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Effectiveness of Backward Walking in Reducing Postural Low Back Pain: A Cross-Sectional Study

Kusum Agarwal[1*], Srijeeta Biswas[1], Ravikant Ballav[2] and Satyen Bhattacharya[3]

[1]*Department of Physiotherapy, Techno India University, Kolkata, West Bengal, India.*
[2]*Department of Physiotherapy, School of Health Sciences, The Neotia University, Diamond Harbour, West Bengal, India.*
[3]*Burdwan Institute of Medical and Life Sciences, West Bengal, India.*

*kusumagarwal380@gmail.com(Corresponding Author)

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ABSTRACT

Background: Lower back pain (LBP) is a prevalent and common musculoskeletal issue that can affect both mobility and functional quality. Backward walking (retro-walking) has gained attention due to its ability to reduce pain and improve disability while maintaining strength, mobility, and balance in many other conditions. The aim of this study is to examine its therapeutic effectiveness in reducing the symptoms of pain related to postural low back pain and also improving functional abilities in adults aged 30–50 years.

Purpose: The purpose of the study is to evaluate whether backward walking (retro-walking) can effectively reduce pain and improve daily functional activities in adults (aged 30–50 years) who are suffering from postural low back pain (LBP).

Methods: Out of 69 individuals chosen on the basis of inclusion and exclusion criteria, a total of 34 participants with postural LBP were recruited and divided into Group A (control) and Group B (experimental). The six-week intervention for Group B included backward walking sessions three times per week, starting at 10 minutes per session and progressing to 30 minutes on a flat surface. Oswestry Disability Index (ODI) and Numerical Pain Rating Scale (NPRS) scores were recorded pre- and post-intervention. SPSS software was used for statistical analysis, with paired and unpaired t-tests assessing differences within and between groups.

Results: Statistical evaluation revealed a significant reduction in pain scores post-intervention ($p<0.001$) and an improvement in functional abilities in both groups. However, Group B experienced a greater decline in NPRS scores compared to Group A.

Conclusion: Backward walking is an effective, non-invasive, and cost-efficient intervention for individuals with postural LBP. The study had a relatively small sample size, which limits its generalization. Also, the study was done for a shorter period; therefore, long-term effects remain unpredictable.

1. Introduction

One common problem affecting a large portion of the global population, with estimates suggesting between 60% and 80% of individuals, is lower back pain (Hoy *et al.*, 2012; Walker, 2000; Anderson, 1999). This discomfort can significantly impact daily routines, and for about 10–20% of those affected, it progresses to chronic low back pain. Among individuals with chronic low back pain, approximately 7–12% experience serious disruption to daily life (Hoy *et al.*, 2012; Walker, 2000). Globally, low back pain remains the leading cause of years lived with disability, with an estimated 619 million people affected in 2020. Several factors are believed to contribute to lower back pain. These include poor posture, degenerative changes in the spinal discs, spinal osteoarthritis (spondylosis), sprains, muscle tension, and repetitive movements or stresses in a single direction (Verywell Health, 2024; NCBI Bookshelf, 2025). Changes in the angle of the lower spine—particularly in the lumbosacral region—can also lead to lower back pain. Alterations in lumbar lordosis and lumbosacral alignment may increase mechanical stress and disrupt spinal stability as the body shifts the curvature of the lumbar, thoracic, and cervical spines in attempts to maintain balance and center of gravity (Cho *et al.*, 2020).

Experts in both research and clinical settings often point to the importance of core strength and proper pelvic alignment in addressing and preventing lower back pain (Bono, 2004; Gordon *et al.*, 1991). This aligns with anatomical reasoning, suggesting that walking backward could be beneficial (Uthoff *et al*., 2020; Wan *et al*., 2015). When walking backward, the foot strikes the ground differently; instead of the heel hitting first, the toe makes initial contact. This subtle gait change correlates with observable biomechanical shifts, such as a decrease in the lumbosacral angle—indicating a slight forward shift of the pelvis—and increased activation of lumbar extensor muscles, potentially creating more space in the facet joints and alleviating lower back pain (Quirk, 2019). While this idea is grounded in anatomical principles, the manuscript has not yet thoroughly tested the actual movements involved in backward walking. Therefore, this study aimed to explore how effective backward walking is for individuals with postural LBP and whether it brings changes with functions. While the anatomical rationale for its potential benefits exists, the actual mechanics of backward walking and running haven't been thoroughly studied. According to a recent study, backward walking can help with improved mobility and is also effective in strengthening the muscles around lower limbs like hips, knees, and ankles and also plays a crucial role in strengthening the core muscles (Dangi & Nirbhavane, 2014). The mechanics of retro-walking differ significantly from forward walking. Instead of a heel strike, the toe makes initial contact with the ground. The leg swings backward with a bent knee, which then straightens as the foot lands. This altered movement pattern may play an important role in reducing the overall issues associated with postural low back pain. It was also reported that beyond strength gains, retro-walking can also improve coordination and gait characteristics—such as stride length and speed—and is beneficial for improving neurological deficits (Wang *et al*., 2018). The objective of the study was to find out the effectiveness of backward walking in adults with LBP, including both genders between the ages of 30 and 50 years, and to evaluate the improvement in functions.

2. Methodology

2.1. Study Participants

The present study employs a cross-sectional research approach, and the participants for this study were recruited between the ages of 30 and 50 years. Both genders were involved, and the study was followed for 6 weeks. Total participants chosen were 69, out of which 34 were selected on the basis of inclusion and exclusion criteria. Outcome measures scales used are the Numeric Pain Rating Scale (NPRS) and the Oswestry Disability Index (ODI). The objective of the study was explained to all participants. All participants gave their informed consent before participation. The inclusion criteria were: Adults aged 30–50 years and participants diagnosed with postural low back pain; both genders are included. Whereas, the exclusion criteria were: history of bone or joint tumors, History of bone tuberculosis, Presence of severe knee pain due to trauma, History of infection affecting the musculoskeletal system, Previous fractures involving the lower limb or spine. Participants were randomly assigned into two groups (Group A – Control; Group B – Experimental) using a simple randomization (lottery) method. Group codes were placed in sealed envelopes and drawn by each participant to ensure allocation concealment. Data collection was performed by an independent physiotherapist, blinded to group allocation and study hypothesis, to minimize potential researcher bias.

2.2. Outcome Measure

2.2.1. Numeric Pain Rating Scale (NPRS)

The Numeric Pain Rating Scale (NPRS) is an extensively utilized, one-dimensional tool for measuring pain intensity. It is a segmented numeric adaptation of the Visual Analog Scale, where respondents select a whole number between 0 and 10 that best represents the intensity of their pain (Childs *et al.,* 2005). The NPRS 11-point scale score ranges from 0 (indicating no pain) to 10 (representing the worst imaginable pain).

2.2.2. Oswestry Disability Index (ODI)

The Oswestry Disability Index assesses the patient's subjective range of perceived disability related to the individual's function, e.g., work status difficulty or activity of daily living. The higher score shows more considered disability. It was calculated by dividing the total score (0-5) by the number of sections answered and multiplying by 100 (Sandal *et al.,* 2021). It evaluates nine distinct body locations (back, lower back, both hips, both knees, both feet, and both ankles) for one year and the last seven days for pains and discomforts. It also determines whether the pain has interfered with work during the previous twelve months**.** Since the NPRS and ODI are two of the most popular, valid, and dependable instruments for determining pain severity and functional disability in people with low back pain, we chose them as outcome measures. The ODI is the "gold standard" for measuring disability in LBP and explicitly examines functional limitation linked to spinal diseases (Fairbank & Pynsent, 2000). In contrast, the NPRS offers a straightforward, sensitive, and responsive assessment of subjective pain intensity (Childs *et al.,* 2005). Clinical recommendations support both measures for assessing LBP. These instruments were therefore selected due to their significant clinical relevance, ease of use, and good psychometric validity.

2.3. Procedure

After assessment of the patient, the individuals in both groups received a hydrocollator pack for 15 minutes on the lower back to reduce muscle spasms and pain and to improve the extensibility of tissues. The temperature of the hydrocollator pack was sufficient for the targeted area. The hot pack was wrapped with a mackintosh sheet. During this process, the therapist inquired about the temperature. After that, pelvic bridging exercises were given to both the groups, and retro walking was provided to only the experimental group, that is, Group B. In the first week, the patient walked backward for 10 minutes at their comfortable speed with 5 minutes of warm-up. The participants were gradually exposed to increasing the walking time up to 30 min over the period of 6 weeks. Hot packs and pelvic bridging exercises, which are routine conservative care for postural LBP, were administered to the control group. The evidence provides strong support for these therapies' benefits in lowering muscle spasms, increasing core stability, and improving circulation. The significance of stabilization exercises as a safe and effective protocol for managing mechanical and postural LBP has been well reported (Salik *et al.*, 2021; Smrcina *et al.*, 2022). Heat therapy is effective in reducing muscle spasm in nonspecific back pain. For the control group, this strategy was therefore regarded as an appropriate standard treatment (Freiwald *et al.,* 2021). Previous research showing the effectiveness of the retro-walking protocol in musculoskeletal rehabilitation served as the foundation for its development. Retro-walking reduces pain by improving posture, balance, coordination, and core muscular activation, according to Dangi and Nirbhavane (2014) and Balasukumaran *et al.* (2019). Retro-walking was also reported to improve lumbar stability and decrease lumbosacral angle. Therefore, we modified these published protocols to create our 6-week progressive program (10 to 30 minutes per session, three times per week).

2.4. Statistical Analysis

The statistical analysis was done using SPSS SOFTWARE. Baseline data was taken at the beginning of the study (pre-test values) and after the completion of the treatment (post-test values) to analyze the effectiveness of the methods. The categorical variables were represented in frequency and percentage. Numerical variables were presented using mean and standard deviation. Pre-post comparison was done using the paired sample t-test. Comparison between the groups was done using the unpaired t-test. An ap value <0.05 was considered statistically significant.

3. Results

The age distribution shows that Group A had a mean age of 41.176 ± 4.127, while Group B had a mean age of 39.059 ± 4.534. Additionally, the gender distribution indicates that females make up 61.8% of the sample, whereas males constitute 38.2%. Gender distribution is as follows: Group A – 10 females, 7 males; Group B – 11 females, 6 males (Table 1).

Table 1: Age and Gender Distribution

		Mean	SD
Age	Group A	41.176	4.127
	Group B	39.059	4.534
		Frequency	**Percent**
Gender	Female	21	61.8
	Male	13	38.2

For Group A (Control Group), the pre-intervention mean score was 5.000 ±1.696, with 17 participants. After the intervention, the mean score decreased to 3.941±1.600. The t-value for this change was 4.518, which is statistically significant ($p < 0.001$), suggesting that the intervention had a significant effect on Group A's scores. For Group B (Experimental Group), the pre-intervention mean score was 4.176±1.976, with 17 participants. After the intervention, the mean score dramatically dropped to 1.235±1.348. The t-value of 3.470 ($p < 0.001$) indicates that this change is statistically significant, highlighting a strong effect of the intervention on Group B's scores (Table 2).

Table 2: Comparison of Pre-Post NPRS in Group A and Group B Participants (paired t-test)

NPRS		Mean	Sample size (n)	Std. Deviation	Mean Difference (Post–Pre)	t-value	p-value
Group A	Pre	5.000	17	1.696	1.058	4.518	p<0.001*
	Post	3.941	17	1.600			
Group B	Pre	4.176	17	1.976	2.941	3.470	p<0.001*
	Post	1.235	17	1.348			

For Group A, in the NPRS, the mean score was 1.059±0.966 with 17 participants. For Group B, the mean score was 2.941±1.029. The t-value for this group was 5.498, which is statistically significant ($p < 0.001$), indicating a statistically significant difference between groups, with Group B showing greater improvement compared to Group A (Table 3).

Table 3: Comparison of -Pre-Post NPRS in Group A and Group B Participants (unpaired t-test)

		N	Mean	SD	t-value	p-value
NPRS	Group A	17	1.059	0.966	5.498	p<0.001*
	Group B	17	2.941	1.029		

For Group A, the majority of participants (70.6%) had minimal disability before the intervention, while a smaller proportion (23.5%) had moderate disability, and only 5.9% had severe disability. In Group B, an even larger percentage (88.2%) had minimal disability before the intervention, with 11.8% categorized as having moderate disability. No participants in Group B had severe disability (Table 4). The chi-square test resulted in a value of 2.000 and a p-value of 0.368, indicating no statistically significant difference in the disability distribution between Group A and Group B before the intervention.

Table 4: Cross-Tabulation between ODI-Pre in Group A and Group B

		Group A	Group B	Total	Chi square	p-value
ODI-Pre	Minimal Disability	12	15	27	2.000	0.368
		70.6%	88.2%	79.4		
	Moderate Disability	4	2	6		
		23.5%	11.8%	17.6%		
	Severe Disability	1	0	1		
		5.9%	0.0%	2.9%		
Total 100.0%		17	17	34		
		100.0%	100.0%			

For Group A, after the intervention, 29.4% had minimal disability, 29.4% of participants were classified as having moderate disability, and 29.4% experienced severe disability. Only 11.8% were categorized as crippled. In Group B, 52.9% of participants had minimal disability, 11.8% had moderate disability, and 35.3% had severe disability. No participants in Group B were classified as crippled. The chi-square test gave a value of 4.519 and a p-value of 0.211, indicating no statistically significant difference in the disability distribution between the two groups after the intervention (Table 5).

Table 5: Cross-Tabulation between ODI-Post in Group A and Group B

		Group A	Group B	Total	Chi square	p-value
ODI-Post	Minimal Disability	5	9	14	4.519	0.211
		29.4%	52.9%	41.2%		
	Moderate Disability	5	2	7		
		29.4%	11.8%	20.6%		
	Severe Disability	5	6	11		
		29.4%	35.3%	32.4%		
	Crippled	2	0	2		
		11.8%	0.0%	5.9%		
Total 100.0%		17	17	34		
		100.0%	100.0%			

4. Results

It was observed that both the groups showed profound differences in pain post intervention, with Group B experiencing greater improvement in pain ($p<0.001$). However, there was no significant difference in disability levels. Although the ODI Scale observed the difference, it was not statistically significant. This suggests that although the intervention was effective in reducing pain, its efficiency was not seen much in improving the disability level. Therefore, from the present findings, it can be suggested that while the intervention effectively reduced pain, its impact on functional disability was comparatively modest. Hence, a further study on a larger population and a longitudinal study are required in order to identify its effectiveness in improving the functional capacity as well. Also, the present study shows a lack of gender stratification and external validity. Future studies with larger, stratified samples are recommended to improve external validity and generalizability. Backward walking has been displayed in a number of studies to be an effective rehabilitation protocol for patients with LBP. Retro-walking improves lower limb strength, posture, stability, and coordination, all of which are important for addressing lower back pain, according to Dangi and Nirbhavane (2014). Similar to this study, Balasukumaran *et al.* (2019) reported that backward walking activates core stabilizers in a different way than walking forward, which reduces spinal compression and corrects lumbar alignment. Retro-walking, also improves neuromuscular coordination and restores normal gait patterns. Additionally, Zhang *et al.* (2015) constructed that backward walking improves lumbar flexibility and reduces excessive lordotic curvature, which is consistent with the ROM gains. This result backs the idea that by enhancing biomechanics and reducing the muscle strain on the lumbar spine, backward walking can be a useful strategy for postural LBP.

It was also found that paraspinal muscle activity, specifically the multifidus (MF) and erector spinae (ES), was more active during backward walking (BW) compared to forward walking (FW). They indicated that all the participants with chronic low back pain (CLBP) showed higher activation levels of these muscles than healthy individuals. The study concluded that BW leads to higher recruitment of both global and core extensor muscles, suggesting that backward (Ansari *et al.,* 2018).

5. Conclusion

The present study confirms that backward walking is an effective, non-invasive intervention for reducing pain and functions to some limit in individuals with postural LBP. While this study provides promising results, further research with larger sample sizes and longer follow-up periods is recommended to explore its long-term benefits comprehensively.

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Authorship Contribution

All authors contributed substantially to the conception, design, data collection, analysis, and interpretation of the study. Conceptualization, Methodology, Data Collection, Manuscript Drafting, Data Analysis, Interpretation, Review, and Editing were carried out by Kusum Agarwal and **Srijeeta** Biswas. Supervision, Critical Review, and Final Approval of the Manuscript were performed by Ravikant Ballav and Satyen Bhattacharya.

All authors have read and approved the final version of the manuscript and agree to be accountable for its content.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Declarations

All authors declare that the content of this manuscript has not been published or submitted elsewhere. The manuscript has been read and approved by all authors and represents original work.

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