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Multimodal Physiotherapy Intervention in Grade III Knee Osteoarthritis in an Older Adult: A Case Report

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Abstract

Background: Knee osteoarthritis is a common degenerative musculoskeletal disorder in older adults associated with pain, joint stiffness, muscle weakness, limited range of motion, and reduced functional ability. Physiotherapy plays an important role in symptom management and functional improvement.

Objective: This case report aimed to describe the short-term clinical outcomes of multimodal physiotherapy intervention in an elderly patient with grade III knee osteoarthritis.

Methods: This single-patient case report followed the CARE guideline framework and was conducted at RSUD Pandan Arang Boyolali between September and October 2025. A 73-year-old male patient with grade III right knee osteoarthritis received four physiotherapy sessions over four weeks. Outcome measures included the Visual Analogue Scale (VAS), goniometric assessment, Manual Muscle Testing (MMT), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the Timed Up and Go (TUG) test.

Results: The intervention consisted of infrared therapy, Transcutaneous Electrical Nerve Stimulation (TENS), stretching exercises, quadriceps setting exercises, and hold-relax techniques. Pain intensity decreased from 3 to 2 for resting pain, from 5 to 2 for tenderness, and from 6 to 4 for movement pain. Knee range of motion improved from 0°–110° to 0°–125°. Muscle strength improved from 4-/5 to 4+/5 in knee flexion and to 5/5 in knee extension. WOMAC scores improved from 51 to 45, while TUG performance improved from 16 to 13 seconds.

Conclusion: Multimodal physiotherapy intervention showed potential benefits in reducing pain and improving functional outcomes in an elderly patient with grade III knee osteoarthritis.

Keywords
Knee Osteoarthritis; Physical Therapy Modalities; Exercise Therapy; Transcutaneous Electrical Nerve Stimulation; Aged; Rehabilitation

Introduction

Knee osteoarthritis is one of the most prevalent musculoskeletal disorders among older adults and represents a major contributor to pain, disability, and decreased quality of life worldwide. Aging is associated with progressive physiological changes involving the musculoskeletal and connective tissue systems, which may lead to reduced joint stability, decreased muscle strength, impaired mobility, and functional dependence. Osteoarthritis is characterized by progressive cartilage degeneration, subchondral bone remodeling, synovial inflammation, and osteophyte formation.[1]

The knee joint is one of the most frequently affected weight-bearing joints because of repetitive mechanical loading and age-related degenerative changes. Patients with knee osteoarthritis commonly experience pain, joint stiffness, crepitus, muscle weakness, reduced range of motion, and impaired physical function.[2] These symptoms may limit functional activities such as walking, stair climbing, prolonged standing, and sit-to-stand transfer. In older adults, persistent mobility limitation may also increase fall risk, reduce independence, and negatively affect quality of life.[3] Globally, the prevalence and burden of knee osteoarthritis continue to increase due to population aging and increased life expectancy, making it an important public health concern in geriatric rehabilitation.[4]

Radiographic severity of knee osteoarthritis is commonly classified using the Kellgren–Lawrence grading system. Grade III knee osteoarthritis is characterized by definite osteophyte formation, moderate joint space narrowing, subchondral sclerosis, and possible bone deformity accompanied by clinically significant pain and functional limitation.[5] Several risk factors contribute to disease progression, including advanced age, obesity, repetitive occupational loading, previous joint injury, lower limb malalignment, and decreased muscle strength.

Current management of knee osteoarthritis includes pharmacological, surgical, and conservative approaches. International guidelines from the Osteoarthritis Research Society International (OARSI) and the American College of Rheumatology (ACR) recommend exercise therapy, patient education, and self-management as core conservative interventions for knee osteoarthritis.[6] Exercise therapy has been shown to improve pain, muscle performance, mobility, and physical function in patients with knee osteoarthritis. Physiotherapy interventions may include strengthening exercises, stretching, neuromuscular exercise, range-of-motion training, and adjunctive physical modalities.

Among physiotherapy modalities, Transcutaneous Electrical Nerve Stimulation (TENS) and infrared therapy are frequently used to reduce pain and facilitate exercise participation. TENS may modulate pain through activation of large-diameter afferent fibers and inhibition of nociceptive transmission at the spinal level, while infrared therapy may improve local circulation and reduce muscle

spasm through superficial heating effects. Combined exercise therapy and physical modalities may therefore contribute to improved pain control and functional recovery in patients with knee osteoarthritis.[7]

Although several physiotherapy approaches have been recommended for knee osteoarthritis, evidence regarding the short-term clinical outcomes of multimodal physiotherapy intervention in older adults with grade III knee osteoarthritis remains limited, particularly in local clinical settings. Previous reports have primarily focused on isolated interventions and have not adequately described functional outcomes following combined physiotherapy management.

This case report aimed to describe the short-term clinical outcomes of multimodal physiotherapy intervention consisting of infrared therapy, TENS, stretching exercises, quadriceps strengthening, and hold-relax techniques in an elderly patient with grade III knee osteoarthritis.

Methods

This study was designed as a single-patient case report following the CARE (CAse REport) guideline framework and was conducted at the Physiotherapy Outpatient Department of RSUD Pandan Arang Boyolali, Indonesia, between September and October 2025.

The patient was a 73-year-old male diagnosed with grade III right knee osteoarthritis based on radiographic examination using the Kellgren–Lawrence classification system. Radiographic findings demonstrated definite osteophyte formation, moderate joint space narrowing, subchondral sclerosis, and early bone deformity changes in the right knee joint. The patient reported progressive right knee pain, morning stiffness, crepitus during movement, and difficulty performing functional activities such as walking, stair climbing, prolonged standing, and sit-to-stand transfer. The patient was able to ambulate independently without an assistive device but demonstrated an antalgic gait pattern due to pain. Pharmacological management prescribed by the attending physician was continued during the physiotherapy program.

The patient had no history of neurological disorders, severe cognitive impairment, recent knee surgery, or acute traumatic injury. Written informed consent was obtained from the patient and the patient's legal guardian before participation and publication of this case report.

Baseline assessment included subjective and objective physiotherapy examination. Subjective assessment consisted of pain history, aggravating and relieving factors, and activity limitation during daily living. Objective assessment included inspection, palpation, range-of-motion examination, muscle strength assessment, functional mobility evaluation, and functional ability assessment.

On observation, no edema or skin discoloration was found around the knee joint. Dynamic assessment revealed antalgic gait, pain during walking, and difficulty performing sit-to-stand transfer. Palpation demonstrated tenderness around the right knee joint and hamstring muscle spasm accompanied by crepitus during movement.

Pain intensity was assessed using the Visual Analogue Scale (VAS), a valid and reliable instrument for musculoskeletal pain evaluation**.** Pain assessment included resting pain, tenderness pain, and movement pain. Knee joint range of motion was measured using a universal goniometer with the patient positioned supine according to standard musculoskeletal assessment procedures. Baseline active knee flexion range of motion was 0°–110°.

Muscle strength was assessed using Manual Muscle Testing (MMT**),** which has demonstrated acceptable reliability in musculoskeletal examination. The patient was positioned in sitting during muscle strength assessment. Baseline findings demonstrated muscle strength of 4-/5 in knee flexion and extension.

Functional ability was evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), a standardized instrument widely used to assess pain, stiffness, and physical function in patients with knee osteoarthritis. The baseline WOMAC score was 51, indicating severe functional limitation**.** Functional mobility and fall risk were evaluated using the Timed Up and Go (TUG) test. The patient required 16 seconds to complete the test, indicating impaired mobility and increased fall risk. The baseline physiotherapy assessment findings are summarized in Table 1.

Table 1. Baseline Physiotherapy Assessment Findings

Assessment Component	Findings
Static observation	No edema or skin discoloration
Dynamic observation	Antalgic gait and difficulty during sit-to-stand transfer
Palpation	Tenderness, hamstring muscle spasm, crepitus
VAS resting pain	3
VAS tenderness	5
VAS movement pain	6
Knee range of motion	0°–110°
MMT knee flexion	4-/5
MMT knee extension	4-/5
WOMAC score	51
TUG test	16 seconds

Based on the clinical findings, a multimodal physiotherapy intervention program was developed to address pain, limited range of motion, muscle weakness, muscle spasm, and impaired functional ability. The intervention consisted of infrared therapy, Transcutaneous Electrical Nerve Stimulation (TENS), stretching exercises, quadriceps setting exercises, and hold-relax techniques. Physiotherapy intervention was administered in four treatment sessions over four weeks.

Infrared therapy was applied using a non-luminous infrared lamp positioned approximately 45–60 cm from the anterior knee region for 15 minutes with the patient in long-sitting position. The intervention aimed to increase local circulation, reduce muscle spasm, and facilitate pain reduction.

Conventional TENS was administered for 15 minutes using sensory-level intensity adjusted according to patient tolerance. Stimulation parameters included a frequency of 80–100 Hz and pulse width of 100–200 μs in continuous mode. Electrodes were positioned around the right knee joint using the local contrapad technique.

Stretching exercises targeted the hamstring muscle group to improve flexibility and reduce muscle tightness. Passive stretching was maintained for 15–20 seconds and repeated eight times during each session. Hold-relax techniques were performed using proprioceptive neuromuscular facilitation principles through passive movement toward end range followed by submaximal isometric contraction and relaxation.

Quadriceps setting exercises were prescribed to improve quadriceps activation and knee stability. The exercise was performed isometrically in supine position with 10 repetitions for three sets during each session. During intervention, the patient was monitored for adverse events including excessive pain, dizziness, skin irritation, or treatment intolerance. No adverse events were reported throughout the intervention period.

The clinical management pathway began with the initial physiotherapy assessment and confirmation of grade III knee osteoarthritis based on radiographic findings. The patient subsequently received a multimodal physiotherapy program consisting of infrared therapy, transcutaneous electrical nerve stimulation, stretching exercise, quadriceps setting exercise, and hold relax techniques over four weeks. Clinical symptoms, functional status, joint range of motion, muscle strength, and mobility were monitored throughout the intervention and reassessed at the end of treatment. The sequence of assessment, intervention, monitoring, and short term outcome evaluation is presented in Figure 1.

Figure 1. Clinical Timeline of Physiotherapy Management for Knee Osteoarthritis

Outcome data obtained before and after intervention were analyzed descriptively by comparing changes in pain intensity, range of motion, muscle strength, functional mobility, and functional ability following the four-week physiotherapy program. Patient confidentiality and anonymity were maintained throughout the study process in accordance with institutional ethical principles and the Declaration of Helsinki. Because this study was conducted as a single-patient case report based on routine clinical physiotherapy management without experimental intervention, formal ethical committee approval was not required according to institutional policy.

Results

A 73-year-old male patient diagnosed with grade III right knee osteoarthritis completed a multimodal physiotherapy program consisting of four treatment sessions over four weeks. The intervention program was developed based on the patient's primary clinical problems, including knee pain, limited range of motion, muscle weakness, hamstring muscle spasm, impaired functional mobility, and reduced functional ability during daily activities.

The physiotherapy program consisted of infrared therapy, Transcutaneous Electrical Nerve Stimulation (TENS), stretching exercises, quadriceps setting exercises, and hold-relax techniques. Intervention parameters were adjusted according to patient tolerance and therapeutic objectives. The intervention protocol is summarized in Table 2.

Table 2. Multimodal Physiotherapy Intervention Protocol

Clinical Problem	Physiotherapy Intervention	Intervention Parameters
Knee pain	Infrared therapy	Non-luminous infrared; 45–60 cm distance; 15 minutes/session
Knee pain	Conventional TENS	80–100 Hz; pulse width 100–200 μs; sensory-level intensity; 15 minutes/session
Limited range of motion	Hold-relax technique	10 repetitions × 3 sets targeting hamstring musculature
Muscle weakness	Quadriceps setting exercise	10 repetitions × 3 sets with isometric contraction
Hamstring muscle spasm	Stretching exercise	15–20 seconds hold; 8 repetitions/session

No adverse events or treatment intolerance were reported during the intervention period. The patient demonstrated good adherence throughout the physiotherapy sessions.

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Clinical outcomes were evaluated before and after completion of the intervention program. Outcome measures included pain intensity assessed using the Visual Analogue Scale (VAS), knee range of motion measured using goniometric examination, muscle strength evaluated using Manual Muscle Testing (MMT), functional ability assessed using WOMAC, and functional mobility assessed using the Timed Up and Go (TUG) test. Table 3 presents the comparison of clinical outcomes before and after physiotherapy intervention.

Table 3. Comparison of Clinical Outcomes Before and After Physiotherapy Intervention

Outcome Measure	Pre-Intervention	Post-Intervention
VAS resting pain	3	2
VAS tenderness	5	2
VAS movement pain	6	4
Knee range of motion	0°–110°	0°–125°
MMT knee flexion	4-/5	4+/5
MMT knee extension	4-/5	5/5
WOMAC score	51	45
TUG test	16 seconds	13 seconds

Following four weeks of intervention, reductions in resting pain, tenderness, and movement pain were observed. The greatest reduction occurred in tenderness pain, which decreased from 5 to 2 on the VAS scale. Improvement in pain intensity was accompanied by improved tolerance during walking and sit-to-stand activities.

Knee joint mobility improved after intervention, with active knee flexion increasing from 110° to 125°. Improvement in range of motion was accompanied by reduced subjective stiffness during movement.

Muscle strength assessment demonstrated improvement in both knee flexor and extensor muscle groups. Knee flexion strength improved from 4-/5 to 4+/5, while knee extension strength improved from 4-/5 to 5/5 following intervention.

Functional ability assessed using WOMAC demonstrated improvement from a score of 51 to 45, indicating clinically meaningful improvement in pain-related physical function and daily activity performance. Functional mobility assessed using the TUG test also improved from 16 seconds to 13 seconds following intervention, indicating improved mobility performance and reduced fall risk compared with baseline findings.

Discussion

This case report described the short-term clinical outcomes of multimodal physiotherapy intervention in an elderly patient with grade III knee osteoarthritis. Following four weeks of intervention, improvements were observed in pain intensity, knee range of motion, muscle strength, functional mobility, and functional ability. These findings support the potential role of combined physiotherapy interventions as part of conservative management for symptomatic knee osteoarthritis in older adults.

The reduction in pain observed in this patient may be associated with the combined effects of infrared therapy, TENS, stretching, and exercise therapy. Pain in knee osteoarthritis is multifactorial and involves mechanical stress, synovial inflammation, peripheral sensitization, and altered neuromuscular function. Current international guidelines from the Osteoarthritis Research Society International (OARSI) and the American College of Rheumatology (ACR) recommend exercise-based rehabilitation and selected physical modalities as components of non-surgical management for knee osteoarthritis.[8]

The reduction in pain intensity may also be explained by the physiological effects of infrared therapy and TENS. Superficial thermal therapy may increase local circulation, improve tissue extensibility, and reduce muscle spasm through vasodilation effects. Conventional TENS may reduce pain through modulation of nociceptive transmission at the spinal level and activation of large-diameter afferent fibers according to the gate control theory of pain. The combination of electrotherapy and active exercise may therefore facilitate greater patient participation during rehabilitation by reducing pain perception during movement.

Improvement in knee range of motion following intervention may be related to the integration of stretching exercises and hold-relax techniques. Patients with knee osteoarthritis frequently develop joint stiffness and muscle tightness because of pain-related movement limitation and reduced physical activity. In this case, active knee flexion improved from 110° to 125° after intervention. Hold-relax techniques based on proprioceptive neuromuscular facilitation principles may improve flexibility through autogenic inhibition and muscle relaxation mechanisms. Stretching exercises targeting the hamstring muscle group may also contribute to reduced posterior knee tightness and improved movement efficiency.

Muscle strength improvement was another clinically important finding in this report. Quadriceps weakness is commonly associated with impaired knee stability, altered gait mechanics, and reduced physical function in patients with knee osteoarthritis. Following intervention, knee flexion strength improved from 4-/5 to 4+/5, while knee extension strength improved from 4-/5 to 5/5. Quadriceps setting exercises may enhance neuromuscular activation and improve muscle recruitment through repeated isometric contraction. Previous studies have demonstrated that strengthening exercise is one of the most effective conservative interventions for improving physical function in knee osteoarthritis.[9]

Functional ability assessed using WOMAC demonstrated improvement from severe to moderate functional limitation following intervention. Although the six-point reduction in WOMAC score should be interpreted cautiously because this report involved only a single patient, the improvement was accompanied by observable enhancement in walking tolerance, transfer ability, and daily mobility performance. Functional mobility assessed using the Timed Up and Go test also improved from 16 seconds to 13 seconds, indicating better mobility performance and reduced fall risk after intervention.

The findings of this report are consistent with previous evidence supporting multimodal rehabilitation strategies for knee osteoarthritis. Combined exercise therapy and adjunctive modalities may provide additional short-term benefits by improving pain control and facilitating active participation during rehabilitation sessions. In this case, multimodal intervention was selected instead of exercise-only therapy because the patient initially presented with significant pain, muscle spasm, and movement limitation that could interfere with exercise performance.

Several prognostic factors may also have influenced the patient's clinical response. Despite advanced age and chronic degenerative changes, the patient demonstrated good adherence throughout the intervention period and was able to complete all treatment sessions without adverse events. However, concurrent pharmacological management and natural symptom fluctuation may also have contributed to symptom improvement. Therefore, potential placebo effects and other confounding factors should be considered when interpreting these findings.

This report has several clinical implications for geriatric physiotherapy practice. Individualized multimodal physiotherapy interventions may support short-term pain reduction and functional improvement in older adults with knee osteoarthritis. The

integration of exercise therapy with pain-modulating modalities may improve patient tolerance during rehabilitation and facilitate mobility-related functional recovery.

Several limitations should be acknowledged. This report involved only a single patient and therefore has limited generalizability. The intervention duration was relatively short, and no long-term follow-up assessment was available after completion of the physiotherapy program. In addition, the absence of a control comparison limited the ability to determine the independent contribution of each intervention modality. Future studies with larger sample sizes, controlled study designs, and longer follow-up periods are required to evaluate the long-term effectiveness of multimodal physiotherapy intervention in patients with knee osteoarthritis.

Patients with knee osteoarthritis should also be encouraged to perform regular home exercise programs focusing on quadriceps strengthening, stretching, mobility exercise, and functional activity training to support long-term symptom management and functional independence.

Conclusion

Multimodal physiotherapy intervention consisting of infrared therapy, Transcutaneous Electrical Nerve Stimulation (TENS), stretching exercises, quadriceps setting exercises, and hold-relax techniques showed potential benefits in reducing pain and improving knee range of motion, muscle strength, functional mobility, and functional ability in an elderly patient with grade III knee osteoarthritis.

The findings suggest that individualized multimodal physiotherapy programs may support short-term symptom management and functional recovery in older adults with knee osteoarthritis. The integration of pain-modulating modalities and therapeutic exercise may improve patient participation during rehabilitation and facilitate better mobility performance during daily activities.

However, because this report involved only a single patient with a relatively short intervention period, the findings should be interpreted cautiously and cannot be generalized to broader populations. Further studies with larger sample sizes, controlled study designs, and longer follow-up periods are recommended to evaluate the long-term effectiveness and sustainability of multimodal physiotherapy interventions in geriatric populations with knee osteoarthritis.

Author Contribution

Sakhina Lancha Faliha: Conceptualization, Investigation, Methodology, Data curation, Formal analysis, Intervention, Writing original draft.
Dwi Rosella Komala Sari: Supervision, Methodology, Validation, Writing review and editing.
Pradana: Supervision, Clinical guidance, Validation, Writing review and editing.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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Ethics Statement

Written informed consent was obtained from the patient and the patient's legal guardian prior to participation in the physiotherapy intervention and publication of this case report. Patient confidentiality and anonymity were maintained throughout the study in accordance with institutional ethical principles and the Declaration of Helsinki. Because this study was conducted as a single-patient case report without experimental intervention beyond routine clinical physiotherapy management, formal ethical committee approval was not required according to institutional policy.

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