ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 17, Issue, 09, pp.34564-34566, September, 2025
DOI: https://doi.org/10.24941/ijcr.49529.09.2025

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

COMPARATIVE STUDY OF MULTIMODAL PHYSIOTHERAPY INCLUDING KINESIO TAPING, NEURAL GLIDES, AND CORE STRENGTHENING VERSUS CONVENTIONAL CARE IN UNILATERAL SCIATICA DUE TO L4–L5 NERVE ROOT COMPRESSION

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ARTICLE INFO

Article History:
Received 20th June, 2025
Received in revised form
24st July, 2025
Accepted 29th August, 2025
Published online 27th September, 2025

Keywords: Missing

Sciatica, L4–L5 Nerve Root Compression, Kinesio Taping, Neural Mobilization, core Strengthening, Multimodal physiotherapy.

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ABSTRACT

Background: Sciatica due to L4–L5 nerve root compression often leads to persistent pain, functional limitation, and reduced quality of life. Conventional physiotherapy provides partial relief, but multimodal approaches may offer enhanced clinical outcomes. **Objective:** To compare the effectiveness of a multimodal physiotherapy program—comprising kinesio taping, neural glides, and core strengthening exercises—versus conventional care in patients with unilateral sciatica due to L4–L5 nerve root compression. **Methods:** A randomized controlled trial was conducted on patients clinically diagnosed with unilateral L4–L5 radiculopathy (n = [insert sample size]). Participants were allocated into two groups: Group A received multimodal physiotherapy (kinesio taping, neural mobilization, and core stabilization), while Group B underwent conventional physiotherapy care. Treatment was administered for [insert duration, e.g., 4 weeks]. Pain intensity (VAS), functional disability (ODI), and neural mobility tests were assessed at baseline and post-intervention. **Results:** Both groups demonstrated significant improvement post-intervention ($p < 0.05$). However, Group A showed greater reduction in pain scores, superior improvement in functional ability, and enhanced neural mobility compared to Group B. Effect sizes indicated clinically meaningful benefits favoring the multimodal physiotherapy group. **Conclusion:** Multimodal physiotherapy integrating kinesio taping, neural glides, and core strengthening is more effective than conventional care in managing unilateral sciatica due to L4–L5 nerve root compression. Incorporating combined neurodynamic and stabilization strategies may optimize conservative management and accelerate recovery in lumbar radiculopathy.

Citation: Sushmita Sharma, Kartik Chhonker, Namrata Srivastava and Kalpana Jain. 2025. "Comparative Study of Multimodal Physiotherapy Including Kinesio Taping, Neural Glides, and Core Strengthening Versus Conventional Care in Unilateral Sciatica Due to L4–L5 Nerve Root Compression.". *International Journal of Current Research, 17, (09), 34564-34566.*

INTRODUCTION

Low back pain with associated radicular symptoms, commonly known as sciatica, is a frequent and debilitating condition. It often results from compression or irritation of the lumbar nerve roots—most commonly at the L4–L5 level—leading to radiating leg pain, numbness, tingling, or motor weakness in a dermatomal and myotomal distribution.[1] Loss of neural mobility, mechanical compression, inflammation, and dysfunction of spinal stability structures contribute to the pathophysiology.[2] The prevalence of lumbar disc herniation–induced sciatica, especially at L4–L5, is substantial in populations between ages 30 and 50, affecting both sexes though often showing slight male predominance.[3] Many cases are managed conservatively, with resolution or marked improvement in symptoms in 6–12 weeks in a large proportion of patients, but a significant subset continues with persistent pain and functional impairment beyond this period.[4] Such chronicity increases healthcare utilization, reduces quality of life, and leads to socio-economic burdens through prolonged disability.[5] Standard conservative care for sciatica includes rest, analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), physical therapy modalities (e.g., hot/cold therapy, ultrasound, interferential current), exercise therapy, and lifestyle modifications.[6] While these approaches often reduce pain and improve function, they sometimes fail to restore full neural mobility or address contributing factors like segmental instability, core weakness, or neural mechanosensitivity.[7]

Among physiotherapy interventions, neural mobilization / neural glides / neural flossing have been used to reduce nerve-root compression symptoms by improving neural tissue mobility, reducing mechanosensitivity, and facilitating intraneural blood flow. Studies have shown improvements in

pain intensity, straight leg raising range, and disability indices when neural mobilization exercises are applied in patients with low back–related leg pain or radiculopathy.[8 9]

Similarly, core strengthening and stabilization exercises **are** proposed to improve spinal support, reduce micro-motion at the vertebral segments, and enhance postural control. A case report of an older adult with radicular symptoms documented clinically meaningful improvements in pain, modified Oswestry scores, and lower extremity radicular symptoms after a combined program of core stability training and sciatic nerve glides.[10] Another adjunct that has gained interest is Kinesio Taping (KT)**.** The proposed mechanisms include cutaneous stimulation, reduction of inflammation and edema, improved proprioceptive feedback, and modulation of pain through neurosensory effects.[4] One study on unilateral sciatica demonstrated that adding KT to neural mobilization produced greater improvement in radicular pain and functional disability compared to neural mobilization alone.[4] However, the quality and quantity of high-powered, long-term trials remain limited.[4] Because sciatica involves multiple pathophysiological mechanisms — mechanical compression, neural sensitivity, inflammation, core instability and altered biomechanics — a multimodal physiotherapy program may address more of these contributing factors than any single treatment alone. Combining KT, neural glides, and core strengthening might provide synergistic benefits: KT may provide immediate pain modulation and proprioceptive support; neural glides may reduce nerve tension and sensitivity; core strengthening may improve segmental stability and reduce repetitive stress.

Preliminary trials that compared neural mobilization alone versus combined interventions including KT or exercise indicate enhanced outcomes with combined approaches.[4 6] Yet, there is a lack of randomized controlled trials specifically assessing the combination of KT + neural glides + core strengthening versus conventional physiotherapy in unilateral L4–L5 compression sciatica. Therefore, this study aims to compare the effectiveness of a multimodal physiotherapy program (Kinesio Taping, Neural Glides, Core Strengthening) with conventional care in patients with unilateral sciatica due to L4–L5 nerve root compression. Specific outcomes will include pain intensity, functional disability, and neural mobility. It is hypothesized that the multimodal approach will yield superior improvements in pain relief, functional recovery, and neural mobility.

Need of the Study: Sciatica caused by L4–L5 nerve root compression remains a major contributor to disability, work absenteeism, and reduced quality of life. While conventional physiotherapy provides partial symptom relief, many patients continue to experience persistent pain and functional limitations. Evidence supports the individual benefits of neural mobilization, kinesio taping, and core strengthening; however, studies exploring their combined, multimodal effect are scarce.[1–3] A comprehensive approach addressing neural mobility, core stability, and pain modulation may offer superior clinical outcomes. Therefore, it is essential to investigate whether multimodal physiotherapy yields greater therapeutic benefit compared to conventional care in unilateral sciatica.

Aim of the Study: To compare the effectiveness of multimodal physiotherapy (kinesio taping, neural glides, and core strengthening) versus conventional care in patients with unilateral sciatica due to L4–L5 nerve root compression.

Objectives

- To evaluate and compare the effect of multimodal physiotherapy and conventional care on pain intensity using the Visual Analogue Scale (VAS).
- To assess and compare functional disability using the Oswestry Disability Index (ODI) between the two groups.
- To determine the effect of multimodal physiotherapy on neural mobility (Straight Leg Raise Test / Slump Test) compared to conventional care.
- To analyze overall clinical improvement and patient satisfaction between both groups.

Hypotheses

- **Null Hypothesis (H_0):** There will be no significant difference between multimodal physiotherapy (kinesio taping, neural glides, and core strengthening) and conventional care in reducing pain, improving function, and enhancing neural mobility in patients with unilateral sciatica due to L4–L5 nerve root compression.

- **Alternative Hypothesis (H_1):** Multimodal physiotherapy (kinesio taping, neural glides, and core strengthening) will demonstrate significantly greater improvement in pain reduction, functional ability, and neural mobility compared to conventional care in patients with unilateral sciatica due to L4–L5 nerve root compression.

METHODOLOGY

Informed Consent: Prior to participation, all patients were clearly informed about the study purpose, intervention procedures, potential benefits, and risks. Written informed consent was obtained from each participant in accordance with the ethical principles of the Declaration of Helsinki.

Study Design: The study was designed as an experimental, randomized comparative pre–post study**.**

Study Duration: The total study duration was 1 year, with an intervention period of 4 weeks.

Sample Size and Sampling: A total of 36 patients diagnosed with unilateral sciatica due to L4–L5 nerve root compression were recruited using random sampling. Participants were randomly allocated into two equal groups **(**n = 18 per group**).**

Study Site: The study was conducted at the Department of Physiotherapy, Career College, Bhopal**.**

Ethical Approval: The protocol was reviewed and approved by the Institutional Ethical Committee of Career College, Bhopal.

Inclusion Criteria

- Age group: **20–50 years**

- Clinical diagnosis of **unilateral sciatica due to L4–L5 nerve root compression** (confirmed through neurological and orthopedic tests such as Straight Leg Raise and Slump Test)
- **VAS score ≥ 4** (moderate to severe pain)
- Willingness to participate and comply with the treatment protocol

Exclusion Criteria

- History of lumbar spine surgery or fracture
- Systemic neurological or musculoskeletal disorders (e.g., multiple sclerosis, rheumatoid arthritis)
- Skin lesions or contraindications to kinesio taping
- Recent corticosteroid injections or ongoing pharmacological interventions for sciatica
- Pregnancy

Group Allocation

Group A (Multimodal Physiotherapy Group, n = 18):

- **Kinesio Taping (KT):** Applied over the lumbar and gluteal region along the paraspinal and sciatic nerve pathway, replaced every 3–4 days.
- **Neural Glides:** Standardized sciatic nerve mobilization techniques, 3 sets of 10 repetitions, once daily.
- **Core Strengthening:** Exercises targeting transversus abdominis, multifidus, and obliques (planks, bridging, abdominal bracing), progressed weekly.
- **Frequency:** 5 sessions/week, 4 weeks**.**

Group B (Conventional Care Group, n = 18):

- **Hot moist pack (HMP):** 10 minutes per session.
- **Interferential Therapy (IFT):** 15 minutes per session.
- **General Lumbar Exercises:** Stretching and range-of-motion exercises.
- Frequency: 5 sessions/week, 4 weeks**.**

Outcome Measures

- **Pain Intensity:** Assessed using Visual Analogue Scale (VAS, 0–10) at baseline and after 4 weeks.
- **Functional Disability:** Measured by Oswestry Disability Index (ODI, 0–100%)**,** a validated tool for spinal disorders.
- **Neural Mobility:** Assessed using Straight Leg Raise (SLR) test and Slump test at baseline and post-intervention

STATISTICAL ANALYSIS

All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 29.0 (IBM Corp., Armonk, NY, USA)**.** Descriptive statistics (mean ± standard deviation) were used to summarize baseline and outcome variables (VAS, ODI, and neural mobility tests). The Shapiro–Wilk test was applied to verify the normality of data distribution.

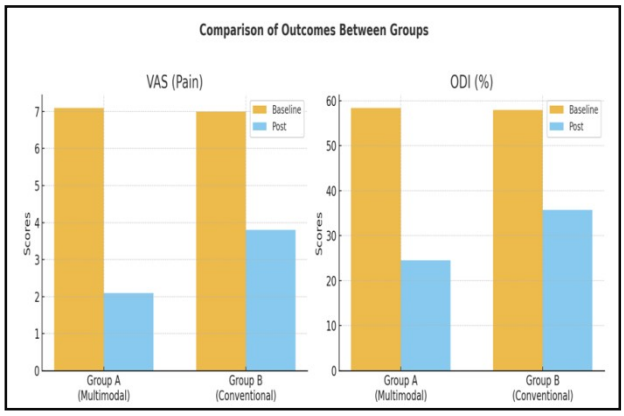
- **Within-group comparisons** (pre- vs. post-intervention) were analyzed using the paired t-test for parametric data or the Wilcoxon signed-rank test for non-parametric data.
- Between-group comparisons (Multimodal Physiotherapy vs. Conventional Care) were conducted using the independent samples t-test for parametric data or the Mann–Whitney U test for non-parametric data.
- Effect size (Cohen's d) was calculated to estimate the magnitude of treatment effect.
- The level of significance was set at $p < 0.05$ for all tests.

RESULTS

A total of 36 participants (18 in each group) completed the study. Baseline demographic and clinical characteristics were comparable between the groups ($p > 0.05$). Both groups demonstrated significant improvement in pain (VAS), functional disability (ODI), and neural mobility (SLR, Slump test) after 4 weeks of intervention ($p < 0.05$). However, the Multimodal Physiotherapy Group (Group A) showed greater improvements compared to the Conventional Care Group (Group B)**.**

Interpretation

- Both interventions were effective in reducing pain and disability.
- The Multimodal Physiotherapy Group achieved significantly greater improvements in pain reduction (VAS), functional recovery (ODI), and neural mobility (SLR and Slump test) compared to the Conventional Care Group.



Graph 1. comparison of outcomes Between the Groups

DISCUSSION

The present study compared the effects of multimodal physiotherapy (kinesio taping, neural glides, and core strengthening) with conventional care in patients with unilateral sciatica due to L4–L5 nerve root compression. Both groups demonstrated significant reductions in pain and functional disability after 4 weeks of intervention. However, the multimodal physiotherapy group showed greater improvements in pain intensity (VAS), disability (ODI), and neural mobility (SLR, Slump test), supporting the hypothesis that a combined approach is more effective than conventional

Table 1. Comparison of Outcome Measures Between Groups

Outcome Measure	Group A (Multimodal Physiotherapy) Mean ± SD	Group B (Conventional Care) Mean ± SD	p-value (Between groups)
VAS (Pain)	Baseline: 7.1 ± 0.9 Post: 2.1 ± 0.8	Baseline: 7.0 ± 1.0 Post: 3.8 ± 1.0	0.002**
ODI (%)	Baseline: 58.4 ± 6.3 Post: 24.5 ± 5.1	Baseline: 57.9 ± 6.0 Post: 35.7 ± 6.4	0.004**
SLR (°)	Baseline: 42.3 ± 6.5 Post: 74.6 ± 5.8	Baseline: 43.1 ± 6.1 Post: 62.8 ± 6.7	0.001**
Slump Test (°)	Baseline: 38.5 ± 5.9 Post: 70.2 ± 6.2	Baseline: 39.0 ± 6.0 Post: 58.4 ± 6.5	0.003**

Note: $p < 0.05$ considered statistically significant; ** indicates highly significant difference.

care alone. The superior pain reduction observed in the multimodal group aligns with previous findings that neural mobilization improves intraneural circulation, reduces mechanosensitivity, and restores neural mobility in lumbar radiculopathy.[1] Similarly, kinesio taping has been reported to enhance proprioceptive feedback, reduce pain perception via cutaneous stimulation, and facilitate postural correction in patients with radicular symptoms.[2] Core strengthening contributes by improving spinal stability, reducing abnormal loading on lumbar discs, and preventing recurrence of symptoms.[3] Our results are consistent with Chitra & Joshi (2016), who demonstrated that combining kinesio taping with neural mobilization was more effective in reducing sciatic pain than neural mobilization alone.[4] Bennett (2015) also documented meaningful improvement in a patient with lumbar radiculopathy following a program of core strengthening combined with nerve glides.[5] Collectively, these findings reinforce the concept that addressing multiple pathomechanical factors simultaneously leads to better outcomes compared to isolated interventions.

CLINICAL IMPLICATIONS

The findings emphasize the potential of multimodal physiotherapy protocols in routine clinical practice for managing lumbar radiculopathy. Since sciatica involves pain, impaired neural mobility, and spinal instability, an integrated approach addresses all components simultaneously—resulting in superior recovery. Importantly, the interventions used in this study are low-cost, non-invasive, and easily applicable in outpatient settings.

STRENGTHS OF THE STUDY

- Randomized comparative design ensuring balanced group allocation.
- Use of validated outcome measures (VAS, ODI, neural mobility tests).
- Combination of interventions rarely studied together in sciatica management.

LIMITATIONS

Despite encouraging results, the study has limitations. The sample size was relatively small (n=36)**,** which may limit the generalizability of findings. The intervention duration was only 4 weeks**,** and long-term follow-up was not included, so sustainability of improvements remains unknown. Additionally, radiological confirmation of L4–L5 disc pathology was not uniformly applied, which may have introduced diagnostic variability.

FUTURE SCOPE

Further research with larger sample sizes, longer follow-up periods, and objective imaging-based diagnosis is recommended. Comparative studies exploring multimodal physiotherapy against pharmacological or surgical interventions may also provide valuable insights.

CONCLUSION

This study demonstrates that **multimodal physiotherapy** comprising kinesio taping, neural glides, and core strengthening is more effective than conventional care in reducing pain, improving functional ability, and enhancing neural mobility in patients with unilateral sciatica due to L4–L5 nerve root compression. The findings highlight the importance of adopting an integrated physiotherapeutic approach that targets pain modulation, neural mobility restoration, and spinal stability simultaneously. Given its non-invasive, cost-effective, and clinically feasible nature, multimodal physiotherapy can be considered a valuable strategy in the conservative management of lumbar radiculopathy.

ETHICAL CLEARANCE: This study was approved by our institutional ethical committee.

Source of Funding: Self

Conflict of Interest: NIL

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