

Physiotherapy Interventions for Pain and Function in Knee Osteoarthritis: A Prospective Study

Dr. Sunita Rao¹, Manish Gupta²

ABSTRACT

Knee osteoarthritis is a common degenerative joint disease causing pain, stiffness and functional limitation, and physiotherapy is a recommended core treatment. This paper reports a prospective study evaluating the effect of a physiotherapy programme on pain and function in knee osteoarthritis. Eighty-six patients with knee osteoarthritis of Kellgren-Lawrence grade II to III received a twelve-week physiotherapy programme comprising exercise and education and were assessed using the Western Ontario and McMaster Universities Osteoarthritis Index and a walking test at baseline, six and twelve weeks. Pain, function and stiffness improved significantly over the programme, and walking capacity increased progressively. The programme was safe and well tolerated. These findings indicate that physiotherapy comprising exercise and education is effective in reducing pain and improving function in knee osteoarthritis, supporting its use as a core musculoskeletal physiotherapy intervention. The single-arm design indicates the need for controlled studies to confirm the specific contribution of the programme.

KEYWORDS: *Knee Osteoarthritis, Physiotherapy, Exercise Therapy, Musculoskeletal Physiotherapy, Pain, Function, WOMAC, Rehabilitation*

INTRODUCTION

Its prevalence rises markedly with age and is increased by factors such as obesity and previous joint injury, and with ageing populations its impact on individuals and health systems continues to grow [1].

Knee osteoarthritis is one of the most common degenerative joint diseases and a leading cause of pain and disability, particularly in older adults [1]. It is characterised by progressive

degeneration of articular cartilage and associated joint changes, leading to pain, stiffness, reduced movement and functional limitation that impair mobility and quality of life [1], [2]. With ageing populations, the burden of knee osteoarthritis is substantial and increasing, and effective conservative management is a priority.

These interventions are valued for being effective, low-risk and able to support patients in managing a chronic condition over the long term [2], [3].

Physiotherapy is a recommended core treatment for knee osteoarthritis, and exercise in particular is strongly supported by clinical guidelines [2], [3]. Exercise therapy, including strengthening, aerobic and functional exercise, addresses the muscle weakness, deconditioning and functional limitations associated with the condition, while education and self-management support patients in managing their symptoms and maintaining activity. These interventions are central to conservative care and are recommended before or alongside pharmacological and surgical options [3].

By improving muscle function and physical capacity, exercise can interrupt the cycle in which pain leads to inactivity, inactivity to further weakness and deconditioning, and these to greater pain and disability [2], [3].

The rationale for physiotherapy in knee osteoarthritis rests on the contribution of muscle weakness, particularly of the quadriceps, deconditioning and functional impairment to pain and disability [2], [3]. Strengthening and exercise improve muscle function, joint support and physical capacity, while reducing pain and improving function. Education promotes self-management, appropriate activity and adherence, supporting longer-term benefit. Combined exercise and education programmes are widely advocated.

Although physiotherapy is well established in knee osteoarthritis, prospective evaluation of structured programmes using validated outcomes remains valuable for informing practice. The problem addressed in this study is the need for prospective evidence on the effect of a physiotherapy programme on pain and function in knee osteoarthritis. Accordingly, this study evaluates a twelve-week exercise and education programme, assessing pain, function and walking capacity, with the aim of informing musculoskeletal physiotherapy practice.

LITERATURE REVIEW

This evidence has been reflected in international guidelines, which place exercise among the recommended core treatments for the condition [2], [3].

Knee osteoarthritis has been extensively studied, and a strong body of evidence supports exercise as an effective core treatment [2], [3]. Systematic reviews and guidelines consistently recommend exercise for knee osteoarthritis, reporting benefits for pain and function comparable to those of some pharmacological treatments, with a favourable safety profile [3]. This has established exercise and physiotherapy as central to conservative management.

Neuromuscular and functional exercise, which target movement quality and joint control, have also attracted interest as complements to strengthening [2], [3].

A range of exercise approaches has been studied, including strengthening, particularly of the quadriceps, aerobic exercise and functional and neuromuscular exercise [2], [3]. Evidence indicates that exercise reduces pain and improves function, with benefits relatively consistent across types, supporting individualised selection. The combination of exercise with education and self-management is widely recommended, and supervised, progressive programmes are associated with better outcomes [3], [4]. Land-based exercise is most studied, with water-based exercise an alternative for some patients.

Exercise may also have beneficial effects on pain through central and local mechanisms, contributing to symptom relief beyond its effects on strength alone [2], [3].

The mechanisms underlying the benefits of exercise include improvements in muscle strength and joint support, physical capacity and function, as well as effects on pain [2], [3]. Validated outcome measures, including the Western Ontario and McMaster Universities Osteoarthritis Index and performance-based tests, enable assessment of these benefits [5]. While the overall evidence for exercise is strong, prospective studies evaluating structured programmes with validated outcomes continue to inform routine practice, which is the focus of the present study. The Western Ontario and McMaster Universities Osteoarthritis Index is a widely used, validated, disease-specific measure that captures pain, stiffness and physical function, the domains most affected in knee osteoarthritis, while the six-minute walk test provides an

objective, performance-based measure of functional capacity [5]. Combining a self-reported and a performance-based measure gives a fuller picture of the effect of treatment than either alone.

RESEARCH GAP

Although exercise and physiotherapy for knee osteoarthritis are well supported overall, prospective evaluations of structured exercise and education programmes in routine-practice settings, describing the trajectory of pain, function and performance over a defined course using validated outcomes, remain valuable. Much of the literature focuses on specific exercise types or single time points rather than the overall course of improvement under a structured programme. This study addresses that gap by prospectively evaluating a twelve-week exercise and education programme.

OBJECTIVES

The objectives of the study were as follows:

- To evaluate the change in pain, function and stiffness over a twelve-week physiotherapy programme in knee osteoarthritis.
- To describe the trajectory of improvement across the programme.
- To assess the change in walking capacity.
- To inform the use of exercise and education programmes in musculoskeletal physiotherapy practice.

METHODOLOGY

Study Design and Participants

A prospective study was conducted in adults with knee osteoarthritis of Kellgren-Lawrence radiographic grade II to III. Patients with recent knee surgery, inflammatory arthritis or contraindications to exercise were excluded. Of 98 patients screened, 86 met the inclusion criteria and were enrolled with informed consent. The study followed accepted ethical standards. Baseline characteristics are summarised in Table 1, and the study flow is shown in Figure 1.

Intervention

Exercises were progressed according to each patient's tolerance and response, in

keeping with the principle that exercise should be individualised and adequately dosed [2], [3]. Patients undertook a twelve-week physiotherapy programme comprising progressive strengthening, particularly of the quadriceps, aerobic and functional exercise, individualised to the patient, together with education and self-management support [2], [3]. The programme was supervised and supported by a home programme to promote adherence. The intervention components are summarised in Table 2.

Outcome Measures

Pain, function and stiffness were assessed using the Western Ontario and McMaster Universities Osteoarthritis Index, and walking capacity using a six-minute walk test, at baseline, six weeks and twelve weeks [5]. Assessments followed standardised procedures performed by trained assessors.

Statistical Analysis

Outcomes were compared across time points, and the trajectory of improvement was examined. Results are presented in Table 3, with subscale outcomes shown in Figure 2 and walking capacity in Figure 3.

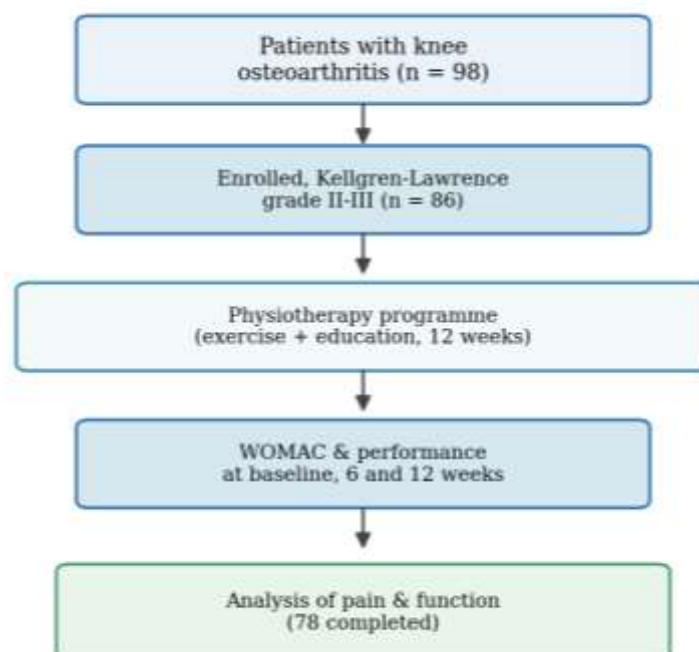


Figure 1: Flow of Participants through the Physiotherapy Programme and Assessment

Table 1: Baseline Characteristics of the Study Cohort (N = 86).

Characteristic	Value	Notes
Mean age (years)	61.4 ± 8.2	Range 48-78
Female / Male	54 / 32	63% female
K-L grade II / III	44 / 42	
Mean BMI	28.6 ± 3.9	
Mean baseline WOMAC	54.7 ± 13.1	Total score

Table 2: Components of the Physiotherapy Programme

Component	Description
Strengthening	Progressive quadriceps and lower-limb strengthening
Aerobic exercise	Low-impact aerobics training
Functional exercise	Task-specific and balance training
Education	Self-management and activity advice
Home programme	Supported independent exercise

RESULTS AND FINDINGS

The high completion rate suggests that the programme was acceptable to patients and feasible to complete in this setting [3].

Of 86 enrolled patients, 78 (91%) completed the twelve-week programme and all assessments. Pain, function and stiffness improved significantly over the programme, as shown in Figure 2.

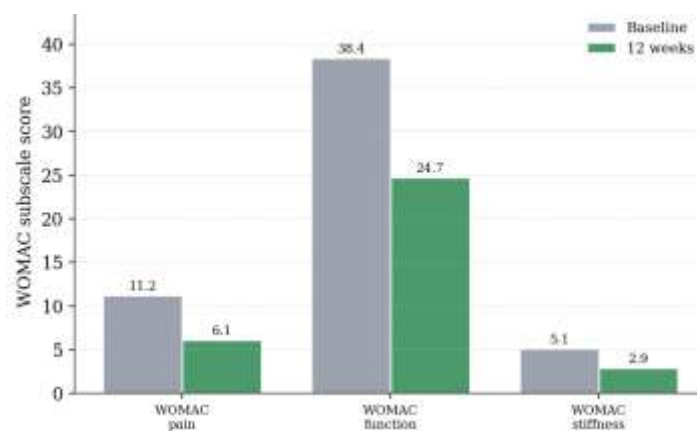


Figure 2: Western Ontario and McMaster Universities Osteoarthritis Index Subscale Scores Before and After the Programme

The reductions exceeded the magnitude generally considered clinically important, indicating that the improvements were meaningful to patients and not merely statistically detectable [3], [5].

Mean scores for pain, function and stiffness on the Western Ontario and McMaster Universities Osteoarthritis Index improved significantly from baseline to twelve weeks, indicating meaningful reductions in pain and stiffness and improvement in function. These improvements are consistent with the established benefits of exercise and physiotherapy in knee osteoarthritis, reflecting gains in muscle function, joint support and physical capacity [2], [3]. The improvement in function is particularly important given its impact on mobility and independence.

Because walking underlies so many everyday activities, an increase in walking distance has direct relevance to independence and participation in daily life [1], [5].

Walking capacity also improved progressively over the programme (Figure 3). The six-minute walk distance increased from baseline through six weeks to twelve weeks, demonstrating improved functional exercise capacity. This progressive improvement complements the gains in pain and function and reflects the cumulative effect of progressive exercise on physical capacity [3], [5]. The improvement in walking capacity is a clinically meaningful functional outcome relevant to patients' daily activities.

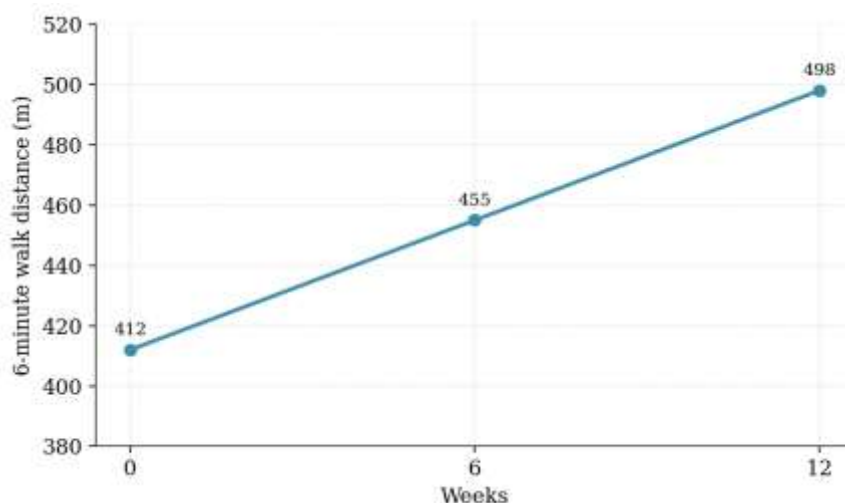


Figure 3: Six-Minute Walk Distance over the Twelve-Week Programme

The good adherence and absence of serious adverse events support the feasibility and safety of delivering such a programme in routine practice [3].

Overall, the physiotherapy programme was associated with significant improvements in pain, function, stiffness and walking capacity. The programme was safe and well tolerated, with good adherence and no serious adverse events. Aggregate outcomes are summarised in Table 3.

Table 3: Outcomes over the Programme

Outcome	Baseline	12 weeks	Change
WOMAC pain	11.2	6.1	-5.1
WOMAC function	38.4	24.7	-13.7
WOMAC stiffness	5.1	2.9	-2.2
6-minute walk (m)	412	498	+86

DISCUSSION

The consistency of improvement across pain, function, stiffness and walking capacity strengthens confidence that the programme produced a genuine and broad benefit [2], [3].

This prospective study found that a twelve-week physiotherapy programme comprising exercise and education was associated with significant improvements in pain, function, stiffness and walking capacity in patients with knee osteoarthritis. These findings support the use of physiotherapy as a core musculoskeletal intervention in knee osteoarthritis and are consistent with the strong evidence and guideline recommendations favouring exercise [2], [3]. This breadth of improvement reflects the multiple mechanisms through which exercise acts in knee osteoarthritis, including gains in muscle strength, joint support, mobility and overall physical conditioning [2], [3].

The improvements across multiple domains, including pain, function, stiffness and walking capacity, indicate a broad benefit of the programme [2], [3]. The progressive improvement in walking capacity over the programme reflects the cumulative effect of progressive exercise on muscle function and physical capacity, underlining the importance of an adequate course of

structured exercise. The combination of strengthening, particularly of the quadriceps, with aerobic and functional exercise addressed the muscle weakness and deconditioning central to disability in knee osteoarthritis, while education supported self-management and adherence [3].

Maintaining mobility and function is also important for general health, since reduced activity in knee osteoarthritis can contribute to wider deconditioning and comorbidity [1], [2].

The improvement in function and walking capacity is of particular clinical significance, as functional limitation and reduced mobility are major consequences of knee osteoarthritis with substantial impact on independence and quality of life [1], [5]. By improving function and physical capacity, physiotherapy addresses the outcomes that matter most to patients and supports continued activity. As a core, low-risk and effective treatment, physiotherapy is recommended before or alongside pharmacological and surgical management, and these findings reinforce its value in routine practice.

Quadriceps weakness is a well-recognised feature of knee osteoarthritis and an important target of treatment, since stronger muscles improve joint support and reduce the load transmitted through the joint [2], [3]. The emphasis on progressive strengthening within the programme is therefore directly aligned with the underlying impairments of the condition.

The integration of education and self-management with exercise is also important, as it supports adherence, appropriate activity and the long-term self-management that knee osteoarthritis, as a chronic condition, requires [2], [3]. Equipping patients to manage their own condition extends the benefits of supervised therapy into everyday life.

Certain limitations should be acknowledged. The single-arm design, without a control group, prevents attribution of the improvements specifically to the programme rather than to natural fluctuation, non-specific effects or regression to the mean, although the progressive improvement and consistency across outcomes support a genuine effect. The single-centre setting limits generalisability, and the twelve-week horizon does not capture longer-term outcomes. These considerations indicate the need for controlled studies, but the findings provide useful real-world evidence supporting physiotherapy.

LIMITATIONS

This study has several limitations. The single-arm design, without a control group, cannot separate the effect of the programme from natural symptom fluctuation, non-specific effects or regression to the mean. The single-centre setting limits generalisability, and the twelve-week follow-up does not capture longer-term outcomes or the durability of benefits. The study included patients with Kellgren-Lawrence grade II to III osteoarthritis, so findings may not apply to milder or more severe disease, and some withdrawal occurred. Pain, function and walking capacity were the focus, with broader quality-of-life outcomes not the primary measure.

FUTURE SCOPE

Future research should include randomised controlled trials comparing physiotherapy programmes with control or alternative interventions to establish their specific efficacy in knee osteoarthritis, and studies with longer-term follow-up to assess the durability of benefits. Research into the optimal content, intensity and delivery of exercise and education, and into strategies to support long-term adherence, would help optimise programmes. Studies across the spectrum of disease severity, and of the role of physiotherapy in delaying or avoiding surgery, would broaden applicability. Evaluation of quality-of-life and patient-centred outcomes, alongside pain and function, would further inform musculoskeletal physiotherapy management of knee osteoarthritis.

CONCLUSION

These findings reinforce the position of exercise and physiotherapy as a core, first-line treatment recommended in clinical guidelines for knee osteoarthritis [2], [3].

In this prospective study, a twelve-week physiotherapy programme comprising exercise and education was associated with significant improvements in pain, function, stiffness and walking capacity in patients with knee osteoarthritis, with progressive benefit over the programme. The findings support the use of physiotherapy as a core, first-line musculoskeletal intervention for knee osteoarthritis. While the single-arm design precludes firm conclusions about the specific contribution of the programme relative to natural course and non-specific effects, the consistent improvements observed support its use, and controlled studies are warranted to confirm and extend these findings.

REFERENCES

1. Hunter DJ, Bierma-Zeinstra S. Osteoarthritis. The Lancet. 2019;393(10182):1745-1759.
2. Bannuru RR, Osani MC, Vaysbrot EE, et al. OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis. Osteoarthritis and Cartilage. 2019;27(11):1578-1589.
3. Fransen M, McConnell S, Harmer AR, et al. Exercise for osteoarthritis of the knee. Cochrane Database of Systematic Reviews. 2015;(1):CD004376.
4. Bennell KL, Hinman RS. A review of the clinical evidence for exercise in osteoarthritis of the hip and knee. Journal of Science and Medicine in Sport. 2011;14(1):4-9.
5. Bellamy N, Buchanan WW, Goldsmith CH, et al. Validation study of WOMAC. Journal of Rheumatology. 1988;15(12):1833-1840.

***Author for Correspondence**

Dr. Sunita Rao

E-mail: mesunita.rao45@yahoo.co.in

¹Associate Professor, Dept. of Musculoskeletal Physiotherapy, Krishna College of Physiotherapy

²Student, Dept. of Musculoskeletal Physiotherapy, Krishna College of Physiotherapy

Received Date: February 15, 2026

Accepted Date: March 10, 2026

Published Date: April 10, 2026

Citation: Dr. Sunita Rao, Manish Gupta. Physiotherapy Interventions for Pain and Function in Knee Osteoarthritis: A Prospective Study. Diagnostics in Musculoskeletal Physiotherapy. 2026; 2(1): 23-33p.