI score in Group B, where the p-value is <0.01. A statistically significant difference was found between the pre- and post-treatment NPRS and NDI scores, with a significant improvement in NPRS and NDI score after treatment.

INTER-GROUP COMPARISON OF POST-TREATMENT NPRS (NUMERIC PAIN RATING SCALE) AND NDI (NECK DISABILITY INDEX)

Table 6: Inter-group comparison of post-treatment NPRS and NDI

OUTCOME	GROUP	t-test for Equality of Means			
		Mean	SD	P value	t value
NPRS POST	**GROUP A**	2.4000	0.82808	0.002	3.494
	GROUP B	1.4000	0.73679	0.002	3.494
NDI POST	**GROUP A**	18.2000	3.40588	0.000	4.391
	GROUP B	13.7333	1.98086	0.000	4.391



Graph 4: Inter-group comparison of pre-treatment NPRS and NDI

Table 6 & Graph 4 shows the inter-group comparison of NPRS and NDI after 6 weeks. A statistically significant difference (p‹0.05) in NPRS and NDI Score was found between Groups A and B groups after 6 weeks.

The demographic analysis showed that both Group A (Therapeutic Exercises) and Group B (Pilates) were homogenous in terms of age and gender, with mean ages of 30.73 and 30.46 years respectively, and identical gender distribution (66.67% female, 33.33% male). Normality testing confirmed that all outcome data (NPRS and NDI scores, pre- and post-treatment) were normally distributed, making them suitable for parametric statistical analysis.

Intra-group comparison showed that both Group A (Therapeutic Exercises) and Group B (Pilates) experienced statistically significant improvements in pain and disability scores after six weeks of intervention. In Group A, the mean NPRS score decreased from 6.27 to 2.40, and the NDI score from 28.60 to 18.20 (p < 0.001 for both). Similarly, in Group B, the mean NPRS score reduced from 6.20 to 1.40, and the NDI score from 28.13 to 13.73 (p < 0.001 for both). These results indicate that both therapeutic exercises and Pilates were effective in reducing neck pain and improving functional disability within their respective groups.

Inter-group comparison revealed no statistically significant difference in pre-treatment NPRS and NDI scores between the two groups, confirming that both groups were homogenous at baseline. However, post-treatment comparisons showed that Group B had significantly lower NPRS and NDI scores than Group A. The post-treatment NPRS score in Group B was 1.40 compared to 2.40 in Group A (p = 0.002), and the NDI score was 13.73 in Group B versus 18.20 in Group A (p = 0.000), indicating a greater improvement in the Pilates group.

Findings from the study suggest that while both interventions—therapeutic exercises and Pilates—are effective in managing neck pain and disability, Pilates resulted in significantly greater improvement. Therefore, Pilates may be considered a more effective treatment option for reducing neck pain and enhancing neck-related functional outcomes.

DISCUSSION

This study aimed to compare the effects of therapeutic exercises and Pilates on neck pain and disability over a six-week intervention period. The results demonstrated that both interventions significantly reduced pain intensity, as measured by the Numeric Pain Rating Scale (NPRS), and improved functional ability, as assessed by the Neck Disability Index (NDI). However, Pilates produced significantly greater improvements compared to therapeutic exercises. Intra-group analysis showed that both Group A (Therapeutic Exercises) and Group B (Pilates) experienced statistically significant reductions in pain and disability from pre- to post-treatment. These findings are consistent with existing literature, which supports the use of active rehabilitation programs for individuals with neck pain. Therapeutic exercises generally target muscle strengthening, joint mobility, and posture correction, which help relieve strain on cervical structures and promote functional recovery. However, the Pilates group showed more substantial changes. The greater improvements observed in Group B may be attributed to the unique components of Pilates, which emphasize core stabilization, breathing control, postural alignment, and neuromuscular coordination. These factors can contribute to better spinal support and muscle balance, which are especially important for individuals with neck dysfunction. Pilates also encourages body awareness and mindfulness, which may further assist in managing pain perception and improving movement efficiency.

Inter-group comparisons confirmed that while both groups started with similar levels of pain and disability, the post-treatment outcomes differed significantly. Group B had notably lower NPRS and NDI scores after the intervention, indicating that Pilates was more effective than therapeutic exercises in reducing neck pain and improving functional capacity. These findings align with recent studies that have found Pilates-based exercises to be more beneficial than conventional therapy in managing chronic neck and back pain. The results of this study suggest that Pilates may offer a more comprehensive approach to neck rehabilitation. Its emphasis on whole-body movement, postural control, and core engagement may better address the underlying biomechanical and neuromuscular issues contributing to neck pain. For clinicians, this highlights the potential value of incorporating Pilates into rehabilitation programs, especially for patients with chronic or recurrent neck problems. Despite the promising findings, this study has limitations. The sample size was relatively small, and the duration of the intervention was limited to six weeks. Long-term effects of Pilates versus therapeutic exercises remain unknown, and future studies with larger populations and extended follow-up periods are needed. Additionally, the study relied on self-reported outcome measures, which, while valid, may be influenced by subjective perception. In conclusion, both therapeutic exercises and Pilates are effective in managing neck pain and disability. However, Pilates demonstrated superior outcomes, suggesting it may be a more effective treatment strategy. Further research is recommended to confirm these findings and explore their long-term implications.

CONCLUSION

The study concludes that both Pilates and therapeutic exercises are beneficial in reducing pain and improving functional ability in individuals with chronic neck pain. However, participants who performed Pilates experienced significantly greater improvements in pain intensity and disability scores. Therefore, Pilates may be considered a more effective and comprehensive approach for managing chronic neck pain.

LIMITATIONS

Sample size is small
Short study duration

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