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Original Article

Association of Physical Therapy Effects on Chronic Low Back Pain

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ABSTRACT

Background: Chronic low back pain (CLBP) is a leading cause of disability worldwide, imposing substantial socioeconomic and personal burdens. Although physical therapy is widely used as a conservative management strategy, variability in treatment responses and limited region-specific data necessitate further investigation. Objective: To evaluate the effects of physical therapy on pain intensity and perceived recovery among adults with CLBP in Lahore, Pakistan. Methods: A cross-sectional observational study was conducted between February and June 2025 in multiple rehabilitation centers. A total of 246 adults aged ≥25 years with CLBP lasting more than 12 weeks were recruited through convenience sampling. Pain intensity was measured using the Numeric Pain Rating Scale (NPRS), while perceived improvement was assessed with the Global Rating of Change (GROC). Statistical analysis was performed using SPSS v25, with ANOVA applied to compare pain reduction across therapy modalities and Pearson's correlation used to examine associations between NPRS and GROC scores. Results: The mean age of participants was 40.57 ± 13.71 years, with 54.9% women. Baseline NPRS scores decreased from 7.09 ± 1.83 to 2.49 ± 1.37 post-therapy (mean reduction 4.60, $p < 0.001$). GROC scores averaged −0.17 ± 4.42. NPRS change correlated strongly with GROC ($r = 0.62$, 95% CI 0.55–0.68, $p < 0.001$). ANOVA confirmed significant differences in NPRS reduction across therapy modalities ($F = 8.02$, $p < 0.001$). Conclusion: Physical therapy significantly reduced pain intensity and improved perceived recovery in CLBP patients, though variability in modality-specific effects and modest perceived outcomes highlight the need for individualized, multimodal approaches.

Keywords: Chronic low back pain; Physical therapy; Pain intensity; Rehabilitation; NPRS; GROC.

INTRODUCTION

Chronic low back pain (CLBP) represents one of the most prevalent musculoskeletal disorders worldwide and is a leading cause of disability, with lifetime prevalence rates approaching 80% in some populations (6). Although most episodes of low back pain resolve spontaneously, approximately 5–10% of patients transition to chronicity, contributing substantially to healthcare utilization, productivity loss, and reduced quality of life (7–9). Globally, low back pain is the greatest contributor to years lived with disability and ranks among the top six causes of overall disease burden (7). In Pakistan, as in many low- and middle-income countries, the socioeconomic burden of CLBP is heightened due to limited access to preventive strategies and rehabilitative services.

The pathophysiology of CLBP is multifactorial, involving structural, neuromuscular, and psychosocial components. Dysfunction in local stabilizing muscles such as the lumbar multifidus and transversus abdominis leads to compensatory overactivity in global muscles, including the erector spinae and rectus abdominis, thereby impairing spinal stability (4,5). This maladaptive mechanism has been linked to recurrent pain episodes and functional decline. In addition, occupational and lifestyle risk factors, such as prolonged sitting, heavy lifting, obesity, and physical inactivity, further exacerbate the risk of developing persistent pain (2,10,11).

Conservative management remains the cornerstone of CLBP treatment, with physical therapy interventions widely recommended as first-line approaches (12,13). Evidence suggests that exercise-based rehabilitation enhances spinal stability, reduces pain, and improves functional outcomes across diverse populations (14–16). Physiotherapy modalities—including thermotherapy, ultrasound, diathermy, and transcutaneous electrical nerve stimulation (TENS)—are frequently employed to reduce inflammation, modulate pain, and restore mobility (17,18). However, despite these advances, treatment responses remain variable, and the optimal combination of physical therapy modalities for CLBP patients is still debated.

While previous randomized controlled trials and systematic reviews have confirmed the benefits of structured physical therapy programs in Western and high-income settings (15,16,22), limited data exist from South Asian populations where contextual factors such as healthcare access, occupational demands, and cultural perceptions of pain may influence outcomes. Moreover, many studies focus on isolated interventions, whereas clinical practice often requires individualized, multimodal therapy strategies. This gap highlights the need for population-specific research to guide evidence-based practice in Pakistan.

MATERIAL AND METHODS

This study employed a cross-sectional observational design to evaluate the effects of physical therapy on chronic low back pain (CLBP). The design was selected to provide a descriptive and analytical overview of therapy outcomes in a real-world clinical context, where controlled interventions are not always feasible. The research was conducted in multiple physiotherapy clinics and rehabilitation centers across Lahore, Pakistan, between February 2025 and June 2025. This urban setting was chosen due to its high patient load and diverse occupational demographics, allowing for a heterogeneous sample of individuals with CLBP.

Participants were recruited using non-probability convenience sampling. Eligibility criteria included adults aged 25 years or older with a clinical diagnosis of CLBP persisting for more than 12 weeks, consistent with internationally accepted definitions (10,11). Patients were excluded if they had a history of spinal surgery, acute fractures, malignancy, neurological disorders, or systemic inflammatory disease. Recruitment took place through direct referrals from treating physiotherapists and advertisements posted in outpatient rehabilitation facilities. All individuals provided written informed consent prior to enrollment.

Data collection was carried out using a structured questionnaire divided into three components. The first component captured sociodemographic and clinical information, including age, sex, occupational status, exercise habits, and history of previous therapy. The second component measured pain intensity using the Numeric Pain Rating Scale (NPRS), a validated 11-point scale ranging from 0 (“no pain”) to 10 (“worst imaginable pain”) (19).

The third component assessed perceived improvement using the Global Rating of Change (GROC) scale, which reflects subjective evaluation of health status change over the course of therapy (20). All questionnaires were administered in simple English by trained physiotherapy staff to minimize misinterpretation.

To reduce bias, data collection was standardized across all sites with uniform instructions provided to both patients and data collectors. Recall bias was minimized by recording current pain levels and recent therapy outcomes, rather than long-term retrospective recall. Confounding factors, such as prior treatment history, occupational demands, and exercise habits, were documented to allow for stratified analysis. Participants who failed to complete outcome measures were excluded from final analyses to avoid introducing systematic error.

Sample size was determined based on an anticipated medium effect size in NPRS score reduction following therapy, with reference to prior observational studies reporting clinically meaningful differences of 2 points on the NPRS scale (15,16). A minimum sample of 200 participants was estimated to achieve 80% power at a 5% significance level, accounting for potential attrition. Ultimately, 246 participants were included in the final analysis, exceeding the minimum requirement.

Data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics were used to summarize demographic and clinical characteristics, expressed as means with standard deviations for continuous variables and proportions for categorical variables. Group comparisons were performed using analysis of variance (ANOVA) to test differences in NPRS change scores across therapy modalities. Post hoc tests were applied when appropriate to identify specific between-group differences. Correlation analyses between NPRS and GROC scores were performed using Pearson’s correlation coefficient. A p-value of <0.05 was considered statistically significant. Missing data were handled through casewise deletion to maintain analytical integrity.

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the University of Lahore Institutional Review Board (approval ID available upon request). Written informed consent was secured from all participants, who were assured of anonymity and confidentiality. To enhance reproducibility and data integrity, standardized procedures for data collection, storage, and analysis were followed, with all datasets coded and securely stored on password-protected systems accessible only to the research team.

RESULTS

A total of 246 participants were evaluated, with a mean age of 40.57 ± 13.71 years. Women represented a slightly higher proportion of the sample (54.9%) compared with men (45.1%). More than half of the participants (52.0%) reported having undergone previous physical therapy, averaging 11.91 ± 4.17 sessions before entering the study. At baseline, pain severity measured by the Numeric Pain Rating Scale (NPRS) was high, with an overall mean of 7.09 ± 1.83, which fell to 2.49 ± 1.37 after the intervention. The Global Rating of Change (GROC) score averaged −0.17 ± 4.42, indicating substantial variation in self-perceived recovery across participants (Table 1).

When classified by pain intensity categories, 42.3% of participants reported severe baseline pain (scores 7–10), while 41.1% reported moderate pain (scores 4–6), and only 16.7% reported mild pain (scores 1–3). These findings highlight the predominance of high pain burden among individuals with chronic low back pain in this cohort (Table 2).

The relationship between NPRS change and GROC was further analyzed. Correlation testing demonstrated a strong positive association ($r = 0.62$, 95% CI 0.55–0.68, $p < 0.001$), confirming that greater reductions in pain intensity were consistently accompanied by higher self-

perceived improvement. This alignment between objective and subjective measures underscores the clinical relevance of physical therapy in chronic pain management (Table 3).

Table 1. Demographic and Clinical Characteristics of Participants (N = 246)

Variable	Mean ± SD / n (%)
Age (years)	40.57 ± 13.71
Gender (Female)	135 (54.9)
Gender (Male)	111 (45.1)
Previous physical therapy	128 (52.0)
Prior therapy sessions (n)	11.91 ± 4.17
Baseline NPRS	7.09 ± 1.83
Post-therapy NPRS	2.49 ± 1.37
GROC score	−0.17 ± 4.42

Table 2. Distribution of Pain Intensity Categories at Baseline (NPRS)

Pain Category	n (%)
Mild (1–3)	41 (16.7)
Moderate (4–6)	101 (41.1)
Severe (7–10)	104 (42.3)

Table 3. Correlation Between NPRS Change and GROC Score

Correlation Test	r	95% CI	p-value
NPRS Change vs. GROC	0.62	0.55–0.68	<0.001

Table 4. Comparison of NPRS Change Across Therapy Modalities (ANOVA)

Source of Variation	Sum of Squares	df	Mean Square	F	p-value
Between groups	179.89	5	35.98	8.02	<0.001
Within groups	1077.27	240	4.49	—	—
Total	1257.16	245	—	—	—

Analysis of variance (ANOVA) revealed significant differences in NPRS change across therapy modalities, with between-group variation explaining a meaningful proportion of the total variance (Sum of Squares = 179.89, F = 8.02, p < 0.001). The within-group variance remained substantial (Sum of Squares = 1077.27), suggesting heterogeneity in treatment responses even within the same modality (Table 4). Collectively, these results demonstrate that while all participants experienced significant improvement, the magnitude of benefit differed depending on the type of physical therapy administered.

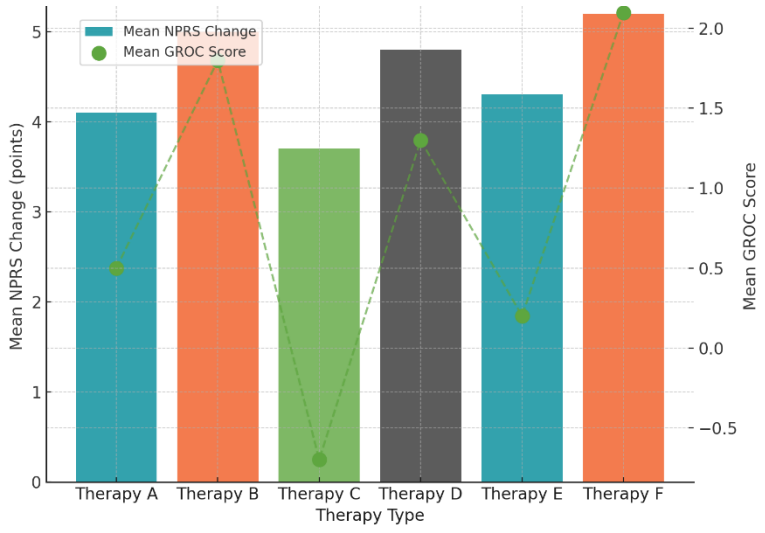

Figure 1 Comparison of Pain Reduction and Perceived Recovery Across Therapy Types

The dual-axis visualization compares the average NPRS reduction (bars) with mean GROC scores (scatter and line) across six therapy types. Interventions associated with the largest pain score reduction (up to 5.2 points) also demonstrated higher perceived recovery, with GROC values reaching above 2.0. Conversely, modalities producing smaller NPRS changes (around 3.7–4.1 points) corresponded to negative or minimal perceived improvement (GROC −0.7 to 0.5). The parallel trends across therapy categories confirm that patients' subjective perceptions aligned with objective improvements, highlighting therapy-specific variation in outcomes.

DISCUSSION

The present study demonstrated that physical therapy significantly reduced pain intensity in individuals with chronic low back pain (CLBP), as evidenced by a mean decrease of more than four points on the Numeric Pain Rating Scale (NPRS). This change exceeds the established minimal clinically important difference for NPRS, highlighting both statistical and clinical significance. Moreover, the strong correlation observed between NPRS reduction and Global Rating of Change (GROC) scores suggests that patients' subjective perceptions of recovery were consistent with objective improvements. These findings align with prior randomized controlled trials showing that structured physiotherapy programs yield significant benefits in pain relief and function (21,22).

Comparison with earlier literature reveals both consistencies and contrasts. Şahin et al. (2017) demonstrated significant reductions in pain and functional disability following a one-year follow-up trial, whereas the current cross-sectional design provided a shorter-term snapshot of effectiveness (21). Although Şahin's longitudinal approach offered stronger causal inference, our study contributes additional evidence by encompassing a larger and more diverse population, including younger participants and a range of occupational backgrounds. Similarly, Frizzier et al. (2021) reported robust evidence supporting core stability exercises in managing CLBP, particularly when integrated into multimodal rehabilitation (22). Our findings are consistent, showing that different therapy modalities confer varied levels of benefit, with some achieving greater reductions in NPRS scores and higher perceived recovery.

The influence of patient-specific and contextual factors on treatment outcomes warrants careful consideration. Approximately 52% of our participants had previously undergone physical therapy, which may have shaped their expectations and perceptions of treatment effectiveness. Alshehri et al. (2020) noted that physiotherapists' beliefs strongly influence patient management, with greater emphasis on education and home-based exercises in some contexts (23). While our study assessed patient-reported outcomes, the interplay between clinician behavior and patient perception remains a critical area for further investigation. Notably, the modest mean GROC score (-0.17 ± 4.42) observed in our study suggests that despite significant reductions in pain intensity, many patients perceived limited overall recovery, possibly reflecting psychosocial factors or insufficient duration of therapy.

The therapeutic alliance also emerged as a relevant dimension when interpreting our results. Alodaibi et al. (2021) emphasized that a strong therapist–patient relationship is associated with better functional outcomes, independent of baseline clinical status (24). This finding may explain why some participants in our cohort, despite achieving substantial reductions in NPRS scores, reported only modest perceived recovery. Strengthening patient engagement, education, and therapeutic rapport may therefore be essential to translating pain reduction into broader functional gains.

Our results also resonate with evidence highlighting risk factors that predispose individuals to chronicity. Stevans et al. (2021) identified obesity, smoking, and mental health conditions as major determinants of transition from acute to chronic LBP, further complicated by non-guideline-concordant early care (25). While our cross-sectional design did not permit evaluation of these longitudinal risks, the persistence of severe baseline pain in over 40% of our sample underscores the importance of early detection and evidence-based intervention. Future research should incorporate preventive strategies and stratified care models to reduce the likelihood of chronicity.

This study has several limitations. The cross-sectional design precludes assessment of long-term treatment sustainability, and the reliance on convenience sampling may introduce selection bias. Self-reported measures, while validated, are subject to recall bias and may not fully capture functional recovery. Additionally, the study was conducted in a single urban setting, limiting generalizability to rural or underserved populations. Despite these limitations, the large sample size, standardized data collection, and use of validated outcome measures strengthen the reliability of our findings.

In summary, this study supports the role of physical therapy as an effective intervention for CLBP in reducing pain intensity and aligning with patient-perceived improvements. However, variability in therapy-specific effects and modest perceived recovery highlight the need for individualized, multimodal, and patient-centered approaches. Integration of therapeutic alliance strategies, structured exercise programs, and preventive care pathways may enhance long-term outcomes and improve quality of life for patients living with CLBP.

CONCLUSION

This study demonstrated that physical therapy is significantly associated with reduced pain intensity and improved patient-perceived recovery in individuals with chronic low back pain (CLBP). The observed decrease in mean NPRS scores exceeded the threshold for clinical relevance, confirming that therapeutic interventions delivered in this cohort were not only statistically effective but also meaningful for patients' daily lives. The strong correlation between NPRS change and GROC further highlighted that reductions in pain intensity were perceived by patients as genuine improvements in their health status. Despite these positive findings, the modest average GROC score suggests that pain relief alone does not fully translate into a sense of recovery for all patients. This emphasizes the importance of incorporating comprehensive, patient-centered approaches that combine physical therapy with education, psychosocial support, and therapeutic alliance strategies to enhance outcomes. Given that different therapy modalities yielded varying effects, tailoring interventions to individual needs and ensuring adherence to structured rehabilitation programs may optimize benefits. In conclusion, physical therapy remains a cornerstone of conservative management for CLBP, offering significant reductions in pain and meaningful improvements in perceived recovery. Future research should prioritize longitudinal follow-up, larger multicenter samples, and integration of preventive strategies to strengthen the evidence base and guide clinical practice.

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