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Comparison between Effect of Static Stretching Exercise versus IASTM on Erector Spinae and Lumbar Multifidus in Non-Specific Chronic Low Back Pain: A Pilot Study

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ABSTRACT

Background: Non-specific chronic low back pain (NSCLBP) is a prevalent condition often lacking identifiable pathoanatomical causes. Despite various treatment modalities, limited evidence exists comparing the effects of static stretching and Instrument-Assisted Soft Tissue Mobilization (IASTM) on muscle-specific outcomes in NSCLBP.
Objective: To assess and compare the effects of static stretching exercises and IASTM on pain and spinal flexibility in individuals with non-specific chronic low back pain, with a control group receiving core strengthening and hot pack therapy.
Methods: A pretest-post-test control group design was employed with 21 participants aged 25–28 years, randomly assigned into three groups: Group A (static stretching), Group B (IASTM), and Group C (control group with core strengthening and hot pack therapy). Interventions were administered thrice weekly for four weeks. Pain intensity and spinal flexibility were measured pre- and post-intervention using the Numeric Pain Rating Scale (NPRS) and Finger-to-Floor Distance (FFD), respectively. Data were analysed using ANOVA and paired t-tests, with significance set at $p < 0.05$.
Results: All groups showed statistically significant improvements in pain and flexibility within-group ($p < 0.05$). However, ANOVA revealed no significant differences between groups post-treatment for either pain or flexibility ($p > 0.05$). Tukey's post-hoc analysis indicated that Group C exhibited the greatest reduction in pain, while flexibility improvements were comparable across all groups.
Conclusion: Static stretching, IASTM, and core strengthening with hot pack therapy each significantly reduced pain and improved flexibility in patients with NSCLBP. While no statistically significant differences were observed between the interventions, core strengthening combined with hot pack therapy (Group C) showed a greater reduction in pain, suggesting its potential efficacy as a cost-effective treatment option for NSCLBP.

Key words: non-specific chronic low back pain; soft tissue mobilization; static stretching; flexibility, range of motion.

INTRODUCTION

Although the exact mechanisms underlying the prevalence of non-specific low back pain (NSLBP) remain unclear, it is a common condition. NSLBP is something that most people encounter more than once in their lifetime.[1] Due to the balance of the posterior structures, including the erector spinae and ligaments, CLBP patients experience discomfort when bending forward and backward.[2] Patients with CLBP complained of internal muscle weakness, pain from shortening, and neuromuscular problems.[3] Even though there are many pathological conditions that can cause LBP, it has been shown that 85% of them do not have any pathoanatomical or radiological abnormalities.[4]

Joint and muscle extensibility are essential determinants of physical function and, thereby, essential determinants of maintaining independent activities of daily living.[5] Although current evidence shows a clinically relevant effect of acute stretching on musculoskeletal, neuropathic and nociplastic pain, there is limited and conflicting knowledge of the effect of regular stretching exercises on regional and widespread pain sensitivity. If stretching exercises can reduce pain sensitivity over time, it would allow an additional low-cost and -risk treatment option for patients experiencing pain.[6,7]

However, applying stretching exercises for pain management in different patient populations requires understanding the mechanisms underlying the potential change in pain. Static stretching is presented as a safer and more effective method because it does not exceed the normal range of motion of joints. It does not require a high level of fitness, and causes less muscle pain.[8]

Recently, instrument-assisted soft tissue mobilization (IASTM) has received much attention because it uses to treat musculoskeletal condition and help to improve the healing soft tissues.

Instrument-assisted soft tissue mobilization (IASTM) is based on tools, which can prevent the extra force being applied by the practitioners and offers early rehabilitation compared to manual therapy.[9] It is a new version of treatment for muscular pain and disability. It is dependent on tools, as described by Cyriax in 1982. It is based on the concept of applying pressure with specific shaped tools for tight muscles, tendons, and contracting structures. These tools are adaptive to different anatomical shapes of the structures where pressure is to be applied.[10] When a stimulus is applied to the injured soft tissue using an instrument, the activity and the number of fibroblasts increase, along with fibronectin, through localized inflammation, which then facilitates the synthesis and realignment of collagen is one of the proteins that makes up the extracellular matrix.[11]

The available literature lacks any comparative study of comparative effect of static stretching exercises and IASTM on erector spinae and lumbar multifidus in non-specific chronic low back pain with control group in a single study with consistent statistical calculations, which would allow for a reliable assessment of the studied treatments and their comparison to one another, and in relation to a representative control group. Therefore, the aim of this study was to assess the comparative effects of static stretching exercises and IASTM on erector spinae and lumbar multifidus in treating non-specific chronic low back pain. The study assesses the effect of static stretching and IASTM on muscles for reduction of pain, increasing strength and flexibility.

METHODS

Study Design and Setting

This study employed a Pretest-Post-test Control Group Design. Ethical approval was obtained from the Research Ethical Committee (REC) of Baba Mastnath University (REC number: BMU/FPT/2024/215). The study was conducted at SBMN Hospital, Baba Mastnath University, Asthal Bohar, Rohtak.

Participants

Male and female participants aged 25 to 28 years with chronic low back pain (LBP) persisting for more than 12 weeks and a Numeric Pain Rating Scale (NPRS) score between >4/10 and <7/10 were included.

Exclusion criteria: Participants with a history of lumbar canal stenosis, spondylolisthesis, spinal surgery for disc herniation, spina bifida, or spinal stenosis were excluded. Additionally, individuals with spinal fractures within the past six months, spinal pathologies such as tuberculosis, tumours, or osteoporosis, spinal cord injuries, or hip joint-related pathological conditions were not included in the study.

Sample size

The study's sample size was determined utilizing a calculated formula, taking into account

Z (α/2) = For 5 % significance level = 1.96,

Z (1-β) = For 80 % power of

study = 0.84.

d = mean difference of one same variable from previous study, σ =

difference of standard deviation from previous study.

N = (2 * (Zα/2 + Z1-β)^2 * σ^2) / Δ^2

A sample size of 21 was calculated using the formula. 7 subjects were taken in each group.

Randomization and Intervention

A total of 21 participants with non-specific chronic low back pain were selected using convenience sampling, following predefined inclusion and exclusion criteria. After obtaining informed consent, participants were randomly assigned to one of three groups: Group A (n = 7) received static stretching exercises, Group B (n = 7) underwent Instrument-Assisted Soft Tissue Mobilization (IASTM), and Group C (n = 7, Control) performed core strengthening exercises along with hot pack therapy. The intervention was administered by the investigator, with sessions conducted three times per week for four weeks, each lasting one hour.

Outcome Measures

Pain intensity and spinal flexibility were assessed at baseline and at the end of the fourth week using:

- Numeric Pain Rating Scale (NPRS) for pain assessment
- Finger-to-Floor Distance (FFD) for spinal flexibility

STATISTICAL ANALYSIS

Data were analysed using Analysis of Variance (ANOVA) to compare changes in pain and spinal flexibility between the groups before and after the intervention. Within-group comparisons were performed using a paired t-test. Statistical significance was set at $p < 0.05$.

RESULT

Demographic characteristics of the participants -

The mean age and SD of participants in Groups A, B and C were 26.71 and 1.799, 27.29 and 2.138, 27.00 and 2.160 respectively. All groups did not differ significantly in age.

Table 1 Demographic Characteristics of the Participants

ANOVA	Variables		
	AGE		
	Group A	Group B	Group C
Mean	26.71	27.29	27.00
S.D.	1.799	2.138	2.160
F test	0.137		
Table Value at 0.05	3.040		
P value	0.872^{NS}		

^{NS}= not significant

Table 2 Gender distribution

Gender	Group A	Group B	Group C
Male (%)	4.3%	4.3%	4.3%
Female (%)	5.7%	5.7%	5.7%
Male (F)	3	3	3
Female (F)	4	4	4

The gender distribution across the three groups (A, B, and C) is well-balanced, with each group comprising a similar proportion of males (4.3%) and females (5.7%). Specifically, each group consists of three males and four females. This ensures that the groups are comparable in terms of gender composition, with no significant differences among them.

Table 3. Comparison between the pre- post-treatment assessments of Pain-NPRS

Pain	Group A		Group B		Group C		F-	p-value
	Mean	SD	Mean	SD	Mean	SD		
Pre	5.71	1.113	6.00	0.816	5.14	1.069	1.113	0.271^{NS}
Post	3.71	0.756	3.86	0.690	4.29	1.113	0.812	0.445^{NS}
t	9.17		4.22		3.29			
p-value	0.00*		0.01*		0.02*			

^{NS}= Not significant, *= Significant

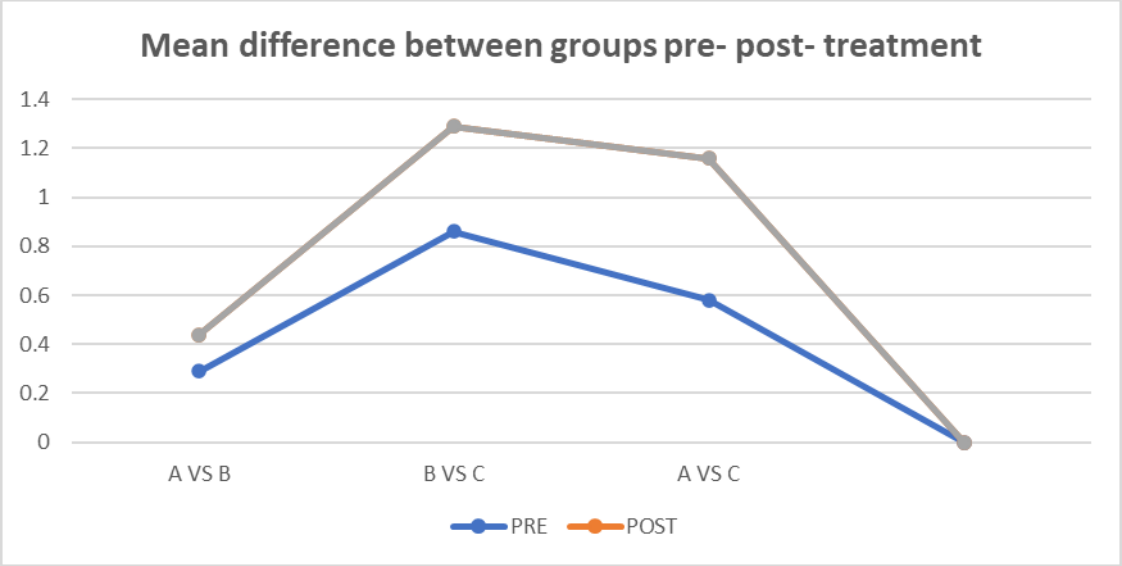

Fig. 1 Schematic representation of Tukey's pairwise comparison analysis of the pre- post-treatment of Pain-NPRS.

Table 4. Comparison between the pre- post-treatment assessments of Flexibility

flexibility	Group A		Group B		Group C		F-	p-value
	Mean	SD	Mean	SD	Mean	SD		
Pre	20.29	1.254	20.57	1.134	20.29	1.254	0.129	0.879^{NS}
Post	18.29	1.976	19.71	1.113	19.43	1.397	1.691	0.187^{NS}
t	4.583		6.001		3.287			
p-value	0.004*		0.001*		0.017*			

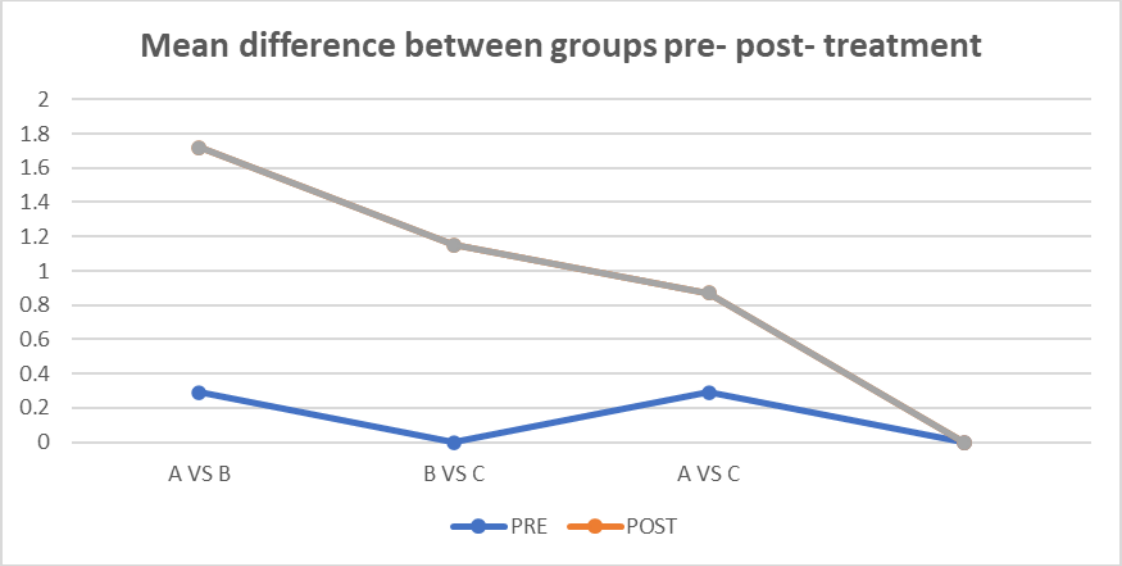

Fig. 2 Schematic representation of Tukey's pairwise comparison analysis of the pre- post-treatment of Flexibility.

Analysis of variance (ANOVA) shows that there was no significant difference in pain and flexibility post-intervention assessment across the three groups table (3 and 4). Paired t- tests indicated that there was a significant difference between pre- and post-intervention assessment of pain and flexibility in groups A, B & C while Tukey's pairwise comparisons showed no significant differences between groups pre-intervention for either pain or flexibility. Post-intervention, pain levels in Group C were significantly lower than in Groups A and B, while flexibility outcomes showed no significant differences across groups. This suggests that the intervention had a comparable effect on flexibility but a greater impact on pain reduction in Group C.

DISCUSSION

The present study aimed to compare the effects of static stretching exercises and Instrument-Assisted Soft Tissue Mobilization (IASTM) on pain and spinal flexibility in individuals with non-specific chronic low back pain (NSCLBP), including a control group receiving core strengthening and hot pack therapy. While all three groups showed statistically significant improvements in pain and flexibility from baseline to post-intervention, no significant differences were observed between the groups when analysed using ANOVA. However, within-group comparisons revealed meaningful clinical improvements, particularly in Group C.

The results support existing literature suggesting that various conservative interventions, including stretching, manual therapy, and core strengthening, can effectively reduce pain and improve physical function in individuals with chronic low back pain. Static stretching has been recognized for its role in improving muscle extensibility and reducing muscle tension, which can contribute to decreased pain perception and increased spinal flexibility. Similarly, IASTM facilitates soft tissue mobilization and may enhance collagen synthesis and alignment, promoting better musculoskeletal function.

Interestingly, although Groups A (static stretching) and B (IASTM) showed significant within-group improvements, Group C (core strengthening with hot pack therapy) demonstrated a relatively greater reduction in pain. This may be attributed to the combination of passive and active therapy components—thermal therapy likely increased local circulation and relaxed muscle tension, while core strengthening targeted stabilization and improved neuromuscular control. These findings are in line with previous studies

suggesting that multimodal approaches may offer enhanced benefits in managing NSCLBP.

Despite these improvements, the lack of significant differences between groups in the ANOVA suggests that each intervention has a comparable effect on flexibility, and to some extent, pain. However, the greater pain reduction in Group C observed in Tukey's pairwise analysis may indicate that combining therapeutic heat with active core engagement is more effective for short-term pain management than passive interventions alone.

Limitations

This study had some limitations, including a small sample size (n=21), short intervention duration (4 weeks), and a limited age range (25–28 years), which may affect the generalizability of the findings. Future research should consider larger and more diverse populations, longer follow-up periods, and the inclusion of objective muscle performance measures (e.g., electromyography or ultrasound) to gain deeper insights into the physiological mechanisms behind each intervention.

CONCLUSION

In conclusion, while all interventions were effective in reducing pain and improving flexibility in NSCLBP patients, core strengthening exercises combined with hot pack therapy yielded the most notable reduction in pain. These findings highlight the importance of an individualized, multimodal approach in the conservative management of chronic low back pain.

Declaration by Author

Ethical approval: Ethical approval was obtained from the Research Ethical Committee (REC) of Baba Mastnath University (REC number: BMU/FPT/2024/215).

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Conflict of Interest: The author declares no conflict of interest.

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