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Effect of Pilates and Yoga in Reducing Pain and Disability in Non-Specific Chronic Low Back Pain: Randomised Controlled Trial

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Abstract: ***Background: Chronic non-specific low back pain (CNSLBP) is a multifactorial condition involving both physical and psychological factors. Interventions addressing these components may provide better outcomes. Yoga and Pilates are mind–body exercise approaches that incorporate core strengthening, flexibility, postural control, and relaxation. However, limited evidence exists regarding their comparative effectiveness in CNSLBP management. This study aimed to compare the effects of Pilates and Yoga exercises on pain and disability in individuals with CNSLBP. Methods: Forty-five participants aged 18–45 years with chronic non-specific low back pain were randomly allocated into three groups. Group 1 received Pilates exercises, Group 2 received Yoga exercises, and Group 3 (control group) received pain and self-care education. Interventions were administered three times per week for 6 weeks. Pain and disability outcomes were assessed before and after the intervention. Results: Both the Pilates and Yoga groups showed greater improvement in pain and disability compared to the control group. Pilates exercises were found to be more effective than Yoga exercises in reducing pain intensity and functional disability in individuals with CNSLBP. Conclusion: Both Pilates and Yoga exercises are effective in the management of chronic non-specific low back pain. However, Pilates exercises demonstrated slightly greater effectiveness in improving pain and disability outcomes.***

Keywords: Chronic non-specific low back pain, Hatha Yoga, Pilates, Exercise therapy, Core strengthening, Rehabilitation

1. Introduction

Chronic low back pain (CLBP) is one of the most common musculoskeletal disorders, with nearly 85% of cases classified as non-specific in nature. Several factors contribute to CLBP, including poor posture, mechanical postural alterations, weakness of spinal musculature, joint degeneration, and reduced flexibility. Although various treatment approaches are available for managing CLBP, many interventions demonstrate only moderate effectiveness once pain becomes chronic. Therapeutic exercises have shown significant benefits in the management of CLBP, particularly exercise programs targeting core strengthening and spinal stabilization. Since chronic pain is multifactorial in nature, multidisciplinary approaches are considered beneficial for individuals with CLBP. [1]

Interventions addressing multiple dimensions of low back pain may provide greater therapeutic benefits. Yoga and Pilates are two increasingly popular mind–body exercise approaches that target both the physical and psychological aspects of pain through core strengthening, flexibility training, controlled movement, breathing, and relaxation techniques. These non-traditional exercise regimens have gradually become integrated into treatment paradigms for low back pain management. [2,3]

Yoga is a mind–body intervention that combines physical postures with breathing control, mental focus, and meditation. Hatha Yoga primarily consists of three interconnected components: asanas (physical postures), pranayama (breathing exercises), and meditation or relaxation techniques. The postures are designed to improve flexibility, muscle strength, balance, and postural control through controlled movements performed in standing, sitting, reclining, or inverted positions. Breathing exercises facilitate concentration and coordination between movements, while relaxation and meditation promote a calm mental state. [4,5]

Pilates is another form of mind–body exercise emphasizing controlled movement, posture, breathing, and concentration. The technique focuses on activation and stabilization of the "powerhouse" or core musculature through a series of controlled movements and limb activities. Each exercise begins with core stabilization followed by movement through a controlled range. The mental component of Pilates is reflected through concentration and coordinated breathing during exercise performance. [3,6]

Yoga and Pilates are increasingly utilized for their therapeutic benefits in individuals with chronic low back pain. However, limited evidence exists comparing the effectiveness of these two approaches. Therefore, the present study was undertaken to compare the effects of Yoga and Pilates exercises in individuals with chronic non-specific low back pain.

2. Methodology

Forty-five participants aged 18–45 years with complaints of low back pain reporting to the Physiotherapy Outpatient Department were clinically screened for chronic non-specific low back pain of duration greater than 3 months.

Participants were excluded if they had acute low back pain, age above 45 years, pregnancy, recent spinal surgery, history of psychosis, drug or alcohol abuse, or were uncooperative for participation in the study. Written informed consent was obtained from all participants prior to enrolment. Simple randomization was performed using a computer-generated random number table.

One investigator managed the allocation process and provided group assignments to the treating physiotherapists using consecutively numbered opaque sealed envelopes. Allocation was concealed from both the participants and the outcome assessor throughout the study, and from the physiotherapist until the initiation of treatment. The 45 participants were randomly allocated into three groups, with 15 participants in each group. All groups received interventions for 6 weeks, with three treatment sessions per week.

Outcome Measures

Pain intensity was assessed using the Visual Analogue Scale (VAS), and functional disability was assessed using the Modified Oswestry Disability Questionnaire (MODQ). Baseline assessments were performed prior to intervention, and post-intervention assessments were conducted at the end of 6 weeks.

3. Interventions

Group 1: Pilates Group

Participants in the Pilates group underwent mat-based Pilates training consisting of 12 sessions conducted three times per week, with each session lasting 30 minutes over a period of 6 weeks. The exercise program consisted of two cycles of five exercises each, performed for 10 repetitions according to the participant's skill level. The exercises included spine stretch, double leg stretch, pelvic curls, leg circles, hundred, back extension, chest lift, criss-cross, swimming, and front support plank.

Group 2: Hatha Yoga Group

Participants in the Hatha Yoga group performed sessions incorporating three integrated components: asanas (physical postures), pranayama (breathing exercises), and meditation/relaxation. The postures were designed to improve flexibility, strength, balance, and postural control through standing, sitting, reclining, and inverted positions involving forward bends, backward bends, twists, and balancing activities. Breathing exercises were used to coordinate movements and enhance mental focus. Each session concluded with a short relaxation and meditation period in supine lying with eyes closed. Sessions were conducted by a certified yoga instructor and lasted 45 minutes.

Group 3: Self-Management Group

Participants in the self-management group received reassurance, pain education, and advice to remain physically active. Pain education was delivered through a structured program focusing on key concepts of pain biology with the aim of reducing fear, misconceptions, and concerns related to the condition.

4. Statistical Analysis

The collected data were analysed using Statistical Package for the Social Sciences (SPSS) software version 15.0. Descriptive statistics were used to summarize the demographic and baseline characteristics of the participants.

Within-group comparisons for pain and disability scores before and after the intervention were analysed using the paired *t*-test to determine the effectiveness of each intervention over the 6-week treatment period. Between-group comparisons for pain and disability outcomes were performed using the unpaired *t*-test to compare the effectiveness of Pilates exercises, Hatha Yoga, and self-management interventions.

A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant for all analyses.

5. Results

All three groups demonstrated improvement following the 6-week intervention period; however, greater improvements were observed in the Pilates and Hatha Yoga groups compared to the self-management group.

In the Pilates group (Group 1), the mean VAS score decreased from 6.93 ± 0.96 before intervention to 3.00 ± 1.24 after intervention. Similarly, the mean ODI score reduced from 28.86 ± 4.45 to 14.26 ± 4.08 following treatment, with an overall reduction in disability percentage of 17%.

Outcome Measure	Pre-Intervention (Mean ± SD)	Post-Intervention (Mean ± SD)
VAS Score	6.93 ± 0.96	3.00 ± 1.24
ODI Score	28.86 ± 4.45	14.26 ± 4.08

In the Hatha Yoga group (Group 2), the mean VAS score decreased from 6.80 ± 0.86 pre-intervention to 5.60 ± 0.63 post-intervention. The mean ODI score improved from 29.66 ± 4.67 to 20.23 ± 3.49, with a 12% reduction in disability.

Outcome Measure	Pre-Intervention (Mean ± SD)	Post-Intervention (Mean ± SD)
VAS Score	6.80 ± 0.86	5.60 ± 0.63
ODI Score	29.66 ± 4.67	20.23 ± 3.49

In the self-management group (Group 3), the mean VAS score reduced from 6.73 ± 0.91 before intervention to 4.03 ± 1.24 after intervention. The mean ODI score improved from 28.94 ± 5.45 to 24.26 ± 4.32, with a 4% reduction in disability.

Outcome Measure	Pre-Intervention (Mean ± SD)	Post-Intervention (Mean ± SD)
VAS Score	6.73 ± 0.91	4.03 ± 1.24
ODI Score	28.94 ± 5.45	24.26 ± 4.32

Between-group comparison demonstrated that the Pilates group showed greater improvement in pain reduction and functional disability compared to the Hatha Yoga and self-management groups. Although both Pilates and Yoga interventions were effective, Pilates exercises produced comparatively superior outcomes in individuals with chronic non-specific low back pain.

6. Discussion

The present study was conducted among participants aged 18–45 years diagnosed with chronic non-specific low back pain. Individuals above 45 years of age were excluded because low back pain in this population is more commonly associated with degenerative changes of the lumbar spine. Baseline values demonstrated no statistically significant differences among the groups, indicating homogeneity of participants before intervention.

Significant reduction in pain was observed in both the Pilates and Hatha Yoga groups following the intervention period. Pain intensity in the present study was assessed using the Visual Analogue Scale (VAS), which has been reported to possess superior reliability and validity for assessing low back pain when compared to the Semantic Differential Scale, as described by Oloagan et al. [7] Although both interventions demonstrated statistically significant improvement in pain reduction, Pilates exercises were found to be comparatively more effective than Yoga exercises. [8]

The findings of the present study are consistent with previous research demonstrating the beneficial effects of both Yoga and Pilates in individuals with chronic low back pain. Galantino et al. conducted a randomized controlled pilot study evaluating the effects of a modified yoga protocol in patients with chronic low back pain and reported improvements in flexibility, balance, and psychological well-being. [5,9] Similarly, Williams et al. compared Yoga therapy with an educational control program and concluded that Yoga produced greater improvements in pain and disability among patients with chronic low back pain. [10,11]

The therapeutic mechanisms underlying Yoga may involve both physical and psychological components associated with low back pain. Yoga is believed to improve flexibility, strength, balance, posture, and body awareness. It targets muscle imbalances by stretching tight musculature and strengthening underutilized core muscles, thereby improving spinal alignment and postural control. Previous studies have demonstrated improvements in hip flexion, spinal mobility, and hamstring flexibility following Yoga interventions in patients with low back pain. [12] In addition to physical benefits, Yoga incorporates relaxation, breathing exercises, and meditation, which may reduce stress, improve mood, enhance body awareness, and decrease muscular tension.

Core muscle weakness and impaired neuromuscular control are recognized biomechanical deficits in individuals with low back pain. Pilates focuses on activation and stabilization of the “powerhouse” or core musculature, thereby improving spinal stability, neuromuscular control, and movement coordination. The Pilates method emphasizes proper recruitment patterns of core muscles before progression to advanced movements. A study by C.W. Lee reported that mat-based Pilates exercises are particularly effective as they utilize body weight to strengthen stabilizing musculature without the need for specialized equipment. [13] Several studies and systematic reviews have also reported positive short-term effects of Pilates in reducing pain and improving functional outcomes in patients with low back pain.

Psychological factors such as fear-avoidance beliefs, pain catastrophizing, and negative perceptions regarding low back pain are strongly associated with increased disability and reduced physical activity levels. [14] Conversely, positive recovery expectations and appropriate education may improve treatment outcomes. Patient education and self-management strategies can help individuals better understand their condition, reduce fear and misconceptions, encourage physical activity, and promote long-term self-management of symptoms. Education also aims to reassure patients regarding the favorable prognosis of non-specific low back pain and reduce healthcare dependency.

7. Conclusion

Both Yoga and Pilates exercises were found to be effective in reducing pain and functional disability in individuals with chronic non-specific low back pain. However, Pilates demonstrated comparatively greater effectiveness in improving functional outcomes and reducing pain intensity. Therefore, Pilates may be considered a more beneficial therapeutic exercise approach for the management of chronic non-specific low back pain.

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