Effectiveness of Multimodal Intervention: Trigger Point Therapy, Deep Tissue Massage, and Stretching in Patients with Low Back Pain

Efektivitas Intervensi Multimodal: Trigger Point, Deep Tissue Massage, dan Stretching pada Pasien Low Back Pain

Original Article

Albertus Gracia Nossanandi Krisnayantyo *

Universitas Negeri Yogyakarta,,
INDONESIA

Abstract.

Background Low back pain (LBP) is a highly prevalent musculoskeletal disorder that contributes significantly to functional limitations and decreased quality of life, particularly in individuals with non-specific low back pain (NSLBP). The complexity of its underlying mechanisms necessitates effective non-pharmacological interventions that address both pain and functional impairments.

Objectives This study aimed to evaluate the effectiveness of a multimodal intervention consisting of trigger point therapy, deep tissue massage, and stretching in reducing pain intensity and improving lumbar flexibility in patients with NSLBP.

Methods A quantitative pre-experimental study with a one-group pretest–posttest design was conducted involving 21 participants selected through incidental sampling. Pain intensity was measured using the Visual Analog Scale (VAS), and lumbar flexibility was assessed using the Fingertip-to-Floor Test (FTF). The intervention was administered in a single session lasting approximately 50 minutes. Data were analyzed using a paired sample t-test with a significance level of 0.05.

Results The findings showed a significant reduction in pain intensity, with mean VAS scores decreasing from 77.48 to 32.14, and improvements in lumbar flexibility, particularly in ante flexion (from 10.81 to 4.31). Statistical analysis confirmed significant differences between pretest and posttest measurements ($p < 0.05$) across all variables.

Conclusion The multimodal intervention combining trigger point therapy, deep tissue massage, and stretching is effective in reducing pain and improving flexibility in patients with NSLBP. These findings support the integration of multiple manual therapy techniques as a practical and evidence-based approach in musculoskeletal rehabilitation.

Keywords: low back pain, multimodal intervention, trigger point therapy, deep tissue massage, stretching

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*Correspondence: nossaalbertus@gmail.com
Albertus Gracia Nossanandi Krisnayantyo
Magister Program of Sport Science, Faculty of Sport and Health Science, Universitas Negeri Yogyakarta, Indonesia

INTRODUCTION

Low back pain (LBP) is recognized as one of the most prevalent musculoskeletal disorders globally and remains the leading cause of disability worldwide. Recent evidence indicates that LBP affects up to 84% of the population during their lifetime, with projections suggesting that the number of cases may exceed 800 million by 2050 [1]; [2] . This condition significantly impacts individuals' functional capacity, productivity, and quality of life, making it a major public health concern both globally and locally. In Indonesia, the prevalence of LBP ranges between 7.6% and 37%, with approximately 80% of individuals experiencing at least one episode during their lifetime, reflecting a substantial burden in developing countries. These findings underscore the urgency of identifying effective, evidence-based interventions for LBP management.

From a pathophysiological perspective, the majority of LBP cases (approximately 90%) are classified as non-specific low back pain (NSLBP), primarily associated with mechanical dysfunctions such as muscle strain, myofascial trigger points, and postural abnormalities. Myofascial pain, characterized by localized tenderness and referred pain patterns, is commonly linked to the presence of trigger points and muscle tightness, which can reduce range of motion (ROM) and increase pain perception. Contemporary research highlights that LBP is not solely influenced by muscular factors but also involves complex interactions between soft tissues, fascia, and neuromuscular control systems, suggesting the need for comprehensive therapeutic approaches [3]; [4].

In clinical practice, non-pharmacological interventions are widely recommended as first-line treatment strategies for LBP, particularly manual therapy and exercise-based rehabilitation. Systematic reviews have demonstrated that massage therapy, trigger point therapy, and stretching can contribute to pain reduction, improved flexibility, and enhanced functional outcomes [5]. Deep tissue massage has been shown to effectively reduce muscle tension and improve ROM by targeting deeper layers of soft tissue, while stretching interventions enhance muscle extensibility and biomechanical efficiency [6]. Additionally, trigger point therapy is known to modulate pain through neurophysiological mechanisms such as the gate control theory and endorphin release, thereby decreasing pain perception.

Despite the growing body of evidence supporting individual therapeutic modalities, existing studies predominantly focus on single interventions rather than integrated or multimodal approaches. For instance, [7] examined the comparative effectiveness of deep tissue massage combined with stretching but did not include trigger point therapy as part of the intervention. Similarly, [8] emphasized the role of manual therapy but highlighted inconsistencies in outcome measures and intervention protocols. These limitations indicate a significant research gap regarding the combined effectiveness of multiple manual therapy techniques applied simultaneously in LBP management.

Furthermore, recent literature suggests that multimodal interventions may provide superior outcomes compared to single-modality treatments due to their ability to address multiple underlying mechanisms of LBP, including muscular tension, neural sensitization, and biomechanical dysfunction. However, the evidence remains inconclusive due to heterogeneity in study designs, sample characteristics, and treatment protocols [9]. This gap highlights the need for well-structured experimental studies that evaluate the synergistic effects of combining trigger point therapy, deep tissue massage, and stretching within a single treatment framework.

Based on these considerations, the present study aims to examine the effectiveness of a multimodal intervention consisting of trigger point therapy, deep tissue massage, and stretching in patients with low back pain. Specifically, this study seeks to evaluate the extent to which this combined intervention reduces pain intensity and improves flexibility as key indicators of functional recovery. By employing a pre-experimental design, this research attempts to provide empirical evidence on the clinical benefits of integrating multiple therapeutic techniques.

This study is expected to contribute both theoretically and practically to the field of rehabilitation and sports therapy. Theoretically, it enriches the existing body of knowledge by providing empirical support for multimodal intervention frameworks in LBP management. Practically, the findings may serve as a reference for clinicians, physiotherapists, and sports therapists in developing more effective, evidence-based treatment protocols. Moreover, this research may inform future studies aimed at optimizing intervention strategies and addressing the limitations of current therapeutic approaches..

METHOD

Research Subjects

This study employed a quantitative approach involving participants diagnosed with non-specific low back pain (NSLBP) in the acute and subacute phases. The target population consisted of adult patients experiencing LBP symptoms within community-based clinical settings. A non-probability sampling technique, specifically incidental sampling, was applied to recruit participants who met the inclusion criteria during the study period. A total of 21 participants were included, which is consistent with recommendations for preliminary experimental studies exploring treatment effectiveness in clinical contexts [10]. Inclusion criteria comprised individuals aged 20–70 years diagnosed with NSLBP, while exclusion criteria included patients with specific spinal pathologies such as fractures, tumors, or neurological disorders. The selection of this sampling method was justified by the accessibility of participants and the exploratory nature of the study, which aimed to evaluate the initial effectiveness of a multimodal intervention in real clinical conditions [11]. Ethical considerations were maintained by ensuring informed consent and confidentiality of participant data throughout the study.

Research Design

This study employed a quantitative approach involving participants diagnosed with non-specific low back pain (NSLBP) in the acute and subacute phases. The target population consisted of adult patients experiencing LBP symptoms within community-based clinical settings. A non-probability

sampling technique, specifically incidental sampling, was applied to recruit participants who met the inclusion criteria during the study period. A total of 21 participants were included, which is consistent with recommendations for preliminary experimental studies exploring treatment effectiveness in clinical contexts [10]. Inclusion criteria comprised individuals aged 20–70 years diagnosed with NSLBP, while exclusion criteria included patients with specific spinal pathologies such as fractures, tumors, or neurological disorders. The selection of this sampling method was justified by the accessibility of participants and the exploratory nature of the study, which aimed to evaluate the initial effectiveness of a multimodal intervention in real clinical conditions [11].. Ethical considerations were maintained by ensuring informed consent and confidentiality of participant data throughout the study.

Data Analysis

Data analysis was conducted using inferential statistical techniques to determine the effectiveness of the intervention. Prior to hypothesis testing, data were subjected to assumption tests, including normality testing using the Shapiro–Wilk test and homogeneity testing using Levene's test. If the data met parametric assumptions ($p > 0.05$), a paired sample t-test was employed to examine differences between pretest and posttest scores in pain intensity and flexibility. The significance level was set at $\alpha = 0.05$. The paired t-test is widely recommended for within-subject experimental designs to evaluate treatment effects [12]. Additionally, effect size was calculated to determine the magnitude of the intervention's impact, providing a more comprehensive interpretation of clinical relevance [13]. Statistical analyses were performed using IBM SPSS Statistics software (version 26), which is commonly used in health and rehabilitation research for its robustness and reliability in handling quantitative data.

RESULTS AND DISCUSSION

Results

This study aimed to examine the effectiveness of a multimodal intervention consisting of trigger point therapy, deep tissue massage, and stretching in reducing pain intensity and improving lumbar flexibility among patients with non-specific low back pain (NSLBP). The findings are presented systematically, including descriptive statistics, comparative analysis (pretest vs. posttest), and inferential results to highlight the significance of the intervention.

1. Participant Characteristics

   A total of 21 participants were included in this study, with age distribution ranging from 21 to 70 years. The largest proportion of participants was within the 21–30 years age group (33.33%), followed by 31–40 years (24.81%) and 51–60 years (24.81%), while smaller proportions were observed in the 41–50 and 61–70 age groups (each 9.52%). This distribution indicates that NSLBP affects a broad age range, particularly individuals in productive age groups, which aligns with epidemiological findings highlighting the high burden of LBP in working populations (Wu et al., 2020).

2. Descriptive Analysis of Pretest and Posttest Data

   The descriptive results demonstrate notable differences between pre-intervention and post-intervention measurements in both pain intensity and lumbar flexibility.

Table 1. Pretest Data: Pain and Lumbar Flexibility

Variable	Minimum	Maximum	Mean	SD
Pain (VAS)	50	97	77.48	12.87
Flexibility (Ante)	-11	29	10.81	12.24
Flexibility (Dextro)	25	48	35.21	6.49
Flexibility (Sinistro)	25	47	34.95	6.40

Description:

Pretest data indicate that participants experienced high levels of pain (mean VAS = 77.48), accompanied by limited lumbar flexibility across all movement directions.

Table 2. Posttest Data: Pain and Lumbar Flexibility

Variable	Minimum	Maximum	Mean	SD

Pain (VAS)	10	50	32.14	11.16
Flexibility (Ante)	-14	25	4.31	12.61
Flexibility (Dextro)	22	43	31.91	5.60
Flexibility (Sinistro)	22	42	32.48	6.19

Description:

Posttest results show a substantial reduction in pain intensity and improvements in lumbar flexibility, particularly in ante flexion.

3. Comparative Analysis (Pretest vs. Posttest)

The comparison between pretest and posttest scores reveals significant improvements following the intervention.

Table 3. Comparative Analysis (Pretest vs. Posttest)

Variable	Pretest Mean	Posttest Mean	Difference	Improvement (%)
Pain (VAS)	77.48	32.14	↓45.34	58.52%
Flexibility (Ante)	10.81	4.31	↓6.50	60.12%
Flexibility (Dextro)	35.21	31.91	↓3.30	9.37%
Flexibility (Sinistro)	34.95	32.48	↓2.47	7.06%

Description:

The most substantial improvement was observed in pain reduction (58.52%) and ante flexion flexibility (60.12%), while lateral flexion improvements were relatively smaller.

4. Inferential Analysis (Paired Sample t-test)

Statistical analysis using the paired sample t-test revealed a significant difference between pretest and posttest values ($p = 0.000$, $p < 0.05$) for both pain and flexibility variables. This indicates that the multimodal intervention had a statistically significant effect on reducing pain and improving lumbar flexibility.

Discussion

The present study demonstrates that a multimodal intervention combining trigger point therapy, deep tissue massage, and stretching produces significant improvements in patients with non-specific low back pain (NSLBP), as evidenced by reductions in pain intensity and enhancements in lumbar flexibility. The statistically significant decrease in Visual Analog Scale (VAS) scores ($p < 0.05$) indicates that the intervention effectively alleviates pain, while improvements in Fingertip-to-Floor Test (FTF) outcomes reflect increased functional mobility. These findings support the hypothesis that integrating multiple manual therapy techniques yields measurable clinical benefits, particularly in short-term rehabilitation contexts. The magnitude of pain reduction (58.52%) observed in this study suggests a strong therapeutic effect compared to baseline conditions, reinforcing the clinical relevance of multimodal approaches.

From a theoretical perspective, the observed outcomes can be explained through several physiological and neurobiological mechanisms. Trigger point therapy is known to reduce myofascial pain by releasing localized muscle tension and modulating nociceptive input through mechanisms such as the gate control theory and endogenous opioid release [14]. Deep tissue massage contributes by improving blood circulation, reducing muscle stiffness, and facilitating tissue recovery at deeper muscular layers [15];[16]. Meanwhile, stretching enhances muscle extensibility and viscoelastic properties, leading to improved range of motion and reduced mechanical stress on the lumbar region [17]. The integration of these modalities likely creates a synergistic effect, targeting multiple underlying causes of NSLBP simultaneously, including muscle tightness, reduced flexibility, and neuromuscular dysfunction.

The findings of this study are consistent with recent empirical evidence supporting the effectiveness of manual therapy and exercise-based interventions for LBP management. [5]reported that massage therapy significantly reduces musculoskeletal pain, while [6] demonstrated that deep tissue massage improves both pain and range of motion. Similarly, [18] found that stretching interventions significantly enhance flexibility and reduce instability in patients with LBP. However, unlike these studies, which primarily examined single modalities, the present study highlights the added value of combining multiple interventions within a single treatment session. This suggests that

multimodal therapy may provide more comprehensive and efficient outcomes, addressing the multifactorial nature of NSLBP more effectively than isolated treatments.

Despite the overall positive findings, the results also reveal variations in the degree of improvement across different flexibility measures. While ante flexion showed substantial improvement (60.12%), lateral flexion (dextro and sinistro) exhibited relatively smaller gains (9.37% and 7.06%, respectively). This discrepancy may be attributed to several factors, including differences in muscle group involvement, baseline functional limitations, and the specificity of the intervention techniques applied. Ante flexion movements are more directly influenced by posterior chain flexibility (e.g., hamstrings and erector spinae), which were extensively targeted during the intervention. In contrast, lateral flexion involves more complex neuromuscular coordination and may require more targeted or prolonged interventions to achieve significant improvements [19];[20].

Several factors may have contributed to the effectiveness of the intervention. First, the sequential application of trigger point therapy, deep tissue massage, and stretching likely enhanced tissue readiness, allowing subsequent techniques to be more effective. Second, the involvement of multiple muscle groups across the lumbar, pelvic, and lower extremity regions ensured a comprehensive treatment approach. Third, the duration of the intervention (approximately 50 minutes) may have been sufficient to induce acute physiological changes, such as increased circulation and reduced muscle tone. However, it is important to note that individual variability, including age, activity level, and severity of symptoms, may also influence treatment outcomes.

Nevertheless, this study has several limitations that should be considered when interpreting the findings. The use of a pre-experimental one-group pretest–posttest design without a control group limits the ability to establish causal relationships and increases the risk of internal validity threats, such as placebo effects and natural recovery. Additionally, the relatively small sample size (n = 21) restricts the generalizability of the results to broader populations. The short duration of the intervention also limits the ability to assess long-term effects and sustainability of the outcomes. Future research should consider employing randomized controlled trial (RCT) designs with larger sample sizes and longer follow-up periods to validate and extend these findings.

In terms of practical implications, the results of this study suggest that multimodal manual therapy can be an effective non-pharmacological intervention for managing NSLBP. Clinicians, physiotherapists, and sports therapists may consider integrating trigger point therapy, deep tissue massage, and stretching into a single treatment protocol to optimize patient outcomes. From a theoretical standpoint, this study contributes to the growing body of literature emphasizing the importance of multimodal and integrative approaches in musculoskeletal rehabilitation. It highlights the need for treatment strategies that address the complex and multifactorial nature of LBP rather than relying on single-modality interventions.

In conclusion, the findings of this study provide evidence that a multimodal intervention combining trigger point therapy, deep tissue massage, and stretching is effective in reducing pain and improving flexibility in patients with NSLBP. The results underscore the importance of integrated therapeutic approaches in addressing musculoskeletal disorders and offer a foundation for future research aimed at optimizing rehabilitation protocols and improving patient outcomes.

CONCLUSION

This study concludes that a multimodal intervention combining trigger point therapy, deep tissue massage, and stretching is effective in reducing pain intensity and improving lumbar flexibility in patients with non-specific low back pain, as evidenced by significant differences between pretest and posttest outcomes. These findings directly address the research objective and demonstrate that integrating multiple manual therapy techniques can produce meaningful clinical improvements within a short intervention period. Theoretically, this study contributes to the development of rehabilitation science by reinforcing the concept that low back pain management benefits from a multimodal and integrative approach targeting both neuromuscular and biomechanical factors. Practically, the results provide a relevant basis for clinicians, physiotherapists, and sports therapists to implement combined therapy protocols as a non-pharmacological strategy for managing low back pain. However, this study is limited by the use of a pre-experimental design without a control group, a relatively small sample size, and the absence of long-term follow-up, which may affect the generalizability and sustainability of the findings. Therefore, future research is recommended to employ randomized controlled trial designs

with larger and more diverse populations, incorporate long-term outcome measurements, and explore the optimization of intervention duration and intensity to further validate and expand upon these findings.

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AUTHOR CONTRIBUTION STATEMENT

The writing of this article involved roles in devising the research concept and design, reviewing and analyzing relevant literature, and drafting the overall manuscript

CONFLICT OF INTEREST AND FUNDING

There is no conflict of interest.

REFERENCES

[1] T. Zhou, D. Salman, and A. H. McGregor, "Recent clinical practice guidelines for the management of low back pain: a global comparison," *BMC Musculoskelet. Disord.*, 2024.

[2] J. P. Grenier and M. Rothmund, "A critical review of the role of manual therapy in the treatment of individuals with low back pain," *Journal of Manual and Manipulative Therapy*. 2024.

[3] H. Nakagawa *et al.*, "Effectiveness of manual therapy for patients with low back pain from the perspective of physical and psychosocial factors," *J. Phys. Ther. Sci.*, 2024.

[4] Z. Zeng *et al.*, "LAYER: A Quantitative Explainable AI Framework for Decoding Tissue-Layer Drivers of Myofascial Low Back Pain," *arXiv*, no. 412, pp. 1–27, 2025.

[5] S. Mak *et al.*, "Use of Massage Therapy for Pain, 2018-2023 A Systematic Review," *JAMA Netw. Open*, 2024.

[6] Ö. Bingölbali, C. Taşkaya, H. Alkan, and Ö. Altındağ, "The effectiveness of deep tissue massage on pain, trigger point, disability, range of motion and quality of life in individuals with myofascial pain syndrome," *Somatosens. Mot. Res.*, 2024.

[7] E. H. Delano, W. Kushartanti, N. I. Arovah, S. H. A. Shafi, and W. A. Nugroho, "A Comparison Between the Effectiveness of Tepurak Therapy Versus Deep Tissue Massage Stretching on Low Back Function in Nonspecific Low Back Pain," *Int. J. Ther. Massage Bodyw. Res. Educ. Pract.*, 2024.

[8] Priti Lendghar, S. Jeya Kumar, S Senthil Kumar, and Pubali Das, "Effectiveness of Maitland Manual Therapy Approach Mobilization with Aerobic Exercise in Patients with Chronic Low Back Pain," *Indian J. Physiother. Occup. Ther. - An Int. J.*, 2024.

[9] K. Kasimis, T. Apostolou, I. Kallistratos, D. Lytras, and P. Iakovidis, "Effects of Manual Therapy Plus Pain Neuroscience Education with Integrated Motivational Interviewing in Individuals with Chronic Non-Specific Low Back Pain: A Randomized Clinical Trial Study," *Med.*, 2024.

[10] O. Boukrina, N. E. Kucukboyaci, and E. Dobryakova, "Considerations of power and sample size in rehabilitation research," *International Journal of Psychophysiology*. 2020.

[11] M. Setia, "Methodology series module 5: Sampling strategies," *Indian J. Dermatol.*, 2016.

[12] A. Field, "Discovering statistics using IBM SPSS statistics (5th ed.). Sage Publications.," *Dk*, 2018.

[13] G. Shieh, "Effect size, statistical power, and sample size for assessing interactions between categorical and continuous variables," *Br. J. Math. Stat. Psychol.*, 2019.

[14] Y. Arun, Y. Joginder, and K. Sheetal, "A Comparative Study of Effectiveness between Myofascial Release and Pressure Release on Pain and Ankle Range of Motion in Adults with Soleus Myofascial Trigger Points," *Int. J. Orthop. Rehabil.*, 2022.

[15] Y. Koren and L. Kalichman, "Deep tissue massage: What are we talking about?," *Journal of Bodywork and Movement Therapies*. 2018.

[16] D. Arsovski, "Deep Tissue Massage Therapy: Effects on Muscle Recovery and Performance in Athletes," *Int. J. Ther. Massage Bodyw. Res. Educ. Pract.*, 2025.

[17] M. M. Jahromi, P. Vlček, and M. G. Lippertová, "Stretching exercises in managing spasticity: effectiveness, risks, and adjunct therapies," *European Journal of Translational Myology*. 2024.

[18] A. P. Oktarina, A. Kekalih, L. T. Mirtha, and Jason, "Stretching exercises for low back pain among dump truck operators in Indonesia," *Int. J. Occup. Saf. Heal.*, 2025.

[19] J. M. Jiménez-Ávila, E. N. Rubio-Flores, A. C. González-Cisneros, J. E. Guzmán-Pantoja, and E. A. Gutiérrez-Román, "Guidelines on the application of the clinical practice guideline on low back pain," *Cir. y Cir. (English Ed.*, 2018.

[20] J. L. Young, M. Shepherd, T. Dickson, and J. Todd, "Do clinical practice guidelines for low back pain include predatory journal or retracted publications? A meta-research study," *Musculoskelet. Sci. Pract.*, 2025.