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Original Article

Therapeutic Effect of Rigid Taping Versus Heat Therapy and Massage on Acute Non-Discogenic Low Back Pain and Functional Disability: A Randomized Controlled Trial

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ABSTRACT

Background: Acute non-discogenic low back pain is a common musculoskeletal condition associated with pain, restricted movement, and functional disability. Conservative physiotherapy interventions such as heat therapy, massage, and taping are frequently used for symptom management; however, comparative evidence regarding the short-term effectiveness of rigid taping versus conventional passive modalities remains limited. Objective: To compare the therapeutic effects of rigid taping with heat therapy combined with massage on pain intensity and functional disability in adults with acute non-discogenic low back pain. Methods: This parallel-group randomized controlled trial included 58 participants aged 20–50 years with acute non-discogenic low back pain of less than six weeks' duration. Participants were randomly allocated into two equal groups. Group A received rigid lumbar taping, while Group B received superficial moist heat therapy followed by therapeutic massage. Both interventions were administered three sessions per week for two consecutive weeks. Pain intensity was assessed using the Numeric Pain Rating Scale, and functional disability was measured using the Oswestry Disability Index. Data were analyzed using paired and independent-samples t-tests, with statistical significance set at $p \leq 0.05$. Results: Both groups showed significant post-treatment improvements. NPRS decreased from 7.12 ± 0.81 to 2.41 ± 0.95 in the rigid taping group and from 7.03 ± 0.76 to 4.10 ± 1.02 in the heat therapy plus massage group. ODI decreased from 36.18 ± 5.44 to 14.37 ± 4.91 and from 35.74 ± 5.28 to 22.48 ± 5.17, respectively. Between-group differences significantly favored rigid taping for both NPRS and ODI outcomes ($p = 0.001$). Conclusion: Rigid taping produced greater short-term reductions in pain intensity and functional disability than heat therapy combined with massage in adults with acute non-discogenic low back pain. Keywords: Acute low back pain; Non-discogenic low back pain; Rigid taping; Heat therapy; Massage therapy; Functional disability; Oswestry Disability Index.

INTRODUCTION

Low back pain is one of the leading contributors to disability worldwide and imposes a substantial clinical, occupational, and socioeconomic burden because of its high prevalence, recurrent course, and effect on daily functioning (1). Acute non-discogenic low back pain refers to localized mechanical pain between the lower costal margin and gluteal folds without clinical evidence of disc prolapse, radiculopathy, spinal fracture, infection, malignancy, inflammatory spinal disease, or other serious spinal pathology (2). Although many acute episodes improve within weeks, pain-related movement restriction, muscle guarding, reduced activity tolerance, and fear of aggravating symptoms may contribute to

functional limitation and delayed recovery if early management is inadequate (3). Because acute non-discogenic low back pain commonly affects adults during their productive years, interventions that can reduce pain while restoring functional activity are clinically important in physiotherapy practice (4).

Conservative management remains the first-line approach for most patients with acute mechanical low back pain, and commonly used interventions include education, activity modification, therapeutic exercise, manual therapy, electrotherapy, superficial heat, massage, and taping techniques (5). Superficial heat therapy and massage are frequently used in routine rehabilitation because they are accessible, inexpensive, and generally well tolerated. Heat therapy may reduce pain by increasing local circulation, improving tissue extensibility, decreasing muscle guarding, and modulating nociceptive input through thermal receptor stimulation (6). Massage therapy may further promote relaxation, improve soft-tissue mobility, reduce paraspinal muscle tension, and stimulate mechanoreceptors that inhibit pain transmission through spinal gate-control mechanisms (7). However, these interventions are largely passive and may provide mainly short-term analgesic or relaxation effects without directly addressing movement control, postural support, or mechanical loading patterns that contribute to symptoms in acute non-discogenic low back pain (8).

Taping techniques have gained increasing attention as adjunctive interventions in musculoskeletal rehabilitation because they may provide external support while allowing patients to remain functionally active (9). Rigid taping differs from elastic kinesiology taping because it uses non-elastic adhesive material to restrict excessive or painful movement, enhance segmental support, improve postural awareness, and reduce mechanical strain on pain-sensitive lumbar structures (10). Through external stabilization and proprioceptive input, rigid taping may help patients move with greater confidence, limit symptom-provoking trunk motion, and reduce protective muscle spasm during daily activities (11). These proposed mechanisms make rigid taping a potentially useful short-term intervention for acute non-discogenic low back pain, particularly when the therapeutic aim is not only pain reduction but also restoration of functional mobility (12).

Existing evidence suggests that taping interventions may produce short-term improvements in pain and disability among individuals with musculoskeletal and spinal pain conditions, but the quality and applicability of this evidence remain variable (13). Much of the available literature has focused on chronic nonspecific low back pain, kinesiology taping, or taping used as an adjunct to broader rehabilitation programs rather than rigid taping as a distinct intervention in acute non-discogenic low back pain (14). In addition, while heat therapy and massage remain widely used in clinical settings, comparative evidence is limited regarding whether a mechanically supportive intervention such as rigid taping provides greater improvement than passive modalities in patients with acute mechanical lumbar pain (15). This distinction is important because acute low back pain management increasingly emphasizes early functional recovery, movement confidence, and patient-centered disability outcomes rather than pain relief alone (16).

Functional disability is a key clinical outcome in acute low back pain because pain-related limitations in sitting, standing, walking, lifting, sleeping, and routine activity can directly affect quality of life and work participation (17). Therefore, evaluating both pain intensity and disability is necessary to determine whether an intervention produces clinically meaningful benefit beyond temporary symptom relief (18). Although previous studies and reviews support the potential role of non-pharmacological interventions in low back pain care, uncertainty remains regarding the comparative effectiveness of rigid taping versus commonly applied heat therapy and massage in acute non-discogenic low back pain (19). Addressing this evidence gap may help clinicians select low-cost, practical, and functionally oriented interventions for short-term rehabilitation in patients with acute mechanical low back pain (20).

Therefore, the present randomized controlled trial was designed to compare the therapeutic effect of rigid taping with heat therapy combined with massage on pain intensity and functional disability in adults with acute non-discogenic low back pain. The study population comprised adults with acute

localized non-discogenic low back pain, the intervention was rigid lumbar taping, the comparator was superficial heat therapy plus therapeutic massage, and the outcomes were pain intensity measured by the Numeric Pain Rating Scale and disability measured by the Oswestry Disability Index. The study hypothesized that rigid taping would produce greater short-term reductions in pain intensity and functional disability than heat therapy combined with massage after two weeks of treatment.

MATERIALS AND METHODS

This study was designed as a parallel-group randomized controlled trial to compare the short-term therapeutic effects of rigid lumbar taping with superficial heat therapy combined with therapeutic massage on pain intensity and functional disability among adults with acute non-discogenic low back pain. The trial was conducted at the Department of Physiotherapy and Rehabilitation, Rehman Medical Institute, Peshawar, over a six-month period. Eligible participants were recruited from patients presenting to the physiotherapy department with symptoms consistent with acute mechanical low back pain. The study followed a two-arm, 1:1 allocation design, with participants assigned either to the rigid taping group or to the heat therapy and massage group after completion of baseline assessment.

Participants were selected using a consecutive sampling approach, in which patients presenting during the recruitment period were screened for eligibility until the required sample size was achieved. Both male and female patients aged 20 to 50 years were eligible if they had acute non-discogenic low back pain of less than six weeks' duration, localized pain between the lower rib margin and gluteal folds, no radiating symptoms below the knee, and baseline pain intensity between 4 and 8 on the Numeric Pain Rating Scale. Participants were excluded if they had clinical evidence or history of lumbar disc prolapse, radiculopathy, spinal surgery, vertebral fracture, spinal tumor, spinal infection, inflammatory spinal disease, neurological deficit, lower-limb weakness, severe osteoporosis, systemic musculoskeletal disease, pregnancy, skin allergy or hypersensitivity to adhesive taping material, or concurrent participation in another physiotherapy rehabilitation program. These criteria were applied to ensure participant safety and to obtain a clinically homogeneous sample of patients with acute non-discogenic mechanical low back pain.

The sample size was calculated using G*Power version 3.1.9.4 for a two-tailed independent-samples comparison between two groups. The calculation was based on a large anticipated effect size of 0.80, an alpha level of 0.05, statistical power of 80%, and equal allocation between groups. The minimum required sample size was 26 participants per group. After adjustment for an anticipated 10% loss to follow-up, the final required sample size was increased to 58 participants, with 29 participants allocated to each group.

After eligibility screening, all participants received a detailed explanation of the study purpose, intervention procedures, expected duration, potential discomforts, confidentiality protections, and their right to withdraw at any stage without any effect on their clinical care. Written informed consent was obtained before enrollment. Each participant was assigned a unique identification code, and all data were recorded using structured data collection forms to maintain confidentiality and reduce recording error. Baseline demographic and clinical variables included age, sex, height, weight, body mass index, duration of symptoms, baseline pain intensity, and baseline functional disability. Body mass index was calculated from measured height and weight. Pain intensity and disability were assessed at baseline and after completion of the two-week intervention period.

Pain intensity was measured using the Numeric Pain Rating Scale, an 11-point patient-reported scale ranging from 0 to 10, where 0 indicates no pain and 10 indicates the worst imaginable pain. The scale is widely used in musculoskeletal rehabilitation and has acceptable validity and reliability for assessing pain intensity in adult clinical populations (21,22). Functional disability was measured using the Oswestry Disability Index, which evaluates limitations related to low back pain across activities such as pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, and travel. Higher

ODI scores indicate greater disability, and the instrument is commonly used for assessing low back pain-related functional limitation (23,24).

Following baseline assessment, participants were randomly allocated to one of two treatment groups using a computer-generated randomization sequence. Allocation concealment was maintained using sequentially numbered, sealed, opaque envelopes prepared by an independent researcher who was not involved in participant recruitment, treatment delivery, outcome assessment, or data analysis. After a participant completed baseline assessment and consent procedures, the corresponding envelope was opened to determine group assignment. Because of the visible and physical nature of the interventions, blinding of participants and treating physiotherapists was not feasible. However, outcome assessment and data analysis were performed by personnel blinded to group allocation to reduce assessment and analytical bias.

Participants allocated to Group A received rigid lumbar taping. The intervention was delivered by a licensed physiotherapist experienced in musculoskeletal rehabilitation and taping techniques. Before each application, the lumbar skin region was inspected for cuts, redness, rash, irritation, or hypersensitivity. The application area was cleaned with alcohol wipes to remove sweat and oil and to improve tape adhesion. Participants were positioned in a comfortable standing posture with slight lumbar extension during tape application. A non-elastic rigid adhesive tape was applied over the lumbar region using anchor strips followed by longitudinal, transverse, and diagonal stabilizing strips. The tape was placed along the lumbar paraspinal region from the lower thoracic area toward the sacral region with moderate tension to provide external mechanical support without restricting circulation or causing discomfort. Additional diagonal stabilization strips were used to support lumbar alignment and limit excessive painful movement during functional activity. After application, participants performed gentle trunk movements to ensure comfort and adequate support. The tape was kept in place for approximately 48 hours unless itching, skin irritation, discomfort, or loosening occurred. Tape removal and reapplication were performed during subsequent treatment sessions. The intervention was administered three times per week for two consecutive weeks, for a total of six sessions.

Participants allocated to Group B received superficial moist heat therapy followed by therapeutic massage. At the start of each session, participants were positioned in prone lying on a treatment couch, with a small pillow placed under the abdomen when needed to reduce lumbar stress. The lumbar region was exposed while maintaining privacy and comfort. Commercial hydrocollator moist hot packs wrapped in multiple towel layers were applied over the lumbar paraspinal region for 15 minutes. Skin sensation was checked before application, and participants were monitored during treatment for excessive heat, redness, discomfort, dizziness, or skin irritation. Immediately after heat therapy, therapeutic massage was administered over the lumbar paraspinal muscles for approximately 15 minutes. Massage techniques included effleurage using gentle longitudinal gliding strokes to promote relaxation and superficial circulation, petrissage using kneading and lifting movements to reduce muscle tightness and improve soft tissue mobility, and circular friction massage over areas of tenderness or muscle spasm. Massage pressure was adjusted according to participant tolerance and pain severity. This intervention was also administered three times per week for two consecutive weeks, for a total of six sessions.

Participants in both groups were advised to continue light daily activities within pain tolerance and to avoid heavy lifting, repetitive bending, sudden twisting movements, and strenuous physical exertion during the intervention period. To reduce performance bias, both interventions were delivered over the same total treatment duration and frequency. Treatment procedures were applied according to a standardized protocol, and outcome measures were collected at the same time points in both groups. Participants were asked to report discomfort, symptom aggravation, skin irritation, or any adverse response during the intervention period. Data collection forms were checked for completeness before

entry, and coded data were entered into Microsoft Excel before transfer to SPSS version 26 for statistical analysis.

Data analysis was performed using SPSS version 26. Continuous variables were summarized as mean and standard deviation, whereas categorical variables were summarized as frequencies and percentages. The Shapiro–Wilk test was used to assess normality of continuous outcome variables. Baseline comparability between groups was assessed for demographic and clinical variables. Within-group pre- to post-treatment changes in NPRS and ODI scores were analyzed using paired-samples t-tests for normally distributed data. Between-group comparisons were performed using independent-samples t-tests for post-treatment values and change scores, with statistical significance set at $p \leq 0.05$. Mean differences, 95% confidence intervals, and effect sizes were calculated to support interpretation of statistical and clinical relevance. The analysis included all participants who completed baseline and post-treatment assessments. Missing data were checked before analysis, and data consistency was reviewed through coded entry, range checks, and comparison of electronic records with original data collection forms.

Ethical approval was obtained from the Ethical Review Committee of Rehman Medical Institute before initiation of data collection. All participants provided written informed consent before enrollment. Participant confidentiality and anonymity were maintained throughout the study by using coded identifiers rather than personal information in the analytical dataset. Access to study data was limited to the research team, and all procedures were conducted in accordance with ethical principles for human participant research.

RESULTS

A total of 58 participants with acute non-discogenic low back pain were enrolled, randomized, and analyzed, with 29 participants allocated to the rigid taping group and 29 participants allocated to the heat therapy plus massage group. All participants completed the two-week intervention protocol and post-treatment assessment; therefore, the final analysis included 58 participants. Baseline demographic and clinical characteristics were comparable between groups, with no statistically significant differences observed for age, height, weight, body mass index, sex distribution, or symptom duration (all $p > 0.05$).

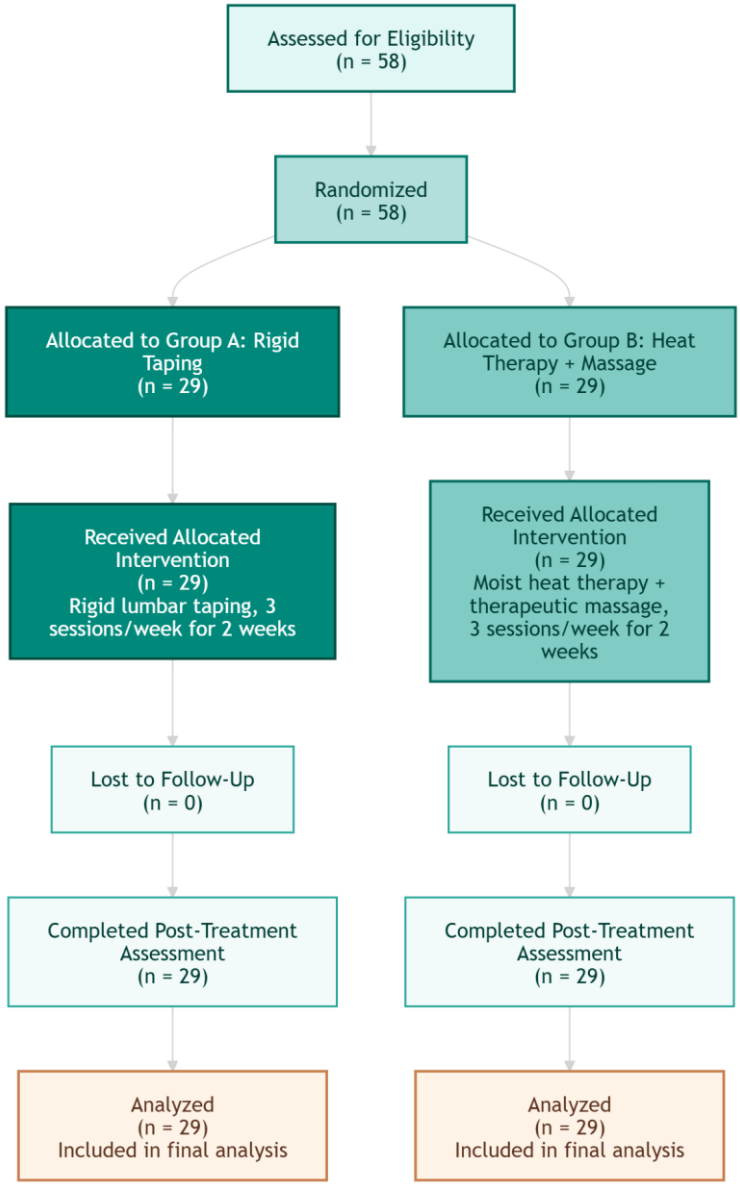

Figure 1. CONSORT Flow Diagram of Participant Enrollment, Allocation, Follow-Up, and Analysis

All 58 randomized participants completed the allocated intervention and post-treatment assessment; therefore, no participants were lost to follow-up, and all randomized participants were included in the final analysis.

Table 1. Baseline Demographic and Clinical Characteristics of Participants

Variable	Group A: Rigid Taping (n = 29)	Group B: Heat Therapy + Massage (n = 29)	Mean Difference / Group Difference	p-value
Age, years	34.21 ± 7.11	35.08 ± 6.89	−0.87	0.642
Height, cm	168.34 ± 8.54	167.71 ± 7.92	0.63	0.771
Weight, kg	71.45 ± 9.12	72.31 ± 8.77	−0.86	0.714
BMI, kg/m²	25.16 ± 2.43	25.71 ± 2.65	−0.55	0.419
Sex, male/female	17/12	16/13	—	0.792
Duration of symptoms, days	18.47 ± 6.13	19.02 ± 5.88	−0.55	0.731

The mean age was 34.21 ± 7.11 years in the rigid taping group and 35.08 ± 6.89 years in the heat therapy plus massage group, showing a small mean difference of −0.87 years that was not statistically significant ($p = 0.642$). Baseline anthropometric characteristics were also comparable, including height, weight, and BMI. The mean BMI was 25.16 ± 2.43 kg/m² in Group A and 25.71 ± 2.65 kg/m² in Group B, with no significant difference between groups ($p = 0.419$). Sex distribution was similar, with 17 males and 12 females in Group A compared with 16 males and 13 females in Group B ($p = 0.792$). Mean symptom

duration was 18.47 ± 6.13 days in Group A and 19.02 ± 5.88 days in Group B, indicating comparable clinical presentation before intervention (p = 0.731).

Table 2. Within-Group Comparison of Pain Intensity Measured by NPRS

Group	Pre-Treatment NPRS Mean ± SD	Post-Treatment NPRS Mean ± SD	Mean Reduction	95% CI for Mean Reduction	t-value	Effect Size, Cohen's dz	p-value
Group A: Rigid Taping	7.12 ± 0.81	2.41 ± 0.95	4.71	4.10 to 5.32	15.82	2.94	0.001
Group B: Heat Therapy + Massage	7.03 ± 0.76	4.10 ± 1.02	2.93	2.34 to 3.52	10.26	1.91	0.001

Pain intensity decreased significantly in both groups after two weeks of treatment. In the rigid taping group, mean NPRS decreased from 7.12 ± 0.81 at baseline to 2.41 ± 0.95 after treatment, producing a mean reduction of 4.71 points with a large within-group effect size (Cohen's dz = 2.94, p = 0.001). In the heat therapy plus massage group, mean NPRS decreased from 7.03 ± 0.76 to 4.10 ± 1.02, producing a mean reduction of 2.93 points with a large within-group effect size (Cohen's dz = 1.91, p = 0.001). Although both groups improved, the absolute reduction in pain was larger in the rigid taping group by approximately 1.78 NPRS points.

Table 3. Within-Group Comparison of Functional Disability Measured by ODI

Group	Pre-Treatment ODI Mean ± SD	Post-Treatment ODI Mean ± SD	Mean Reduction	95% CI for Mean Reduction	t-value	Effect Size, Cohen's dz	p-value
Group A: Rigid Taping	36.18 ± 5.44	14.37 ± 4.91	21.81	19.04 to 24.58	16.11	2.99	0.001
Group B: Heat Therapy + Massage	35.74 ± 5.28	22.48 ± 5.17	13.26	10.87 to 15.65	11.34	2.11	0.001

Functional disability improved significantly in both treatment groups. In the rigid taping group, mean ODI score decreased from 36.18 ± 5.44 before treatment to 14.37 ± 4.91 after treatment, corresponding to a mean reduction of 21.81 points and a large within-group effect size (Cohen's dz = 2.99, p = 0.001). In the heat therapy plus massage group, ODI decreased from 35.74 ± 5.28 to 22.48 ± 5.17, producing a mean reduction of 13.26 points with a large within-group effect size (Cohen's dz = 2.11, p = 0.001). The magnitude of functional improvement was greater in the rigid taping group, with an additional mean ODI reduction of approximately 8.55 points compared with heat therapy plus massage.

Table 4. Between-Group Comparison of Post-Treatment Outcomes

Outcome	Group A: Rigid Taping Mean ± SD	Group B: Heat Therapy + Massage Mean ± SD	Mean Difference	95% CI for Mean Difference	t-value	Effect Size, Cohen's d	p-value
Post-treatment NPRS	2.41 ± 0.95	4.10 ± 1.02	−1.69	−2.21 to −1.17	−6.52	1.71	0.001
Post-treatment ODI	14.37 ± 4.91	22.48 ± 5.17	−8.11	−10.76 to −5.46	−6.13	1.61	0.001

Post-treatment comparison demonstrated significantly better outcomes in the rigid taping group than in the heat therapy plus massage group. Mean post-treatment NPRS was 2.41 ± 0.95 in Group A compared with 4.10 ± 1.02 in Group B, giving a between-group mean difference of −1.69 points in favor of rigid taping. The effect size for post-treatment pain difference was large (Cohen's d = 1.71), and the difference was statistically significant (p = 0.001). Similarly, post-treatment ODI was 14.37 ± 4.91 in Group A and 22.48 ± 5.17 in Group B, producing a between-group mean difference of −8.11 points. This also represented a large treatment effect favoring rigid taping (Cohen's d = 1.61, p = 0.001).

Table 5. Comparative Magnitude of Clinical Improvement Across Outcomes

Outcome	Group A Mean Reduction	Group B Mean Reduction	Additional Improvement with Rigid Taping	Percentage Reduction in Group A	Percentage Reduction in Group B
NPRS	4.71 points	2.93 points	1.78 points	66.15%	41.68%
ODI	21.81 points	13.26 points	8.55 points	60.28%	37.10%

The comparative improvement pattern favored rigid taping across both outcomes. Pain intensity decreased by 66.15% in the rigid taping group compared with 41.68% in the heat therapy plus massage group, showing an additional 1.78-point improvement on the NPRS. Functional disability decreased by 60.28% in the rigid taping group compared with 37.10% in the heat therapy plus massage group, with an additional 8.55-point reduction in ODI. These findings indicate that both interventions were associated with meaningful short-term improvement, but rigid taping produced larger reductions in both pain intensity and disability after two weeks of treatment.

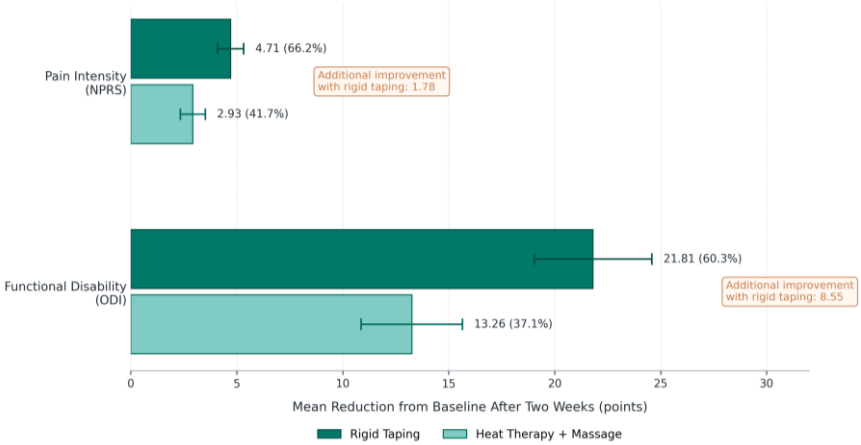

Figure 2. Clinical Improvement Gradient After Two Weeks of Treatment

Rigid taping produced a larger clinical improvement gradient than heat therapy plus massage across both outcomes. Pain intensity decreased by 4.71 NPRS points in the rigid taping group compared with 2.93 points in the heat therapy plus massage group, representing relative reductions of 66.2% and 41.7%, respectively. Functional disability showed a stronger treatment separation, with ODI decreasing by 21.81 points after rigid taping compared with 13.26 points after heat therapy plus massage, corresponding to relative reductions of 60.3% and 37.1%. The additional improvement associated with rigid taping was 1.78 NPRS points for pain and 8.55 ODI points for disability, indicating a consistent short-term advantage for the mechanically supportive intervention.

DISCUSSION

The present study demonstrated that both rigid taping and heat therapy combined with massage produced statistically significant short-term reductions in pain intensity and functional disability among adults with acute non-discogenic low back pain. However, the magnitude of improvement was greater in the rigid taping group across both primary clinical outcomes. Pain intensity decreased from 7.12 ± 0.81 to 2.41 ± 0.95 in the rigid taping group, whereas the heat therapy plus massage group improved from 7.03 ± 0.76 to 4.10 ± 1.02. Similarly, functional disability measured by the Oswestry Disability Index decreased from 36.18 ± 5.44 to 14.37 ± 4.91 following rigid taping, compared with a reduction from 35.74 ± 5.28 to 22.48 ± 5.17 after heat therapy and massage. These findings indicate that while both interventions were beneficial, rigid taping produced a larger short-term therapeutic effect on both pain and disability in patients with acute mechanical low back pain.

The greater reduction in pain observed after rigid taping may be explained by the mechanical and proprioceptive properties of non-elastic taping. Rigid tape provides external support to the lumbar region and may reduce excessive or painful trunk movement during functional activities. This external stabilization can decrease mechanical loading on pain-sensitive lumbar soft tissues and may reduce nociceptive stimulation during movement. In addition, tactile stimulation from tape applied over the

lumbar paraspinal region may enhance proprioceptive feedback and postural awareness, helping patients avoid positions or movement patterns that aggravate symptoms. These mechanisms are consistent with the findings of Bozkurt et al., who reported that rigid taping improved pain, postural stability, and functional performance in patients with mechanical low back pain (15). The present findings also align with Schmidt et al., who observed improved clinical outcomes when taping was combined with manual therapy in patients with nonspecific low back pain (16).

The improvement in functional disability was particularly important because acute non-discogenic low back pain affects not only pain perception but also daily activities such as standing, walking, bending, lifting, sitting, and sleep. The rigid taping group showed an ODI reduction of 21.81 points, compared with 13.26 points in the heat therapy plus massage group. This difference suggests that rigid taping may offer functional advantages beyond analgesia by supporting lumbar movement control and allowing patients to perform daily activities with less pain-related limitation. From a clinical perspective, the larger reduction in ODI in the rigid taping group indicates that the intervention may help patients regain activity tolerance during the acute phase, when movement avoidance and fear of symptom aggravation can contribute to persistent disability.

The findings are also supported by broader evidence on taping interventions in musculoskeletal rehabilitation. A systematic review by Sun and Lou reported that taping techniques may provide short-term improvement in pain and disability when used as an adjunct to physical therapy in low back pain populations (17). Similarly, Ahmed et al. found that dynamic taping produced short-term improvements in pain, disability, mobility, and kinesiophobia among individuals with chronic nonspecific low back pain (18). Although these studies differ from the present trial in taping type, population chronicity, and intervention context, they support the concept that external taping may influence pain, movement confidence, and functional performance. The present trial adds clinically relevant evidence by focusing specifically on rigid taping in acute non-discogenic low back pain and by comparing it with commonly used passive modalities.

Heat therapy and massage also produced significant improvements in pain and disability, which is consistent with their known physiological and analgesic effects. Moist heat may increase local blood flow, improve soft tissue extensibility, reduce muscle guarding, and decrease pain perception through thermal mechanisms. Massage may promote relaxation, reduce paraspinal muscle tension, enhance superficial circulation, and stimulate mechanoreceptors involved in pain modulation. These effects likely explain the improvement observed in the heat therapy plus massage group. However, the smaller magnitude of change compared with rigid taping suggests that passive symptom-relieving modalities may be less effective than interventions that also provide mechanical support and movement control. This interpretation is consistent with findings from studies and reviews reporting short-term benefits of massage and superficial heat for musculoskeletal pain, while also noting that these modalities may have limited influence on stabilization and long-term functional restoration when used alone (19–21).

The clinical relevance of the results is strengthened by the consistency of treatment effects across both outcomes. The rigid taping group achieved a 66.15% reduction in NPRS score and a 60.28% reduction in ODI score, whereas the heat therapy plus massage group achieved reductions of 41.68% and 37.10%, respectively. The additional improvement associated with rigid taping was 1.78 points on the NPRS and 8.55 points on the ODI. This parallel improvement in both pain and disability suggests that the benefit of rigid taping was not limited to symptom perception but also extended to functional recovery. For patients with acute non-discogenic low back pain, such combined improvement is clinically meaningful because early reduction in disability may support continued activity, prevent excessive rest, and reduce progression toward chronic pain-related limitation.

The results should be interpreted within the short-term context of the intervention. The treatment period lasted two weeks, and outcomes were measured immediately after completion of six treatment sessions. Therefore, the findings primarily support the short-term benefit of rigid taping rather than sustained

long-term effectiveness. It is possible that the mechanical support and sensory input provided by taping produced immediate or early improvements in pain and movement tolerance, but the persistence of these effects after tape removal or after return to unrestricted activity remains unknown. Longer follow-up would be needed to determine whether rigid taping has lasting effects on recurrence, work participation, physical activity level, or transition from acute to chronic low back pain.

Several methodological considerations are relevant when interpreting the findings. The trial included equal group allocation, baseline comparability between groups, standardized intervention frequency, and blinded outcome assessment and data analysis, which strengthened internal validity. However, participant and therapist blinding was not feasible because the interventions were visibly and physically different. This may have introduced performance or expectation effects, particularly because taping is a noticeable intervention that may increase patient confidence during movement. The study was also conducted in a single rehabilitation center with a modest sample size, which may limit broader generalizability. In addition, the study did not include a sham taping group, usual-care group, or longer follow-up period, so the specific contribution of mechanical taping effects cannot be fully separated from contextual or placebo-related effects.

Despite these limitations, the findings have practical implications for physiotherapy management of acute non-discogenic low back pain. Rigid taping is relatively low-cost, non-invasive, easy to apply in clinical practice, and capable of providing continuous support during daily activities between treatment sessions. Compared with heat therapy and massage, which mainly provide treatment-session-based symptom relief, rigid taping may extend therapeutic support into functional contexts by limiting painful movement and enhancing postural awareness. These characteristics make rigid taping a potentially useful adjunct in short-term rehabilitation, particularly for patients who experience pain during movement or require additional support to remain active during the acute phase.

Future clinical trials should use larger multicenter samples, longer follow-up periods, and more robust comparator groups, including sham taping or exercise-based rehabilitation, to clarify the independent and sustained effects of rigid taping. Further studies should also incorporate baseline-adjusted analyses, effect sizes, confidence intervals, adverse-event reporting, patient satisfaction, activity-level measures, and objective functional or biomechanical outcomes. Investigating whether rigid taping is most effective in specific subgroups, such as patients with high movement-related pain, postural instability, occupational loading exposure, or fear-avoidance behavior, would help refine clinical decision-making. Overall, the present findings suggest that rigid taping offers greater short-term improvement than heat therapy combined with massage for reducing pain intensity and functional disability in acute non-discogenic low back pain.

CONCLUSION

Rigid taping and heat therapy combined with massage both produced significant short-term reductions in pain intensity and functional disability among adults with acute non-discogenic low back pain; however, rigid taping demonstrated greater clinical improvement across both outcomes after two weeks of treatment. The rigid taping group showed larger reductions in NPRS and ODI scores, indicating that external lumbar stabilization, proprioceptive facilitation, and postural support may provide additional therapeutic benefit beyond the analgesic and muscle-relaxing effects of heat therapy and massage alone. These findings support rigid taping as an effective, low-cost, non-invasive adjunctive physiotherapy intervention for short-term management of acute non-discogenic low back pain and associated disability, particularly when the clinical goal is to reduce pain while improving functional activity.

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