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Pilates as a Therapeutic Approach for Mechanical Low Back Pain in School Teachers: A Pilot Study

Shaiphali Katoch[1], Pinky Dutta[2], Shwetha Sasidharan[3]

[1]*Master of Physiotherapy, Garden City University*

[2]*Professor and Head of Physiotherapy Department, Garden City University*

[3]*Assistant Professor, Garden City University*

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KEYWORDS

Pilates, Core Strengthening, Exercise Therapy, School Teachers, Mechanical Low Back Pain and Functional Disability

ABSTRACT:

Background: Mechanical low back pain (LBP) is one of the most widespread musculoskeletal disorders among educators that is primarily caused by prolonged standing, insufficient ergonomics and repetitive postural stress. It reduces the quality of life and work productivity. Pilates exercises involving focus on the flexibility, posture, and core strengthening have been recently a subject of interest as a rehabilitation method that has proved successful in treating mechanical LBP.

Purpose: This research was to determine the effect of Pilates exercises on the functional disability and extent of pain in over 40 years old female school teachers with mechanical low back pain.

Methods: School teachers (15 female) aged older than 40 years with longer than two months of mechanical lower back pain were involved in an experimental study. The participants were given a structured and under-supervised Pilates program in 10 consecutive days. Functional disability and pain intensity preintervention and postintervention were measured with the help of the Roland-Morris Disability Questionnaire (RMDQ) and Visual Analog Scale (VAS), respectively. Paired t-tests were used to analyse the data.

Results: The mean VAS score, which was 4.73 3.00 x 1.16, and the mean RMDQ score, which was 9.60 5.87 x 3.78, significantly decreased ($p < 0.001$). Individuals with a normal BMI had better functional improvement compared to individuals with an overweight or obese one ($p = 0.018$).

Conclusion: The findings show that a short Pilates exercise regime is effective to reduce the level of pain and functional disability in female school teachers with mechanical low back pain. It is possible to recommend that pilates is a safe, feasible, and non-pharmacological approach to occupational LBP management among educators as a rehabilitation strategy.

1. Introduction

School teachers are one of the occupational groups that have been affected most due to LBP. Teaching staff report a very high prevalence of LBP, with rates reported to range between 12-95% per year compared to other occupational groups (Von 679-699).[1] A cross-sectional multicentre study in Kanpur, India found that 23.1% of higher-secondary school teachers had low back pain in one year, with more cases seen in females.[2] Multicentre cross-sectional surveys across various regions show that sex-specific factors play a role in such prevalence.[3]

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Low back pain is a common muscle and joint problem around the world and a major cause of disability in all age groups.[4] It can impact almost millions of individuals at any given stage of their lives and lifetime prevalence rates have been estimated at between 70-85 percent.[5] LBP is known to not only impose pain and functional impairment but is also a contributor to a considerable socioeconomic burden in terms of lost working days, reduced working productivity and higher health care costs.[6,7] Low back pain has a strong association with socioeconomic problems because they lead to a decrease in productivity, workload and the no. of doctor visits, among other effects, regardless of the cause and pathophysiology.[8,9] 90-95 percent of low back pain cases are mechanical.[10]

Mechanical low back pain or non-specific low back pain is the most prevalent form of LBP.[11] Mechanical low back pain is a prevalent and significant health issue and often includes limitations in mobility and capacity to perform usual tasks, disruptions in sleep and mental health, thus necessitating further studies to understand its nature, risk factors, and natural progression.[5,11,12]

Low back pain can be treated using different methods such as medicines, manual therapy, electrotherapy and exercises. Among these, exercise is considered very helpful as it reduces pain, improve function and help prevent the problem from coming back. Therefore, exercise is often used as the first treatment for chronic low back pain.[13] Pilates is one of the exercise modalities that have lately received most attention as it has become a popular and scientifically justified intervention to cure low back pain. According to many research studies and reviews.[14] Research shows that Pilates helps reduce chronic low back pain and works better than basic exercises.[15] Pilates today is a modern rehabilitation method that is widely used in the physiotherapy practice due to its increasing popularity, clinical effectiveness, and patient acceptability.[16]

Pilates helps improve strength, flexibility, balance, coordination, body awareness and overall physical health. It mainly focuses on holding core muscles steady and this method was developed by Joseph Pilates in 1920s.[17,18]

The key concepts of Pilates are:

1.Centring: The main core muscles are the transverse abdominis, diaphragm, obliques, multifidus and pelvic floor to ensure the lumbopelvic stability.

2. Concentration: Giving attention to the right performance of every exercise.

3. Control: Direction control and motion control of movements.

4. Precision: As many imply, paying attention to technique, which usually consists of few repetitions (up to 10), with the difficulty increased as the skill becomes more mastered.

5. Breathing: The movements are synchronized with the breathing to promote the activity of the deep trunk muscles.

6. Flow: ensuring that the exercises are smooth.[19]

The muscles used mostly in Pilates are the rectus abdominis, internal and external obliques, the lateral quadratus lumborum, the iliopsoas, and the erector spinae.[20]

One of the most common and popular pain measurement tools is the Visual Analog Scale (VAS), which implies the drawing of a point on a line 10 cm long that has to run between the extremes of no pain and the worst imaginable pain.[21] It is frequently applied to manage musculoskeletal pain conditions, including low back pain, and it is easy to administer and responsive to clinical change. The VAS also displays excellent test-retest reliability, as its coefficients of measuring pain are up to $r = 0.97$.[22]

One of the widely used self-report measures of functional disability associated with low back pain is the Roland-Morris Disability Questionnaire (RMDQ). The more the score, the more the disability. Its scale has excellent reliability as test-retest reliability has been reported to range between $r = 0.83$ to 0.91, and it is responsive to meaningful

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functional changes in patients with low back pain because its minimal clinically significant difference (MCID) is approximately 4-5 points.[23,24,25] The scale has high validity and is correlated with other measures of disability, such as the Oswestry Disability Index.[26]

Objectives

AIM AND OBJECTIVES

Aim

To determine the impact of Mat Pilates exercises on mechanical low back pain in female school teachers aged more than 40 years.

Objectives

To find the effectiveness of Mat Pilates in pain intensity and functional disability among female school teachers.

Hypothesis

Null hypothesis: There may be no significant difference in pain intensity and functional disability after the Mat Pilates intervention among female school teachers.

Alternate hypothesis: There may be a significant reduction in pain intensity and functional disability after the Mat Pilates intervention among female school teachers.

Methods

MATERIALS AND METHODS

Type of Study: Experimental pilot study

Study setting: Conducted in schools of West Bangalore

Sample Size: 15 participants

Duration of Study: 10 sessions

Inclusion Criteria

Female school teachers

Age 40-45 years

Having mechanical low back pain for more than 2 months

Able to take part in exercise program

Willing to participate and gave consent

Exclusion Criteria

Any neurological condition

Recent fractures

History of spinal surgery

Trauma

Serious diseases like cancer or inflammatory conditions

Pregnancy

Doing other exercise programs

Outcome Measures

Pain measured using Visual Analog Scale (VAS)

Disability measured using Roland-Morris Disability Questionnaire (RMDQ)

INTERVENTION PROTOCOL

Participants with mechanical low back pain did a supervised Pilates exercise program for 10 sessions. Each session lasted about 20 minutes and was done under supervision to ensure safety.

The exercises were done slowly with proper control and breathing guidance. Participants were advised to move within a pain-free range. Their performance was checked every day. Basic posture and ergonomic advice were given.

No negative side effects were observed during the training session.

Pilates Exercise Program (10 sessions; 20 min.)[27,28]

Component	Exercises	Duration &	Progression Strategy

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		Repetitions	
Warm-up	Deep breathing, Pelvic curl, Supine spine twist	8–10 reps each	Increase to 12 reps by Day 5
Core Strengthening	Hundred, Pelvic bridge, Single-leg stretch, Saw, Teaser, Toe taps	Start with 8–10 reps each	Progress to 12–15 reps; move from basic to advanced
Flexibility	Piriformis stretch, Cat-camel, Child's pose, Bird-dog	Hold 10–15 sec; 6–10 reps	Increase hold to 20–30 sec; reps up to 12 by final days
Cool-down	Breathing	3–5 minutes	Slow diaphragmatic breathing

Image 1: Hundred; Image 2: Pelvic Bridge; Image3: Single leg stretch; Image 4: Saw; Image 5: Teaser; Image 6: Toe tap

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Fig 1 and 2. Cat-Camel Exercise

Performed with a 5-sec. hold in each position, repeated for 6–10 repetitions.

Fig 3. Pelvic Bridging Exercise

Performed with a 10-second hold, repeated for 10 repetitions.

Fig 4. Diaphragmatic Breathing
Performed for 10 cycles.

Fig 5. Child's Pose Stretch
Performed with a 10-second hold, repeated for 6–10 repetitions.

2. Results

1. Changes in Pain Intensity

The intensity of the pain was assessed on the Visual Analog Scale (VAS) and it had significantly decreased after the Pilates intervention. The VAS (pre-intervention) had a mean score of 4.73 (SD= 1.16). The mean post-intervention VAS score was found to be lower (3.00, SD=1.41) after the 10-day program. This will be a mean of 1.73-point decrease in the intensity of pain which is a clinically significant outcome. Figure 1 shows the individual changes in VAS scores of all the participants.

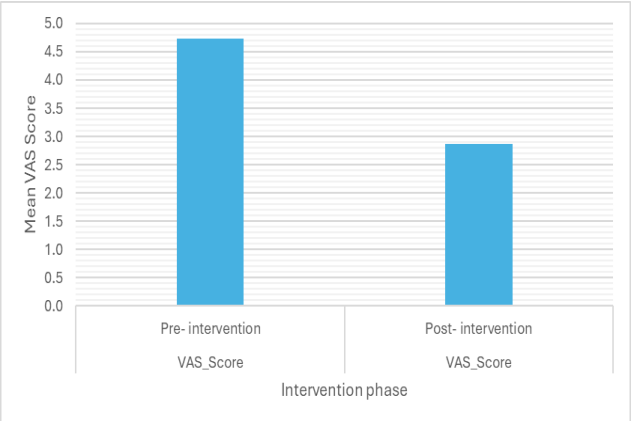

Figure 1 Visual Analog Scale (VAS) Pre- and Post-Pilates intervention scores.

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Table 1: Visual Analog Scale (VAS) Scores Before and After the Pilates Intervention

Measure	Mean Score	Standard Deviation (SD)
Pre-Intervention VAS	4.73	1.16
Post-Intervention VAS	3.00	1.41
Mean Reduction	1.73	0.70

2. Functional Disability Change.

A higher score was evaluated as functional disability using the Roland-Morris Disability Questionnaire, (RMDQ), and the higher the score, the higher the disability. The overall RMDQ showed a significant reduction following the intervention. The average pre-intervention level of RMDQ was 9.60 (SD=3.78). The average score of RMDQ dropped to 5.87 (SD=3.52) after the intervention. This corresponds to an average functional disability reduction of 3.73, which is above the smallest clinically important difference (MCID) of this scale. The distribution of the total RMDQ scores before and after the intervention is presented in Figure 2.

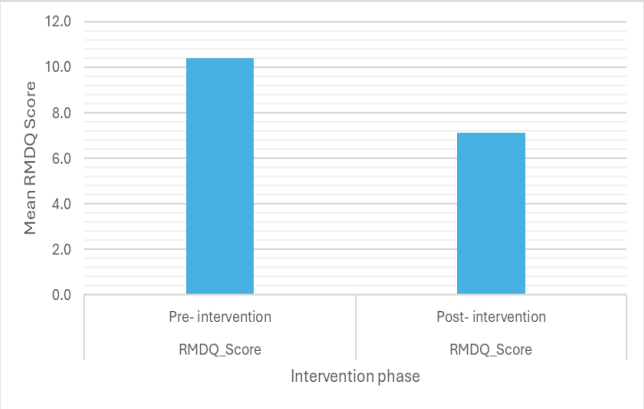

Figure 2: Roland-Morris Disability Questionnaire (RMDQ) Total Scores Before and After the Pilates Intervention

Table 2: Roland-Morris Disability Questionnaire (RMDQ) Scores Before and After the Pilates Intervention

Measure	Mean Score	Standard Deviation (SD)
Pre-Intervention RMDQ	9.60	3.78
Post-Intervention RMDQ	5.87	3.52
Mean Reduction	3.73	1.49

Table 3: Analysis of Pre- and Post-Intervention Outcomes

Outcome Measure	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)	Mean Difference (SD)	t-value	p-value
VAS Score (0-10)	4.73 (1.16)	3.00 (1.41)	-1.73 (0.70)	-9.58	< 0.001
RMDQ Total (0-24)	9.60 (3.78)	5.87 (3.52)	-3.73 (1.49)	-9.70	< 0.001

Table 3: The analysis has demonstrated that the intensity of pain has reduced significantly, and

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VAS scores have lowered on average by 1.73 points (t (14) = -9.58, p < 0.001). In the same way, the statistically significant change in functional disability was identified, as the average change in RMDQ scores was the reduction of 3.73 points (t (14) = -9.70, p < 0.001). Such highly significant p-values (p < 0.001) give highly significant evidence that the changes that were made after the Pilates intervention did not happen by mere chance.

3. Table 4: Relationship between Clinical Improvement and Patient Profile.
4. Pilates reduced pain and disability in all participants. BMI was the only factor linked to the level of improvement while age, teaching experience and back pain history had no major effect.

BMI Category	**n**	**VAS Mean (SD)**	**p-value**	**RMDQ Mean (SD)**	**p-value**
Normal	4	-2.00 (0.82)	0.441	-6.00 (1.41)	0.018*
Overweight	9	-1.67 (0.71)		-3.11 (1.05)	
Obese	2	-1.50		-3.00 (0.00)	
		(0.71)			

**p < 0.05*

Table 4: Participants with normal BMI showed more improvement in functional ability compared to those who were overweight or obese

5. Discussion

In this study, a 10-day Pilates program was given to female school teachers aged 40-45 years who had mechanical low back pain. The aim was to see how Pilates affects pain and daily activities. The results showed that Pilates is a useful treatment as it helped reduce both pain and disability.

The functional ability of participants improved clearly, as seen by a decrease in RMDQ scores from (9.60 + 3.78 to 5.87 + 3.52; p < 0.001). Similarly pain levels also reduced with VAS scores decreasing from (4.73 + 1.16 to 3.00 + 1.41; p < 0.001). These findings show that the improvement was not statistically significant but also meaningful in clinical practice. Previous research studies have also supported that Pilates is helpful in reducing long-term non-specific low back pain.

The improvement seen in this study may be due to better posture and stronger core muscles developed through Pilates exercises. Pilates focuses on deep muscles such as multifidus and transverse abdominis, which help stabilize the spine and reduce stress on the back. Controlled movements and breathing techniques also helping in reducing muscle tension, improving coordination and promoting relaxation.

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The study also found that body weight played an important role in improvement. Participants with normal BMI showed better improvement in disability compared to those who were overweight or obese ($p = 0.018$). This may be because excess body weight increases pressure on the spine and makes exercise more difficult. Earlier studies have also shown that obesity is linked to higher risk of low back pain.

However, there are some limitations in this study. The duration of the program was short; the number of participants was small and there was no control group for comparison. Also, the results were based on self-reported measures, which may have some bias. Because of these reasons, the results cannot be fully generalized to a larger population.

In future, more detailed studies with larger sample sizes, longer duration and proper comparison groups are needed. Studies comparing with Pilates with other exercise methods can also help to better understand its effectiveness.

6. CONCLUSION:

This study showed that a short, structured Pilates program reduced pain and improved daily function in female school teachers with mechanical low back pain. Among teachers, who are at risk of getting occupational low back pain, the findings provide some credibility to the practice of including Pilates-based intervention as a viable, non-pharmacological, and cost-effective rehabilitation strategy. The results indicate that Pilates can be the future of the spinal health support, overall quality of life improvement, and better work performance in this group despite the need to conduct broader research.

7. **CONFLICT OF INTEREST:** The study has no conflict of research.
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