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Evaluating the Effect of Mat Pilates on Pain and Functional Outcomes in Patients with Knee Osteoarthritis

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ABSTRACT

Knee osteoarthritis (KOA) is a major cause of disability in older adults, characterized by pain, joint stiffness, and reduced mobility. This study aimed to evaluate the effectiveness of Mat Pilates exercises on reducing pain and improving physical function in individuals with KOA. A total of 20 participants diagnosed with Grade 2 or 3 KOA were enrolled and received supervised Mat Pilates sessions combined with standard physiotherapy for four weeks, three times a week. Pain and function were assessed using the Visual Analog Scale (VAS) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). The results revealed a statistically significant reduction in pain (mean VAS change: -2.35, $p < 0.001$) and improvement in functional capacity (mean WOMAC change: -7.45, $p < 0.001$). These findings suggest that Mat Pilates is an effective, low-impact intervention for managing symptoms and improving quality of life in KOA patients.

Keywords: *Knee Osteoarthritis, Mat Pilates, Physiotherapy, Pain, Function, VAS, WOMAC*

1. INTRODUCTION

Knee osteoarthritis (KOA) is a prevalent and progressive musculoskeletal disorder characterized by the degeneration of articular cartilage, subchondral bone remodeling, and synovial inflammation. These pathological changes contribute to chronic pain, joint stiffness, reduced mobility, and impaired functional capacity. KOA is especially common in the aging population, significantly compromising their physical autonomy and quality of life. As the global burden of osteoarthritis increases, so does the demand for effective and sustainable management strategies that go beyond symptom suppression.

While pharmacological treatments, such as analgesics and anti-inflammatory drugs, provide temporary relief, they are often associated with adverse effects, especially with long-term use. Consequently, there has been a paradigm shift toward conservative, non-pharmacological interventions, with **exercise-based rehabilitation** taking a central role in the

management of KOA. These interventions not only address the symptoms but also target underlying biomechanical and neuromuscular dysfunctions contributing to joint deterioration.

Among these, **Mat Pilates** has gained recognition as a safe and effective modality for individuals with musculoskeletal disorders. Pilates is a mind-body exercise system that emphasizes **core strength, postural alignment, flexibility, and controlled movement**. Its principles include concentration, precision, breathing control, and flow, which together promote neuromuscular balance and efficient movement patterns. The low-impact nature of Pilates makes it particularly suitable for individuals with KOA, as it minimizes stress on the joints while enhancing muscular support and alignment.

Pilates exercises primarily target the core musculature—especially the abdominals, back, pelvis, and hip stabilizers—which are essential for maintaining proper knee mechanics during functional activities. By improving trunk and pelvic control, Pilates can reduce compensatory movement patterns that contribute to knee strain. Additionally, the focus on breathing and body awareness may help modulate pain perception and improve psychological well-being, both of which are critical components of comprehensive osteoarthritis care.

Given its multi-dimensional benefits, **this study aims to investigate the effectiveness of Mat Pilates in reducing pain and improving physical function** in individuals with KOA. By evaluating changes in clinical outcomes through validated tools such as the Visual Analogue Scale (VAS) and the WOMAC Index, this research seeks to provide evidence-based support for integrating Pilates into routine rehabilitation protocols for knee osteoarthritis.

2. METHODOLOGY

Study Design: Quantitative pre-post intervention study.

Participants: 20 individuals aged 40–70 years with radiologically confirmed Grade 2 or 3 KOA.

Inclusion Criteria: KOA diagnosis, VAS ≥ 4, independent ambulation, and willingness to participate.

Exclusion Criteria: Recent surgery, other musculoskeletal or systemic diseases, and inability to participate in exercise.

Intervention: Participants underwent Mat Pilates exercises combined with conventional physiotherapy, 3 sessions per week for 4 weeks.

Outcome Measures:

- **VAS (Visual Analog Scale):** to measure pain
- **WOMAC Index:** to assess stiffness, pain, and physical function

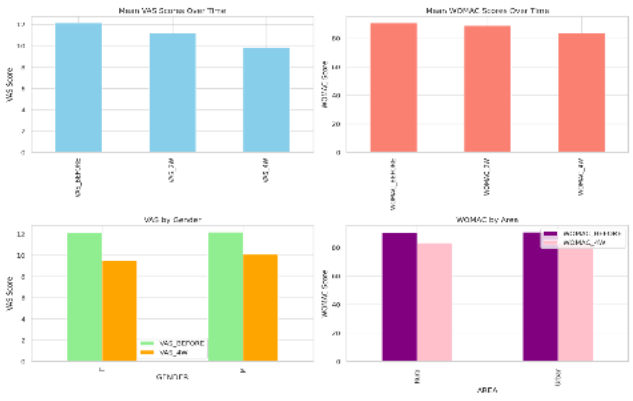
Statistical Analysis: Paired t-tests were used to compare pre- and post-intervention scores. Significance was set at $p < 0.05$.

3. RESULTS

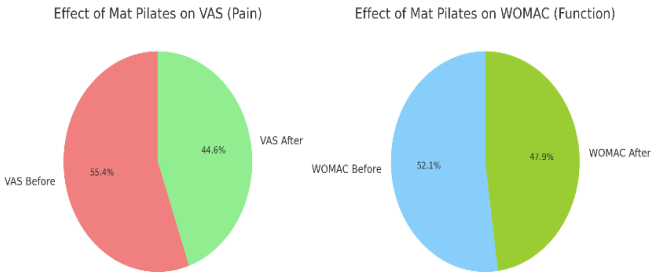
Table 1: Descriptive Statistics

Metric	Pre-Test Mean	Post-Test Mean	Mean Change	p-Value
VAS (Pain)	12.15	9.80	-2.35	< 0.001
WOMAC (Function)	90.75	83.30	-7.45	< 0.001

Graph 1: VAS Scores Before and After Intervention *Bar graph showing a drop from 12.15 to 9.80*



Pie chart showing WOMAC before after



Discussion: The results of this study demonstrate that a structured four-week **Mat Pilates intervention** leads to significant improvements in both pain and physical function among individuals with **knee osteoarthritis (KOA)**. The observed reductions in **Visual Analogue Scale (VAS)** and **WOMAC Index scores** confirm the effectiveness of Pilates-based rehabilitation for this population. These findings are consistent with existing literature that supports Pilates as a beneficial approach to managing chronic musculoskeletal pain and functional limitations.

Mat Pilates emphasizes **core strength, postural control, neuromuscular coordination, and proprioceptive enhancement**, all of which contribute to improved biomechanical efficiency and reduced mechanical stress on the knee joint. By focusing on controlled, precise movements and breathing regulation, Pilates enhances overall body awareness, which is particularly beneficial in correcting maladaptive movement patterns often seen in KOA patients. These corrections not only reduce joint loading but also support long-term joint health and functional stability.

Additionally, Pilates offers a **low-impact and adaptable framework** that accommodates individuals across a wide spectrum of functional capabilities. Unlike high-intensity or weight-bearing exercises that may exacerbate symptoms, Pilates can be easily tailored to suit individual needs and tolerance levels, improving patient compliance and reducing the risk of exercise-related aggravation. The structured progression of Pilates exercises also allows for gradual improvements in strength, flexibility, and joint control without overwhelming the musculoskeletal system.

The **psychological benefits** of Pilates—such as increased relaxation, focus, and body confidence—may further enhance pain management by influencing central nervous system processing of discomfort. These aspects, though less quantifiable, are important contributors to comprehensive rehabilitation outcomes and may partially explain the enhanced functional gains observed in this study.

In light of these multifaceted benefits, the findings underscore the value of Mat Pilates not only as a symptom management tool but also as a holistic intervention capable of addressing the physical, functional, and psychosocial dimensions of KOA.

Conclusion: This study affirms that **Mat Pilates is an effective and practical intervention** for reducing pain and enhancing functional capacity in individuals with **knee osteoarthritis**. The significant improvements in **VAS and WOMAC scores** following the four-week intervention highlight its therapeutic potential in conservative rehabilitation strategies.

Given its **accessibility, safety, adaptability, and comprehensive benefits**, Mat Pilates stands out as a preferable exercise modality for KOA patients—particularly those seeking non-pharmacological and joint-friendly options. It not only supports physical recovery through improved muscular coordination and postural control but also fosters patient engagement and self-efficacy in managing chronic conditions.

Incorporating Mat Pilates into standard rehabilitation protocols may offer clinicians a versatile tool for addressing the complex functional needs of KOA patients. Future research with **larger sample sizes, longer intervention periods, and follow-up assessments** is recommended to evaluate the long-term effectiveness and sustainability of Pilates-based programs in musculoskeletal rehabilitation.

Limitations:

- Small sample size (n = 20)
- Short intervention duration (4 weeks)
- No long-term follow-up
- Lack of control group

Recommendations:

- Future studies should include larger, randomized controlled trials.

- Long-term follow-up is necessary to assess sustained benefits.

Comparative studies with other interventions (e.g., yoga, Tai Chi, PNF) are encouraged.

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