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Effects of manual therapy and inclined board standing on low back pain: a pilot study

Muhammad Hafeez [a], Muhammad Zia Ul Haq [b], Shabana Rahim [c]

[a] *Director, Physical Therapy, Department of Agile Institute of Rehabilitation Sciences, Bahawalpur / PhD Scholar, Lincoln University College Malaysia.*

[b] *Chairman, Department of Physical Education and Sports Sciences, The Islamia University of Bahawalpur /PhD Sciences, Lincoln University College Malaysia.*

[c] *Senior Lecturer, Agile Institute of Rehabilitation Sciences, Bahawalpur.*

Correspondence: muhammad.zia@iub.edu.pk@gmail.com*

ABSTRACT

BACKGROUND & OBJECTIVES: Low back pain (LBP), particularly of a mechanical nature, affects approximately 577 million people worldwide, with its incidence expected to increase due to the aging population. This study aims to assess the impact of Manual Therapy and Inclined Board Standing on LBP management.

METHODOLOGY: This pilot study involved 10 patients (6 females, 4 males) aged 18-65 with LBP. Participants were randomly assigned to two groups: Group A received manual therapy with passive hip lateral rotator stretching and inclined board standing, while Group B received routine medication and inclined board standing. Data were collected at baseline, one week, and two weeks after the intervention. Pain, disability, and quality of life were measured using the NPRS, ODI, and SF-12. Ethical approval and informed consent were obtained.

RESULTS: This pilot study included 10 participants (5 per group), aged 18–65 years, with a female-to-male ratio of 60:40, and a marital status distribution of 60% unmarried and 40% married. Table II presents within-group comparisons, showing significant improvements in pain and disability in Group B, while Group A showed non-significant improvements across all outcomes. The paired-samples t-test revealed that pain levels significantly decreased ($t(9) = 7.97$, $p < 0.001$), disability (measured by ODI) reduced significantly ($t(9) = 3.86$, $p = 0.004$), and quality of life scores improved significantly ($t(9) = 3.67$, $p = 0.005$), indicating the treatment's effectiveness in enhancing clinical outcomes.

CONCLUSION: Manual therapy, passive stretching, and inclined board standing are more effective than inclined board standing alone in managing low back pain and improving lumbar spine function.

KEY WORDS: Inclined Board, Low Back Pain, Manual Therapy.

INTRODUCTION

LBP, particularly the mechanical type, has been documented as an issue of international concern inasmuch as disability and economic loss within short /long-term disability are concerned. As current statistics indicate, LBP affects approximately 577 million people worldwide in 2017, and global incidence and demand are predicted to rise due to changes in aging populations [1]. LBP is most prevalent in workers within the age range of 50-54, and 71% of the years lost due to disability affect this productive population [2].

Meta-analysis provided evidence that both sexes, yet females gain more morbidity from LBP, and, importantly, the highest incidence is demonstrated in the adult working-age populace [3,4]. Additionally, research indicates that the occurrence of LBP is recurrent, with nearly 69% of the population experiencing a similar episode within a year after the first occurrence [5]. Despite these pharmacoeconomic costs, LBP can lead to increased healthcare service consumption, including treatment, and reduced productivity, which manifests, among other factors, as a greater proportion of indirect costs than direct costs, especially in high-income countries [6].

Consistent with the biopsychosocial model, the management of LBP pays close attention to biological, psychological, and social aspects. A similar approach has the potential to enhance outcomes and reduce the costs of LBP [7]. Most current recommendations for patients with FMS emphasize the use of non-pharmacologic therapies, including physical therapy, and educate them about self-care since a combination approach may help to improve long-term outcomes and avoid relapse [8].

The line of gravity should be positioned to address spinal imbalance issues, particularly in the sagittal plane. This

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line must be at the base of support for a balanced person and in an ergonomic position. This line must lie inside the base of support, as indicated by the location of the two feet on the ground, for a person to be balanced and in an ergonomic position. Compensation is necessary when the line of gravity departs from this basis, and different systems may be activated to rectify any inclination toward forward imbalance [9].

When the posterior spinal muscles are contracted, the trunk is raised vertically, requiring the spinal muscles to make an uncomfortable and unusual effort to prevent the trunk from collapsing. A painful pelvic retroversion around the femoral heads can also result from excessive strain on the posterior aspects [10].

The extension reserve, typically 10 degrees, is the upper limit of hip hyperextension. In extreme cases, knee flexion is regulated by the quadriceps [11,12]. The primary goals of mobilization are to temporarily relieve pain and restore functional movements by allowing the joint to regain its full range of movement. Musculoskeletal dysfunction is treated by joint mobilization [13]. At the corresponding joint, mobilization returns the range of motion to normal [14].

Through pain gating, the process of activating mechano-receptors through mobilization results in temporary pain relief [15]. Mobilization occurs through the activation of the descending pathways, also known as pain-inhibitory pathways, which originate in the midbrain and extend to the spinal cord [16]. Studies have demonstrated a tendency for the brain areas responsible for central pain processing to inhibit activity throughout these descending routes and during mobilization [17].

The closed-chain arrangement is designed to maximize the capacity of restricted muscles to be stimulated. To concentrate on the muscle of interest, this involves positioning the extremities in a closed-chain posture, enhancing normal activation patterns, and reducing anticipatory muscle activation. A logical transformation of therapies, concentrating on adaptability, stamina, body awareness, and tolerance, with connected kinetic chain components, can address the impairments [12].

Mobilizations are passive movements that can be classified into two categories: physiological and accessory [12]. The closed-chain arrangement is designed to maximize the capacity of restricted muscles to be stimulated. This entails placing the extremities in a closed-chain position, reinforcing typical activation patterns, and minimizing anticipatory muscle activation to focus on the targeted muscle. A logical transformation of therapies, focusing on adaptability, stamina, body awareness, and tolerance, with interconnected kinetic chain components, can be used to address impairments [18].

The primary aim of mobilization is to relieve the pain for a shorter duration of time, which leads to functional improvement by restoring the full range at the joint. Joint mobilization is a technique used to treat musculoskeletal dysfunction [19]. Mobilization restores the normal range of motion at the respective joint [20].

This pilot study aims to assess the efficacy of manual therapy and inclined board standing in the treatment of low back pain (LBP). This study aims to assess the efficacy of manual therapy and investigate the impact of standing on an inclined board on the treatment of lower back pain.

Research on the combined benefits of manual treatment and inclined board standing for lower back pain is limited. This study fills the knowledge gap by providing details on a potentially comprehensive strategy for managing LBP. It also establishes the framework for the next, more extensive studies that may contribute to the development of clinical practice recommendations and enhance patient care. This study aims to assess the impact of Manual Therapy and Inclined Board Standing on LBP management.

METHODOLOGY

This RCT's pilot study included a total of 10 subjects, both male and female, aged between 18 and 65 years, with a diagnosis of low back pain. The subjects were selected after approval from the Institute Research Committee of the Agile Institute of Rehabilitation Sciences, Bahawalpur, with reference number No. AIRS/IRC/PT-01. The inclusion criteria for the study required participants to have the capacity and willingness to visit the clinic three times, with each visit lasting approximately sixty minutes. Participants had to have experienced recurrent low back pain for more than three months, with or without radiating pain into the lower limbs, and a low back pain score of at least 3/10 on the Numerical Pain Rating Scale (NPRS) and less than or equal to 9/10, 10/10.

The exclusion criteria for the trial were also clearly defined. Subjects who did not provide informed consent, were pregnant, had a previous history of spine surgery, or were previously diagnosed with non-inflammatory or inflammatory joint diseases were excluded. The presence of red flags that required further investigation, cautionary and warning neurological signs, or an inability to participate in the study and exercise program were also grounds for exclusion. Participants who had previously or were currently participating in a physical therapy exercise plan or physical fitness plan were also excluded.

The independent variables in this study included Kaltenborn mobilization, passive stretching of hip lateral rotators, inclined board standing, age, gender, occupation, body mass index, marital status, and socioeconomic status. Treatment Group A received manual therapy combined with passive stretching of hip lateral rotators, along with inclined board standing, administered three times a week for two weeks. Treatment Group B received routine medications along with inclined board standing, which was also administered three times a week for two weeks.

The dependent variables in this study were pain, disability, daily life functions, and quality of life associated with lower back pain. Using the Numeric Pain Rating Scale, patients assess their pain intensity by marking a position between 2 (mild pain) and 10 (most severe pain possible) on an 11-point rating scale. The NPRS scale demonstrates outstanding reliability alongside strong validity, with test-retest results achieving an ICC = 0.93 [21].

Empirically evaluated by the Oswestry Disability Index (ODI), this tool measures the impact of low back pain on patient disability for everyday functions. The gold standard for assessing low back pain uses the ODI due to its 10-item format and excellent reliability (Cronbach's $\alpha = 0.89$), along with strong construct validity [22].

The SF-12 Health Survey evaluates health quality of life through physical and mental health aspects. Life quality assessment using this condensed SF-36 version displays strong internal consistency among diverse population groups with a Cronbach's alpha value ranging from 0.71 to 0.93 [23]. The evaluation method reveals significant aspects of how low back pain influences total health outcomes.

The effectiveness of the two distinct therapies was assessed over the course of two programs using a prospective repeated-measure method. Every reading was collected three times: once at baseline (pretest), and once after the one week of treatment, and once more following the final treatment session, or two weeks later (post-test). The ethical research committee gave its approval to the project. To compute the sample size and assess the variation in pain between age groups, 10 patients (5 in each group) were used. The numeric pain rating scale (NPRS-11-point rating scale) was utilized.

Every patient was selected from the physical therapy department of the Agile Rehabilitation Complex in Bahawalpur. The SF-12 is a self-reported outcome measure tool that evaluates how a person's health impacts their everyday life. All individuals were assessed using pretest measures, which included the Numeric Pain Rating Scale to measure pain and the Oswestry Disability Index to assess functional impairment. Ten subjects (six females and four males) participated in the study for a period of two weeks. After fulfilling the inclusion criteria, participants attended the pretest screening examination. After pretest screening, treatment was given to the selected patients, and then follow-up was conducted with every patient. Every patient attended three sessions per week for two weeks. After two weeks, a final follow-up was conducted with each patient.

Treatment Group A: 5 participants (females = 3, males = 2) received manual therapy to the lumbar spine along with the passive stretching of the hip lateral rotators for 2 weeks (3 sessions/week). Each patient received 30 30-minute sessions. Kaltenborn mobilization was administered to the patients, targeting the specific area examined during the baseline assessment. The patient was in a side-lying position. Therapist stood behind the back of the patient, gave the grade I and II Kaltenborn mobilization (PA glide and lateral to medial glide) for the pain management and grade III for the range of the motion along with the passive stretching to the lateral rotators of the hip joint (i-e gluteus medius, piriformis muscle, TFL, inferior and superior gemelii and obturator internus and externus muscles). Oscillatory and sustained type mobilization was performed in the area of restriction. Three sessions per week were given over a period of 2 weeks.

Treatment Group B: 5 participants (3 females, 2 males) received 1 minute of inclined board standing. Feet are placed at a 35–45-degree angle over the inclined board for a period of 1 minute, along with the routine medications.

The intra-class correlation coefficient (ICC), used to assess the intra-rater dependability of the measures, was calculated with 95% confidence intervals for the absolute difference between trials. The impact of the intervention was compared before and after using the Paired Samples Test. The effects of manual therapy, passive hip abductors stretching, and inclined board standing were used in the case of chronic Nonspecific lower backache in order to compare changes in a few dependent variables between an interventional group with two levels (manual therapy, inclined board standing, and passive hip abductors stretching) and one within the factors of (time)-pre versus post.

Using SPSS version -26, a Paired-Samples t-Test was used to check the significance of Pain, Disability (ODI), and Quality of Life (QOL) before and After Treatment.

RESULTS

This pilot study involved 10 participants, with 5 in each treatment group, and had a mean age range of 18 to 65 years. There were 6 (60%) females and 4 (40%) males, with 2 males in each group and 3 females in each treatment group, and 4 (40%) participants were married and 6 (60%) were unmarried. They belonged to different occupations (Table-I).

Table- II shows that both groups experienced improvements in pain, disability, and quality of life after the intervention. Group B showed statistically significant reductions in pain ($p = 0.025$) and disability ($p = 0.033$), while changes in Group A were not statistically significant. The quality of life improved in both groups, but the difference did not reach significance ($p = 0.070$).

A paired-samples t-test was conducted to assess the effect of treatment on three variables: pain (NPRS), Oswestry Disability Index (ODI) for disability, and quality of life (QOL) before and after treatment. The analysis revealed significant improvements across all measures. For pain, there was a substantial reduction in mean scores post-treatment, with a mean difference of 1.70 (SD = 0.67) and a 95% confidence interval (CI) ranging from 1.22 to 2.18. This reduction was statistically significant, $t(9) = 7.97$, $p < .001$, indicating a strong decrease in pain levels following treatment.

In terms of disability (ODI), the mean score also decreased significantly after treatment, with a mean difference of 0.90 (SD = 0.74) and a 95% CI of 0.37 to 1.43. The paired t-test results, $t(9) = 3.86$, $p = .004$, indicate that treatment was effective in improving participants' functional ability and reducing disability.

Finally, physical component of quality of life (QOL) showed significant improvement after treatment, with a mean difference of 0.60 (SD = 0.52) and a 95% CI between 0.23 and 0.97. This change was statistically significant as well, t(9) = 3.67, p = 0.005, demonstrating a positive effect of the treatment on participants' overall quality of life. Collectively, these results indicate that the treatment had a beneficial impact on pain, disability, and quality of life among participants (Table-III).

Table-I: Univariate analysis of demographic variables.

Variable	Category	Group A n(%)	Group B n(%)
Marital Status	Married	2(40)	2(40
	Unmarried	3(60)	3(60)
Gender	Male	2(40)	2(40)
	Female	3(60)	3(60)
Age Group (Years)	18–30	2(40)	4(80)
	31–42	2(40)	1(20)
	43–65	1(10)	0(0.0)

Table II: Comparison of pre and post-intervention outcomes within groups a and b.

Outcome Variable	Group	Pre Mean ± SD	Post Mean ± SD	Mean Difference	t-value	P-value
Pain	Group A	2.20 ± 0.45	0.20 ± 0.45	2.00	Not computed*	(due to SE = 0)
	Group B	1.80 ± 0.45	0.40 ± 0.55	1.40	3.500	0.025
Disability	Group A	1.60 ± 0.55	1.00 ± 0.00	0.60	2.449	0.070
	Group B	2.20 ± 0.84	1.00 ± 0.00	1.20	3.207	0.033
Quality of Life	Group A	1.60 ± 0.55	1.00 ± 0.00	0.60	2.449	0.070
	Group B	1.60 ± 0.55	1.00 ± 0.00	0.60	2.449	0.070

Table-III: Results for pain, disability (ODI), and physical component of Quality of Life (QOL) before and After treatment.

Outcome Variable	Pre Mean ± SD	Post Mean ± SD	Paired Differences (before vs. after)			t-value	P-value
			Mean±SD	95% Confidence Interval			
				Lower	Upper		
Pain	2.0±.47	0.30±.48	1.70±0.6749	1.22	2.18	7.97	≤0.001
Disability	1.90±.73	1.0±.00	0.90±0.74	0.37	1.43	3.86	0.004
Quality of Life	1.6±.51	1.0±.00	0.60±0.52	0.23	0.97	3.67	0.005

The table shows the mean scores and standard deviations of the initial (pain, disability, and quality of life or QOL (QOL before Intervention) and post-intervention (after training) of Group A (Manual therapy + inclined board standing) and Group B (control or comparison group). In the table, mean differences were computed along with their t-values and the corresponding p-values obtained from paired t-tests, which were used to determine the statistical significance of the change in each group. The comparisons made were statistically significant at a p-value of less than 0.05. The findings indicate that Group B exhibited an overall significant effect with regard to both pain and disability. Group A improved clinically, although the difference was not considerable on a statistical basis due to the limitation in the number of subjects, which led to lower statistical power.

DISCUSSION

The results of this pilot study suggest that the subjects in treatment group A, who received Kaltenborn mobilization in combination with inclined board standing, improved to a greater degree than the subjects in treatment group B, who only performed inclined board standing with routine medication. Thus, the present study suggests that, in contrast to supervised stretching exercises of the lumbar paraspinal muscles reported in other clinical studies, combining manual therapy with passive hip abductor stretching may be more beneficial for pain and function of the lower back. However, the effectiveness for pain management, disability, and quality of life was found to be similar in both treatment groups, implying that inclined board standing also gave positive results.

The results echo current literature that suggests manual therapy results in a larger percentage of improvements in pain and disability than exercise therapy alone in chronic LBP patients [21]. This is in concordance with the observed trends in pain indices: in group A, with complex treatment regimens, the recorded changes may illustrate the effectiveness of integrated care for patients with LBP. Additionally, there is the standing inclined board exercise, which has been observed to correct posture and shift the center of gravity, a crucial aspect of managing pain and functional changes [24].

In support of this study, research carried out among stroke patients in Japan revealed that inclined board standing is safe and effective in improving walking status by changing the centre of Gravity as a result of mobility impairment [25].

In addition, the stretching of the iliotibial band that integrates tendons from the tensor fasciae latae and gluteus maximus produces a highly positive effect on LBP. A similar

comparative analysis on CLBP patients confirmed this, with stretching and soft tissue releasing therapy, which involves the IT also easing pain in the lower back area [26].

RECOMMENDATIONS

To determine the effects of combining manual therapy, passive hip lateral rotator stretching, and inclined board standing than inclined board standing and routine medical treatment (if any) in patients with low back pain, prospective studies are necessary to monitor long-term results.

CONCLUSION

By comparing the Standard Error of Mean (SEM) between the groups, this study revealed that treatment group A showed greater improvement than treatment group B in terms of pain. This research has shown that manual therapy, passive stretching of the hip abductors, and inclined board standing are more effective than inclined board standing alone and routine medications in managing mechanical lower back pain and lumbar spine function.

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DISCLAIMER: This pilot study conducted prior to a related randomized controlled trial that has already been published elsewhere.The decision to publish it as a Brief Report ensures transparency and adherence to ethical publication standards.

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Muhammad Hafeez : Substantial contributions to the conception , design,and the acquisition of data for the work.
Muhammad Zia Ul Haq: Interpretation of data , and drafting the work.
Shabana Rahim: Reviewing it critically for important intellectual content.