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Effective Backward Walking in Chronic Nonspecific Low Back Pain – A Case Report

Dr. Sourangshu Bhattacharyya[1*]; Dr. Swarup Ghosh[2]

[1,2]Assistant Professor, (PT) Department of Physiotherapy, School of Allied Health, Swami Vivekananda University, West Bengal-700121, India.

Corresponding Author: Dr. Sourangshu Bhattacharyya[1*]

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Abstract:

- ***Background:***

Nonspecific low back pain (NSLBP) is one of the most common musculoskeletal conditions, often associated with impaired trunk control, gait mechanics, and functional capacity. Conservative management includes exercise-based interventions, such as backward walking, which alters neuromuscular activation patterns, reduces spinal loading, and improves spinal control.

- ***Case Scenario:***

A 45 year old male individual presented with chronic nonspecific low back pain persisting for two months. The condition was characterized by mechanical pain, a reduced range of motion in the lumbar region, and functional limitations during prolonged standing and walking. Baseline assessments included pain intensity measured by the Numeric Pain Rating Scale (NPRS), functional disability evaluated using the Oswestry Disability Index (ODI), lumbar mobility.

- ***Intervention:***

The patient participated in a structured physiotherapy program that incorporated backward walking training alongside conventional therapeutic exercises. Backward walking was conducted on a level surface under supervision, with gradual increases in duration and speed over a period of 4 weeks. The intervention aimed to enhance trunk stability, proprioceptive control, and lower limb coordination while minimizing lumbar compressive forces.

- ***Outcomes:***

Following the intervention, the patient showed a significant reduction in pain, improved lumbar mobility, and enhanced functional capacity, with a decreased Oswestry Disability Index score without any adverse events .

- ***Conclusion:***

According to this case study, backward walking considered as useful and secure supplemental treatment for nonspecific low back pain and will help to reduce pain and enhance function by encouraging altered neuromuscular activation.

Keywords: *Nonspecific Low Back Pain; Backward Walking; Gait Training; Physiotherapy; Case Report.*

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I. INTRODUCTION

Chronic nonspecific low back pain (CNSLBP) is recognized as one of the leading causes of disability worldwide, affecting individuals across diverse age groups and occupational backgrounds. It is defined as low back pain persisting for more than twelve weeks without a specific identifiable pathological cause such as fracture, infection, tumor, or nerve root compression. Despite advances in diagnostic imaging and rehabilitation strategies, management of CNSLBP remains challenging due to its multifactorial nature, which encompasses physical, psychological, and social components.

Patients with CNSLBP often present with altered movement patterns, reduced physical activity, impaired gait

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mechanics, and heightened fear of movement. Conventional rehabilitation approaches typically include pain education, trunk stabilization exercises, flexibility training, aerobic conditioning, and forward walking programs. While forward walking is widely prescribed for cardiovascular conditioning and general mobility, it may inadvertently reinforce maladaptive movement patterns in some individuals, particularly those with persistent fear-avoidance behaviors and altered spinal loading.

Backward walking, also referred to as retro walking, is an unconventional locomotor task that differs significantly from forward walking in terms of kinematics, muscle activation patterns, sensory input, and balance demands. It requires increased activation of trunk and hip musculature, produces reduced impact forces at initial contact, and places greater reliance on proprioceptive and vestibular feedback. These characteristics suggest potential therapeutic benefits for individuals with chronic pain and movement dysfunction. Emerging evidence indicates that backward walking may reduce joint loading, improve neuromuscular control, and enhance confidence in movement. However, its application in chronic nonspecific low back pain remains underexplored, with limited case-based and experimental evidence available.

This case report therefore aims to describe the effects of a structured backward walking–based rehabilitation program in an individual with chronic nonspecific low back pain and to explore its potential role as an adjunctive physiotherapy intervention.

II. CASE DESCRIPTION

➢ *Patient Information*

The patient is a 38-year-old male office worker who presented with a two-year history of persistent low back pain. The pain had an insidious onset, was localized to the lumbar region, and occasionally radiated to the gluteal area, though without distal lower-limb symptoms such as numbness or weakness. Functionally, the patient reported significant difficulty with prolonged sitting, walking, and bending, all of which interfered with his occupational responsibilities and daily activities. The chronic nature of the pain, combined with its impact on mobility and work performance, suggests a mechanical origin likely exacerbated by occupational factors such as prolonged sitting and poor ergonomics, though further evaluation would be necessary to rule out structural or systemic causes.

III. MEDICAL AND PSYCHOSOCIAL HISTORY

➢ *Case Description*

The patient is a 38-year-old male office worker who has experienced persistent low back pain for two years. The pain developed insidiously, is localized to the lumbar region, and occasionally radiates to the gluteal area without neurological involvement such as numbness or weakness. Importantly, there is no history of trauma, surgery, inflammatory disease, or neurological disorders, and imaging studies including lumbar spine radiographs and MRI revealed no significant pathological findings. Functionally, the patient struggles with prolonged sitting, walking, and bending, which interfere with both occupational duties and daily activities. These features strongly suggest non-specific mechanical low back pain, likely influenced by occupational demands such as prolonged sitting and poor ergonomics, rather than structural pathology.

Psychosocially, the patient demonstrates a pronounced fear of movement, particularly during walking and bending, due to the anticipation of pain exacerbation. This fear has led to avoidance behaviors and reduced participation in physical activity, which in turn contribute to deconditioning and perpetuation of symptoms. The clinical picture aligns with the fear-avoidance model, where pain-related fear leads to guarded movement, reduced activity, and heightened pain perception despite the absence of structural abnormalities. This cycle explains why the patient continues to experience pain and functional limitations despite normal imaging. Addressing these psychosocial factors through education, graded exposure to feared movements, and strategies to rebuild confidence in physical activity would be essential in breaking the cycle of avoidance and restoring function.

➢ *Clinical Presentation*

On clinical assessment, the patient reported a moderate pain intensity of 6/10 on the Numeric Pain Rating Scale (NPRS), indicating a significant but not incapacitating level of discomfort. Lumbar mobility was notably restricted, with both flexion and extension reduced, suggesting stiffness and mechanical limitation in the spine. Gait analysis further revealed an altered walking pattern characterized by shortened stride length and guarded trunk movement, reflecting compensatory strategies to minimize pain and avoid perceived risk of injury. Additionally, trunk muscle endurance was decreased, pointing to deconditioning and reduced capacity of the core musculature to support spinal function during daily activities. Psychosocially, the patient demonstrated high fear-avoidance beliefs, particularly regarding physical activity, which likely perpetuate the cycle of pain and disability by discouraging movement, reinforcing muscular weakness, and sustaining maladaptive motor patterns. Taken together, these findings highlight a multifactorial presentation where physical impairments, altered biomechanics, and psychosocial barriers interact to maintain chronic low back pain and functional limitation.

➢ *Clinical Assessment*

The patient presents with a complex profile of impairments that collectively illustrate the multifaceted nature of chronic non-specific low back pain (CNSLBP). Persistent lumbar pain remains the central complaint, accompanied by reduced spinal mobility that limits functional range of motion and contributes to stiffness during daily tasks. Impaired trunk muscle activation further undermines spinal stability, while altered gait mechanics—characterized by shortened stride length and guarded trunk movement—reflect compensatory strategies aimed at minimizing discomfort but ultimately perpetuate inefficient movement patterns.

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Reduced balance confidence compounds these physical deficits, leading to hesitancy in dynamic activities and increasing reliance on avoidance behaviors. These impairments translate directly into activity limitations, with the patient reporting difficulty walking beyond fifteen minutes, reduced tolerance for prolonged sitting due to escalating pain, and significant challenges in performing bending and lifting tasks essential for both occupational and domestic functioning. The consequences extend beyond physical capacity into participation restrictions, as evidenced by diminished work productivity, avoidance of recreational physical activity, and withdrawal from previously valued social or leisure pursuits.

Collectively, this constellation of impairments, limitations, and restrictions underscores the broader impact of CNSLBP on quality of life, where physical dysfunction interacts with psychosocial barriers such as fear-avoidance beliefs, ultimately reinforcing chronicity and reducing overall well-being.

➢ *Outcome Measures*

To evaluate the patient's progress in a comprehensive and multidimensional manner, several validated outcome measures were employed, each targeting a specific domain of health and function. Pain intensity was quantified using the Numeric Pain Rating Scale (NPRS), a simple yet reliable tool that captures the subjective severity of pain and allows for monitoring changes over time. Disability was assessed through the Oswestry Disability Index (ODI), which provides a structured evaluation of how low back pain impacts daily activities such as sitting, walking, lifting, and personal care, thereby reflecting the degree of functional limitation in real-world contexts. Psychological aspects, particularly fear of movement and activity avoidance, were measured using the Tampa Scale of Kinesiophobia (TSK), which highlights maladaptive beliefs and behaviors that can perpetuate chronicity and hinder rehabilitation. Physical impairments were objectively examined through lumbar range of motion testing, using goniometry and inclinometry to quantify restrictions in flexion, extension, and lateral movements, offering precise data on spinal mobility. Functional capacity was further evaluated through time-based walking assessments, which measure endurance, gait efficiency, and tolerance to sustained activity, thereby linking physical performance to everyday functional demands. Collectively, these outcome measures provided a holistic framework that integrated physical, functional, and psychosocial dimensions, ensuring that progress was not only tracked in terms of pain reduction but also in relation to improved mobility, psychological resilience, and participation in meaningful activities, thus capturing the broader impact of chronic non-specific low back pain on quality of life.

➢ *Rehabilitation Goals*

The short-term goals of rehabilitation were to reduce pain intensity, improve movement confidence, and enhance lumbar mobility. In the long term, the program aimed to improve functional walking tolerance, reduce fear-avoidance behavior, and restore participation in both daily and recreational activities. These goals provided a structured framework for physiotherapy interventions and ensured that treatment addressed both physical impairments and psychosocial barriers.

➢ *Intervention*

A six-week rehabilitation program was designed, consisting of three supervised sessions per week, each lasting approximately 45–60 minutes. Backward walking was chosen as the central intervention due to its unique biomechanical properties, including reduced lumbar compressive forces, increased activation of trunk stabilizers, enhanced proprioceptive input, and disruption of habitual pain-associated movement patterns.

- *Phase I: Familiarization and Pain Modulation (Weeks 1–2)*

The initial phase focused on introducing backward walking safely while reducing pain and fear of movement. Interventions included patient education regarding pain neuroscience and movement safety, supported backward walking on a treadmill at slow speed, static balance and gentle trunk mobility exercises, and breathing and relaxation techniques. This phase emphasized reassurance and gradual exposure to novel movement patterns.

- *Phase II: Progressive Backward Walking and Trunk Activation (Weeks 3–4)*

The second phase aimed to improve gait confidence and enhance trunk muscle engagement. Interventions included backward walking on both treadmill and overground surfaces, with gradual increases in speed and duration. Core stabilization exercises were introduced to strengthen trunk musculature, and dynamic balance tasks were incorporated to challenge proprioceptive control and improve coordination.

- *Phase III: Functional Integration (Weeks 5–6)*

The final phase emphasized integrating backward walking into functional tasks and improving endurance. Interventions included continuous backward walking for extended durations, combined forward and backward walking drills, and functional task simulations such as directional changes and carrying light loads. A home exercise program was also prescribed to reinforce gains and encourage independent practice.

IV. RESULTS

At the end of six weeks, the patient demonstrated significant improvements. Pain intensity decreased from 6/10 to 2/10 on the NPRS. Disability, as measured by the ODI, improved from 36% (moderate disability) to 12% (minimal disability). TSK scores indicated reduced fear of movement, and lumbar mobility improved in all planes. Walking tolerance increased to over 40 minutes, and the patient reported increased confidence in movement, resuming recreational walking without symptom exacerbation.

V. DISCUSSION

Backward walking as a rehabilitative intervention for chronic nonspecific low back pain (CNSLBP) demonstrates

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several promising mechanisms and clinical implications. Unlike conventional forward walking, backward walking requires distinct motor control strategies that challenge the neuromuscular system in novel ways. By reducing reliance on visual input and increasing proprioceptive demand, this activity enhances sensorimotor integration and coordination, thereby promoting more efficient trunk stabilization. The observed reduction in pain intensity may be explained by altered spinal loading patterns, which redistribute mechanical stress across lumbar structures, and by increased activation of trunk musculature, which improves dynamic support of the spine during movement. Importantly, backward walking also functions as a form of graded exposure, gradually reintroducing patients to feared movements such as walking and bending, thereby addressing maladaptive fear-avoidance behaviors that often perpetuate chronic pain. Clinically, improvements in functional outcomes—such as walking tolerance, mobility, and disability scores—suggest that backward walking can serve as a valuable adjunct to conventional physiotherapy approaches, complementing core strengthening, mobility training, and ergonomic education. These findings resonate with emerging literature that supports backward walking in both musculoskeletal and neurological rehabilitation, highlighting its potential to improve balance, coordination, and functional independence. However, while preliminary evidence and case-based observations are encouraging, more robust randomized controlled trials and longitudinal studies are needed to establish its efficacy, optimize protocols, and clarify its role within evidence-based management of CNSLBP.

- *Clinical Implications*

This case demonstrates that backward walking can be safely incorporated into rehabilitation programs for chronic nonspecific low back pain. It may reduce fear-avoidance behavior, improve movement confidence, and enhance functional outcomes. However, individualized progression and supervision are essential to ensure safety and effectiveness.

VI. LIMITATIONS

The report describes a single case and lacks long-term follow-up. As such, the results cannot be generalized to broader populations without further controlled studies. Future research should focus on larger sample sizes and standardized protocols to validate the role of backward walking in CNSLBP rehabilitation.

VII. CONCLUSION

Backward walking appears to be a promising adjunctive intervention in the management of chronic nonspecific low back pain. Its biomechanical and neuromuscular benefits may address both physical and psychological components of chronic pain. While this case provides encouraging evidence, further research is required to establish standardized rehabilitation protocols and evaluate long-term outcomes.

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