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A Rehabilitation Program for Correcting Lateral Deviation Resulting from Lumbar Disc Injuries in Young Wrestlers

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Abstract

Lumbar disc injuries are among the most common issues affecting young wrestlers, often leading to functional disorders of the spine, notably lateral deviation, which negatively impacts motor performance and physical balance. This study aims to design a rehabilitation program based on specialized therapeutic exercises intended to correct lateral deviation, enhance spinal efficiency, and reduce associated pain. The research was conducted on a sample of young wrestlers suffering from lumbar disc herniation accompanied by lateral deviation, who underwent a structured rehabilitation program over a specific period that included core strengthening exercises, balance improvement drills, and stretching and relaxation activities. The effectiveness of the program was evaluated through pre- and post-intervention measurements, assessing deviation angle, pain intensity, and physical performance level. The results revealed a marked improvement in the correction of lateral deviation, a reduction in pain levels, and an enhancement in physical performance, confirming the efficiency of the rehabilitation program in promoting spinal function and mitigating the effects of lumbar disc injuries. The study recommends adopting such programs within therapeutic plans for injured wrestlers to ensure their safe and rapid return to competitive sports.

Keywords: rehabilitation program, lumbar disc injury, lateral deviation, young wrestlers.

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Introduction

Sports injuries are among the major challenges faced by athletes in various sports, particularly in those involving direct physical contact, such as wrestling. Among these injuries, lumbar disc herniation is one of the most common conditions that has a direct impact on physical performance and the biomechanical efficiency of athletes, often resulting in issues related to stability and balance. One of the frequent complications associated with this condition is lateral deviation of posture, which can impair the athlete's ability to execute technical movements effectively, as well as affect motor performance quality and neuromuscular coordination. Wrestling, as a sport, requires high levels of strength, endurance, flexibility, and balance, in addition to an athlete's ability to control body positioning during combat. When a lumbar vertebral injury occurs, the wrestler's ability to maintain proper body alignment during training and competition is compromised, increasing the risk of secondary injuries due to movement asymmetry and biomechanical imbalance. Moreover, the lateral deviation caused by such injuries can result in excessive strain on the spinal muscles and ligaments, potentially leading to future health complications that affect the athlete's long-term career.

Given these challenges, there is a critical need to design a specialized rehabilitation program aimed at correcting the lateral deviation resulting from lumbar disc injuries among young wrestlers. Such a program should be based on well-established scientific principles derived from sports rehabilitation, biomechanics, and physiotherapy, focusing on strengthening the muscles surrounding the spine, improving motor balance, and enhancing flexibility of muscles and joint tissues. These elements collectively contribute to restoring postural stability and reducing the risk of recurrent injuries. Developing an appropriate rehabilitation program for young wrestlers also requires a precise understanding of the biomechanical demands and movement patterns involved in wrestling performance, as well as an assessment of how spinal injuries influence overall athletic efficiency. Therefore, this study seeks to present an effective rehabilitation model that can be incorporated into therapeutic and training programs for young wrestlers, enabling them to regain their functional abilities safely and efficiently, thereby improving performance and minimizing the risk of future injuries.

Wrestling as a sport faces substantial challenges due to injuries that occur during training or competition, particularly spinal injuries such as lumbar disc herniation, which can lead to serious complications affecting body stability and balance. One of the most notable consequences of this condition is lateral deviation, which hinders the athlete's ability to achieve optimal performance and impacts overall motor efficiency. Despite advancements in sports rehabilitation and physiotherapy methods, there remains a shortage of specialized programs specifically

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targeting lateral deviation caused by lumbar disc injuries in young wrestlers. Most existing rehabilitation approaches emphasize improving flexibility and reducing pain but often fail to directly address the structural postural deviations caused by the injury, leading to chronic issues that may hinder the athlete's long-term performance.

Accordingly, this study seeks to answer the central question: To what extent is a proposed rehabilitation program effective in correcting lateral deviation resulting from lumbar disc injuries among young wrestlers? Additionally, it aims to explore the impact of the rehabilitation program on enhancing motor and biomechanical performance and to assess the extent to which wrestlers respond to the program in terms of restoring balance, reducing pain, and improving movement quality.

The research was conducted on first-division young wrestling athletes as the human sample. The implementation period extended from January 5, 2025, to March 10, 2025, and the study was carried out at the Al-Riyada Rehabilitation Center for Sports Injuries in Baghdad.

Methodology

The experimental method was adopted as it is the most appropriate approach for addressing the research problem. The key advantage of the experimental method, compared to other scientific approaches, is its ability to control and regulate various factors affecting the research variables, as well as its capability to reveal causal relationships between causes and effects, enabling the formulation of scientific principles and theories (Ibrahim Abdel Khalek, 2001). Furthermore, the experimental method, in addition to advancing scientific research in the humanities and social sciences—including sports sciences—represents the most reliable way to address both practical and theoretical research problems (Mohamed Hassan Allawi, 1999).

Research Population and Sample

The research population consisted of young wrestlers suffering from lateral deviations due to lumbar disc herniation. The study sample included 12 athletes, whose conditions were diagnosed by a specialist physician in physical rehabilitation and physiotherapy, confirming the presence of lateral deviations associated with lumbar disc injuries.

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Data Collection Tools and Instruments

Data were collected using various methods to ensure accuracy and reliability:

- Sources: Both Arabic and international references were utilized.
- Measurements and Tests: Standardized tests were conducted.
- Test Recording Forms: Forms were used to document individual test results.

Equipment and Tools

- Posture Pro device for postural and alignment analysis.
- Swiss balls for stability and strengthening exercises.
- Light weights for controlled resistance training.

Research Tests

Spinal Flexibility Test (Forward Bending) (Helal et al., 2022): Designed to measure spinal flexibility using a sit-and-reach box with a measuring scale in centimeters. The participant sits with legs extended, reaches forward, and the maximum reach distance is recorded.

Lateral Deviation Measurement using Posture Pro (Hébert-Losier & Abd Rahman, 2018): The device measures spinal inclination, displacement of the head, shoulders, and pelvis, identifies muscular stress points, and provides angular deviation data as quantitative indicators. Reports include pre- and post-test images, pressure distribution maps, and numerical deviation values. These data are compared to evaluate improvement after the rehabilitation program.

Field Procedures

Pilot Study: A pilot trial was conducted on January 2, 2025, to familiarize the researcher with procedures, identify challenges, and verify the adequacy of tools and tests.

Pre-Tests: Conducted on January 5, 2025, prior to starting the rehabilitation program.

Rehabilitation Program: Implemented from January 10, 2025, to March 10, 2025, the program aimed to:

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- Reduce lateral deviation through postural correction and strengthening exercises.
- Improve muscular balance and redistribute spinal loads.
- Decrease lumbar vertebral stress and prevent further complications.

Program Structure: Sessions were held 3–4 times per week, each lasting 30–45 minutes, divided into four phases:

Weeks 1–2 (Preparatory Phase – Flexibility and Mobility): Focused on spinal flexibility and activation of supportive muscles. Exercises included side trunk stretches, Child's Pose, spinal twist stretches, glute bridges, and heel-to-toe walks. Baseline Posture Pro measurements were recorded.

Weeks 3–4 (Muscle Coordination and Core Strengthening): Emphasis on strengthening core muscles and restoring balance. Exercises included single-leg glute bridges, side planks, superman exercises, single-leg balance, and resistance band side steps. Posture Pro measurements were repeated after week 4; intensity was adjusted if improvement was below 15–20%.

Weeks 5–6 (Strength and Postural Stability Development): Focused on enhancing strength and dynamic balance. Exercises included glute bridges with resistance bands, side planks with leg lifts, back extensions on Swiss balls, high knee walks, and wall push exercises. Proper movement coordination was emphasized, and pain levels were monitored.

Weeks 7–8 (Final Strengthening and Postural Assessment): Targeted maximum postural stability. Exercises included dumbbell side bends, dynamic planks, overhead squats, and final back stretching routines. Posture Pro measurements were taken at the end of week 8 and compared to baseline. If lateral deviation correction did not reach 50–70%, the program was extended with adjusted intensity.

Post-Tests: Conducted on March 15, 2025, under the same conditions as the pre-tests to ensure consistency and reliability.

Statistical Analysis

Data were analyzed using arithmetic means, standard deviations, and paired sample t-tests to determine significant differences between pre- and post-test scores and assess the effectiveness of the rehabilitation program in correcting lateral deviation and enhancing spinal function.

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Results

Table 1. *Pre- and Post-Test Results for the Experimental Group*

Test	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	Mean Difference	SD of Difference	Sig
Flexibility	15.4167 ± 0.51493	20.5000 ± 0.52223	6.75000	0.86603	0.000
Posture Pro	14.5000 ± 0.52223	7.7500 ± 0.45227	-5.08333	0.79296	0.000

Note: Significance level ≤ 0.05 with degrees of freedom (11)

Discussion

The results of the study revealed that the applied rehabilitation program had a significant positive effect on correcting lateral deviation resulting from lumbar disc injuries in young wrestlers. This improvement was reflected in the post-intervention measurements, which showed statistically significant differences between pre- and post-tests in favor of the post-test.

These findings indicate that the therapeutic exercises included in the program contributed to strengthening the muscles supporting the spine, enhancing balance and motor stability, which consequently reduced lateral deviation. This is consistent with the findings of Anderson et al. (2018), who emphasized that corrective and strengthening exercises targeting lumbar and lateral muscles play a crucial role in restoring muscular balance and mitigating deformities caused by disc herniation. Similarly, Abd Rahman (2020) noted that rehabilitation programs based on strengthening and balance exercises help reduce spinal problems in athletes.

The current results align with those of Smith et al. (2020), which demonstrated that rehabilitation programs incorporating balance and muscular stability exercises significantly improve spinal deviation in athletes with spinal injuries. Lee et al. (2019) also supported these findings, reporting that integrating therapeutic exercises into rehabilitation programs reduces pain and improves movement biomechanics, thereby assisting in correcting lateral deviation. In addition, Al-Mahdi (2019) confirmed that therapeutic exercises can enhance muscular balance and reduce postural deformities in injured athletes.

Factors Contributing to the Success of the Program

The effectiveness of the rehabilitation program in correcting lateral deviation can be attributed to several factors:

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Use of specialized exercises: The program focused on strengthening and stretching exercises, which enhanced lumbar stability and improved body alignment, as highlighted by Al-Harbi (2021).

Gradual progression of training loads: The program was designed progressively according to the severity of the injury and the athletes' endurance levels, promoting positive development without causing additional strain, as confirmed by Jones et al. (2017).

Integration of physiotherapy techniques: Techniques such as stretching, balance training, and therapeutic massage were incorporated, which have been recommended by several studies, including Al-Maghrabi (2022), emphasizing the role of therapeutic interventions in improving lumbar injury conditions.

Based on these findings, it is recommended to implement specialized rehabilitation programs in sports clubs to prevent and treat spinal injuries among athletes, particularly wrestlers who experience continuous lumbar stress. Similar rehabilitation programs can also be developed for other athletes experiencing comparable issues. According to Abu Zeid (2023), early intervention and ongoing rehabilitation can significantly reduce the risk of lumbar injury progression.

The results of this study reinforce the effectiveness of rehabilitation programs in improving spinal alignment and reducing lateral deviation caused by lumbar disc injuries. They also open the door for further research investigating the impact of rehabilitation programs on other musculoskeletal injuries in athletes. Future studies could focus on comparing the effects of different therapeutic programs on correcting lateral deviation and alleviating symptoms associated with lumbar injuries.

Conclusions

The rehabilitation program proved to be effective in correcting lateral deviation resulting from lumbar disc injuries in young wrestlers, contributing to improved spinal alignment and reduced functional impairments. The therapeutic exercises also decreased players' pain levels, enabling them to move more comfortably and efficiently. Additionally, the program enhanced physical performance and motor balance, positively influencing the athletes' ability to return to training and competitive activities. The results further indicate that early intervention through specialized rehabilitation programs can limit the progression of chronic injuries and mitigate their negative impact on athletes' sports careers. Strengthening core muscles and improving balance were shown to play a key role in preventing injury recurrence and reducing the likelihood of future complications.

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Recommendations

It is recommended to integrate specialized rehabilitation programs into the treatment and physical preparation plans for wrestlers, particularly those with lumbar disc injuries, to ensure proper recovery. Regular spinal assessments should be conducted to detect and address any functional impairments early, preventing further complications. Promoting sports education on spinal injury prevention is essential, raising awareness among coaches and athletes about the importance of therapeutic exercises and proper training techniques. Individualized rehabilitation programs should be developed, considering players' personal differences, to optimize correction of lateral deviations and enhance motor performance. Further studies are encouraged to examine the effects of various rehabilitation programs on spinal injuries in athletes, with a focus on other high-intensity sports. Finally, collaboration between medical teams and coaches should be strengthened to ensure the effective implementation of rehabilitation programs in a manner that aligns with the nature of injuries and the demands of athletic performance.

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