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EFFECTS OF SLUMP NEURAL MOBILIZATION FOR THE TREATMENT OF CHRONIC RADICULAR LOW BACK PAIN

Original Research

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ABSTRACT

Background: Low back pain is a prevalent global health issue affecting individuals across all age groups, impacting their physical, mental, and social well-being. It is a significant concern in both developed and underdeveloped countries and a leading cause of disability worldwide. Chronic radicular low back pain, characterized by radiating discomfort due to neural irritation, demands effective therapeutic interventions to alleviate symptoms and improve quality of life.

Objective: This study aimed to evaluate the effects of slump neural mobilization in conjunction with baseline treatments for managing chronic radicular low back pain.

Methods: A randomized clinical trial was conducted in outpatient departments of multiple hospitals, enrolling 20 participants who met the inclusion and exclusion criteria. Participants were randomly allocated into two groups, with 10 in each group. Group A received slump neural mobilization combined with proprioceptive neuromuscular facilitation rhythmic stabilization and hot pack therapy. Group B received rhythmic stabilization techniques and hot pack therapy alone. Interventions were provided three times per week for five weeks. Pain intensity was assessed at baseline, the second week, and the fifth week using the Numeric Pain Rating Scale. Statistical analyses included the Mann-Whitney test for between-group comparisons and the Friedman test for within-group comparisons.

Results: Between-group analysis revealed significant reductions in pain levels, with p-values of 0.018 at baseline and 0.02 at the fifth week, while results at the second week were not significant ($p = 0.173$). Within-group analysis using the Friedman test demonstrated statistically significant reductions in pain for both groups, with $p = 0.000$. In the treatment group, mean pain scores decreased from 5.70 at baseline to 3.90 at the second week and 1.40 at the fifth week, while the control group showed reductions from 4.20 at baseline to 3.30 at the second week and 2.90 at the fifth week.

Conclusion: The study concluded that slump neural mobilization, when combined with baseline treatments, significantly reduced pain levels in patients with chronic radicular low back pain. These findings support its incorporation as an effective non-invasive intervention in physical therapy.

Keywords: Back pain, chronic pain, low back pain, neurodynamics, neural mobilization, proprioceptive neuromuscular facilitation, randomized clinical trial.

INTRODUCTION

Low back pain (LBP), a condition characterized by discomfort in the lower spinal region, has emerged as a growing health concern, contributing significantly to functional disability worldwide. This condition disproportionately affects individuals in socioeconomically challenged groups, who often lack the financial resources and time required to address the issue effectively (1, 2). LBP can manifest as radiating pain, such as sciatica, or as non-radiating discomfort, and is broadly categorized into mechanical and non-specific types. Non-specific LBP, where no identifiable pathophysiological cause such as infection, osteoporosis, fractures, inflammation, or structural deformities is present, remains particularly challenging to diagnose and treat. Some research also links LBP to lumbar disc degeneration, while mechanical LBP originates from internal spinal structures, intervertebral discs, or surrounding musculature (3).

Chronic LBP, defined as pain persisting for more than six months, affects approximately 9% to 35% of individuals, with a lifetime prevalence estimated at a striking 84% (4). Among these, about 23% of cases are classified as chronic, with 11% to 12% resulting in significant functional disability. Global reviews highlight the alarming prevalence of this condition, with point prevalence rates ranging from 12% to 33% and annual prevalence rates reaching 22% to 65%. Sedentary lifestyles, coupled with activities that strain the spine—such as heavy lifting, frequent bending or twisting, and prolonged exposure to vibrations—further exacerbate the risk of LBP (5, 6).

To address chronic radicular LBP, various therapeutic techniques, including proprioceptive neuromuscular facilitation (PNF) and neurodynamics, have been explored (7). PNF stretching is designed to maintain or improve elasticity and range of motion, showing promise in enhancing balance and function in aging populations with radicular back pain. Neurodynamics, on the other hand, focuses on the mobilization of neural structures implicated in musculoskeletal conditions like radicular low back pain, radicular neck pain, and carpal tunnel syndrome (8). Techniques such as slider neural mobilization involve inducing sliding movements of nerves relative to surrounding tissues, with the goal of restoring mechanical and neurophysiological nerve function. This approach is both safe and versatile, incorporating passive movements, manual nerve mobilization, and exercise regimens to alleviate neural tension and reduce excitation within the dorsal horn of the spinal cord (9, 10).

The neurodynamic method also offers a comprehensive framework for assessing and treating pain, bridging the gap between central and peripheral nervous system dysfunctions. It allows clinicians to utilize specific movement patterns to assess motor responses and tailor interventions accordingly, offering a precise and patient-centered approach to managing chronic radicular LBP.

The objective of this exploration is to evaluate the efficacy of slump neural mobilization, a neurodynamic technique, as an innovative intervention for the treatment of chronic radicular low back pain, addressing the growing need for effective, non-invasive therapeutic solutions to improve patient outcomes.

METHODS

This randomized clinical trial was conducted over a period of approximately four months following the approval of the research synopsis. The study was carried out in outpatient departments of Allied Hospital Faisalabad, National Hospital Faisalabad, Aziz Fatima Hospital Faisalabad, and Government General Hospital Faisalabad. A total of 25 participants were initially screened based on predefined inclusion and exclusion criteria. Of these, 20 patients were selected for participation as they met all eligibility requirements. Participants included both males and females aged 25 to 50 years who presented with numbness and tingling extending to the big toe, reported pain persisting for more than six months, scored between 1 and 6 on the Numeric Pain Rating Scale (NPRS), had no history of lumbar surgery within the past five years, or had undergone lumbar surgery more than five years prior with no significant post-surgical complications. The five-year cut-off was incorporated to ensure that residual effects of recent surgical interventions did not confound the study results, while still allowing for the inclusion of individuals whose surgical outcomes had stabilized and no longer influenced their current condition. All patients also tested positive for the slump test.

Exclusion criteria comprised patients with knee contractures, women in their third trimester of pregnancy, post-surgical patients of the lower leg, individuals with amputations below the knee, or those with a history of spinal fracture, spinal infection, neoplasm, osteoporosis, or signs of an upper motor neuron lesion. The primary outcome of interest was pain intensity, measured using the NPRS.

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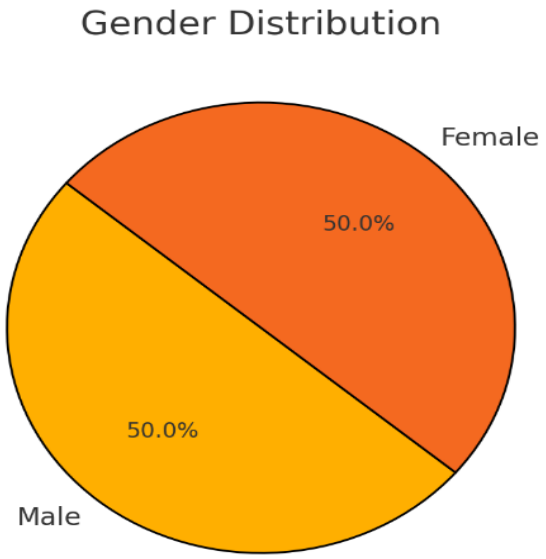
The 20 participants were randomly assigned into two groups. Group A served as the experimental group and received slump neural mobilization in addition to rhythmic stabilization proprioceptive neuromuscular facilitation techniques and a hot pack as baseline treatment. Group B acted as the control group and received only the baseline treatment, which included rhythmic stabilization proprioceptive neuromuscular facilitation techniques and a hot pack. Both groups underwent their respective interventions three times per week over a total duration of five weeks.

Pain intensity readings were taken at three intervals: prior to the intervention, after two weeks of treatment, and at the conclusion of the five-week treatment period. The standardized treatment protocols and structured timeline ensured consistency across groups, providing a reliable framework for data collection and analysis. The inclusion of stabilized post-surgical patients with lumbar surgery more than five years prior further enhanced the study's applicability to a broader clinical population without compromising the integrity of the results.

RESULTS

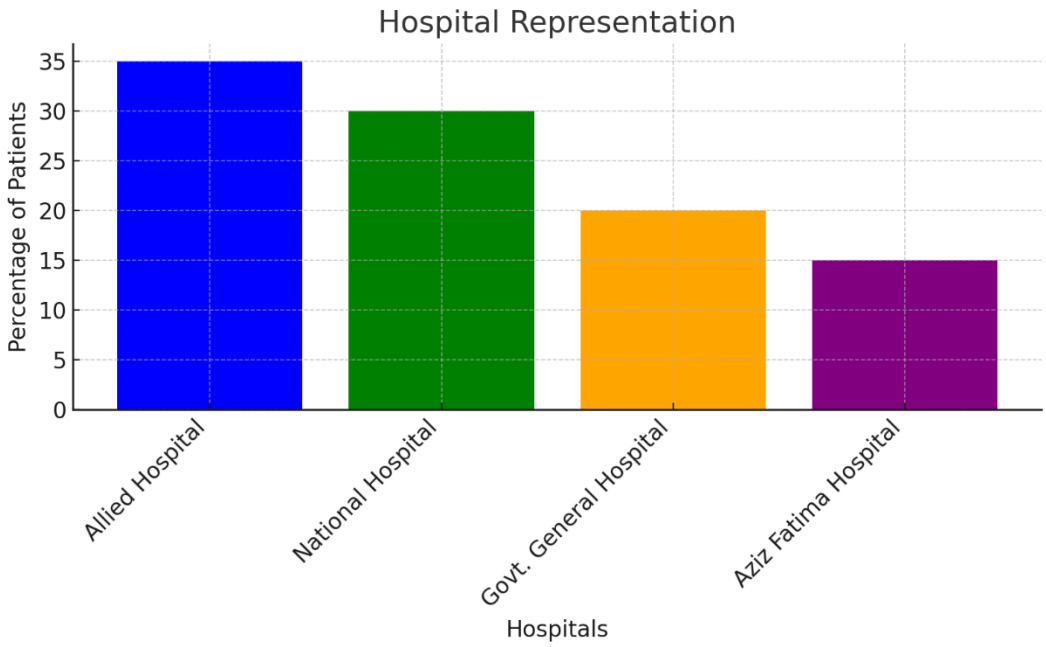
The study included 20 participants, equally distributed between males and females, with 50% representation for each gender. Participants were recruited from four hospitals, with the highest proportion sourced from Allied Hospital (35%), followed by National Hospital (30%), Government General Hospital (20%), and Aziz Fatima Hospital (15%). Age distribution adhered to the inclusion criteria, ranging from 25 to 50 years, ensuring demographic balance. Pain intensity assessments showed that at baseline, the treatment group had a higher mean rank of 13.40 compared to the control group's 7.60. This trend continued at the second week, with mean ranks of 12.20 for the treatment group and 8.80 for the control group. By the fifth week, however, the mean rank reversed, favoring the control group at 13.50 compared to the treatment group's 7.50. Statistical tests confirmed significant differences at baseline ($p = 0.018$) and the fifth week ($p = 0.020$), while no significant differences were observed at the second week ($p = 0.173$). These findings suggest the intervention's effectiveness, particularly when evaluated over the entire treatment period.

Within-group comparisons revealed significant reductions in pain intensity for both groups. In the treatment group, mean pain scores decreased from 5.70 at baseline (SD = 0.483) to 3.90 at the second week (SD = 0.568) and further to 1.40 at the fifth week (SD = 1.075). The control group also showed reductions, with mean scores decreasing from 4.20 at baseline (SD = 1.476) to 3.30 at the second week (SD = 1.160) and to 2.90 at the fifth week (SD = 1.370). Statistical analysis confirmed these changes were significant, with the treatment group demonstrating more substantial improvements. These results underscore the efficacy of slump neural mobilization in achieving superior pain reduction compared to the control intervention over the five-week study period.



This chart illustrates the gender distribution, showcasing an equal representation of male and female participants (50% each).

Figure 1 Gender Distribution



This chart highlights the distribution of participants across hospitals, with the highest representation from Allied Hospital (35%), followed by National Hospital (30%), Government General Hospital (20%), and Aziz Fatima Hospital (15%). These visualizations complement the demographic data presented in the study.

Figure 2 Hospital Representation

Table 1: Between group Analysis for pain (Mann-Whitney and Wilcoxon Test)

	Group of Patients	N	Mean Rank	Sum of Ranks
Pain at Baseline	Treatment Group	10	13.40	134.00
	Control group	10	7.60	76.00
	Total	20		
Pain at 2nd week	Treatment Group	10	12.20	122.00
	Control group	10	8.80	88.00
	Total	20		
Pain at 5th week	Treatment Group	10	7.50	75.00
	Control group	10	13.50	135.00
	Total	20		

Between-group analysis for pain intensity revealed that at baseline, the treatment group had a higher mean rank of 13.40 compared to the control group's 7.60, with total rank sums of 134.00 and 76.00, respectively. At the second week, the treatment group maintained a higher mean rank of 12.20 versus the control group's 8.80, with rank sums of 122.00 and 88.00, respectively. However, by the fifth week, the trend reversed, with the control group showing a higher mean rank of 13.50 compared to the treatment group's 7.50, and corresponding rank sums of 135.00 and 75.00. These shifts in mean ranks highlight the evolving differences in pain reduction outcomes between the two groups over time.

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Table 2: Results for Significant values for Mann-Whitney and Wilcoxon Test

Mann-Whitney U	21.000	33.000	20.000
Wilcoxon W	76.000	88.000	75.000
Z	-2.358	-1.363	-2.321
Asymp. Sig. (2-tailed)	.018	.173	.020
Exact Sig. [2*(1-tailed Sig.)]	.029b	.218b	.023b

The results of the Mann-Whitney and Wilcoxon tests demonstrated significant differences in pain reduction between the treatment and control groups at baseline and the fifth week, while results at the second week were non-significant. Specifically, the Mann-Whitney U values were 21.000 at baseline, 33.000 at the second week, and 20.000 at the fifth week, with corresponding Wilcoxon W values of 76.000, 88.000, and 75.000. The Z-scores were -2.358, -1.363, and -2.321 for baseline, second week, and fifth week, respectively. The asymptotic significance (2-tailed) values indicated statistical significance at baseline ($p = 0.018$) and the fifth week ($p = 0.020$), while the second week showed no significant difference ($p = 0.173$). The exact significance values further confirmed these findings, showing significant results at baseline ($p = 0.029$) and the fifth week ($p = 0.023$), but not at the second week ($p = 0.218$). These outcomes highlight the effectiveness of the treatment, particularly over the full course of the intervention.

Table 3: Within group comparison for pain

Group of Patients		N	Mean	Std. Deviation	Minimum	Maximum
Treatment Group	Pain at Baseline	10	5.70	.483	5	6
	Pain at 2nd week	10	3.90	.568	3	5
	Pain at 5th week	10	1.40	1.075	0	3
Control group	Pain at Baseline	10	4.20	1.476	2	6
	Pain at 2nd week	10	3.30	1.160	2	5
	Pain at 5th week	10	2.90	1.370	1	5
Chi-Square value for Friedman Test						
Treatment Group	N					10
	Chi-Square					20.000
	Df					2
	Asymp. Sig.					.000
Control group	N					10
	Chi-Square					15.935
	Df					2
	Asymp. Sig.					.000

Within-group comparisons for pain intensity revealed significant improvements over time in both the treatment and control groups. For the treatment group, the mean pain score decreased steadily from 5.70 at baseline (SD = 0.483, range 5–6) to 3.90 after the second week (SD = 0.568, range 3–5) and further to 1.40 after the fifth week (SD = 1.075, range 0–3). In the control group, the mean pain score also decreased, but to a lesser extent, starting at 4.20 at baseline (SD = 1.476, range 2–6), reducing to 3.30 at the second week (SD = 1.160, range 2–5), and reaching 2.90 at the fifth week (SD = 1.370, range 1–5).

The Friedman test confirmed these within-group changes were statistically significant for both groups, with a chi-square value of 20.000 ($df = 2$, $p = 0.000$) in the treatment group and 15.935 ($df = 2$, $p = 0.000$) in the control group. These results highlight that while both

groups experienced pain reduction, the treatment group demonstrated a more substantial improvement over the five-week intervention period.

DISCUSSION

Low back pain remains a prevalent issue worldwide, significantly contributing to disability levels, particularly in low- and middle-income countries where resources for effective treatment are limited. Its impact spans across all age groups, though its prevalence and disability burden are notably higher in economically disadvantaged populations (11, 12). While the exact etiology of lower back pain is often unclear, its association with radiating pain caused by neural irritation has led to the exploration of targeted interventions such as neural mobilization techniques (13).

The current study evaluated the effectiveness of slump neural mobilization in reducing pain associated with radiating low back pain when used alongside baseline treatments (14, 15). Pain was assessed using the Numeric Pain Rating Scale, with statistical analysis showing significant improvements in pain levels at baseline and at the fifth week, while results at the second week were not significant. Between-group analyses demonstrated that participants in the treatment group experienced more substantial pain relief compared to those in the control group. Within-group analysis confirmed consistent pain reduction over the five-week intervention period, with marked improvements in the treatment group compared to the control group (16, 17). These findings support the efficacy of slump neural mobilization as a valuable adjunct to baseline treatments for managing radiating low back pain (18).

Previous research has similarly highlighted the benefits of neural mobilization techniques. A comparative study demonstrated significant improvements in pain and functional outcomes, including straight leg raise scores, in participants who received neural mobilization combined with lumbar stability exercises, compared to those who received range-of-motion exercises with lumbar stability protocols (19). These results align with the current study's findings, further underscoring the clinical utility of neural mobilization for addressing pain and functional limitations associated with radiating low back pain (20, 21).

The study's strengths include the use of standardized outcome measures and a well-defined protocol. However, limitations such as a small sample size and the absence of long-term follow-up may restrict the generalizability of the findings. Additionally, the control group’s active treatment may have influenced results, potentially underestimating the full effect of slump neural mobilization. Despite these limitations, the findings contribute to the growing body of evidence supporting neural mobilization as an effective intervention for radiating low back pain, highlighting its potential for inclusion in broader physical therapy practices. Future studies with larger sample sizes and extended follow-up periods are recommended to validate these results and further explore the long-term benefits of neural mobilization.

CONCLUSION

This study concluded that neurodynamic interventions, specifically slump neural mobilization, proved to be an effective approach for managing chronic radicular low back pain. The combined application of slump neural mobilization with proprioceptive neuromuscular facilitation rhythmic stabilization techniques and hot pack therapy significantly contributed to pain reduction and improved patient outcomes. These findings emphasize the value of integrating neurodynamic techniques into comprehensive treatment plans for individuals with chronic radiating low back pain, offering a promising non-invasive option for effective pain management.

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AUTHOR CONTRIBUTIONS

Author	Contribution
Anbreena Rasool	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Javeria Ashraf	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Mariam Mehmood	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Rubina Zulfqar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Mehneel Saqib	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Mahnoor Zia	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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