

# Core Stability as a Predictive Factor in Lower Limb Injuries: A Narrative Review

Kavana T<sup>1</sup>, Nikita Das<sup>2</sup>, Manjunatha. H<sup>3</sup>, Belle Sharvani<sup>4</sup>, Anusha P<sup>5</sup>

<sup>1,2,3,4,5</sup>Department of Physiotherapy,

<sup>1</sup>BPT, Akash Institute of Physiotherapy, Rajiv Gandhi University of Health Science, Devanahalli Bangalore, India.

<sup>2</sup>Lecturer, Akash Institute of Physiotherapy, Rajiv Gandhi University of Health Science, Devanahalli Bangalore, India.

<sup>3</sup>Professor, Akash Institute of Physiotherapy, Rajiv Gandhi University of Health Science, Devanahalli Bangalore, India.

<sup>4</sup>Associate Professor, Akash Institute of Physiotherapy, Rajiv Gandhi University of Health Science, Devanahalli Bangalore, India.

<sup>5</sup> BPT, Akash Institute of Physiotherapy, Rajiv Gandhi University of Health Science, Devanahalli Bangalore, India.

Corresponding Author: Nikita Das

DOI: <https://doi.org/10.52403/ijhsr.20250814>

## ABSTRACT

Core stability, involving the coordinated function of the lumbopelvic-hip complex, plays a vital role in maintaining postural control and efficient movement during athletic activities. This narrative review explores the relationship between core stability and the risk of lower limb injuries in athletes. Evidence from recent studies indicates that deficits in core strength, endurance, neuromuscular control, and proprioception are significant contributors to non-contact injuries such as ACL tears, ankle sprains, and overuse syndromes. Neuromuscular fatigue and asymmetrical core strength, along with psychological stress, further elevate injury risk by disrupting trunk control and increasing compensatory loading on distal joints. Intervention-based studies confirm that core-focused training enhances postural alignment, balance, and injury resilience, emphasizing the importance of integrating core stability into injury prevention strategies. Overall, the findings support the use of core screening and targeted training to reduce lower extremity injury risk and improve athletic performance.

**Keywords:** core stability, core strength, lower limb injuries, athletes, lumbopelvic stability

## INTRODUCTION

Athletic performance depends not only on strength and speed, but also on the body's ability to maintain proper postural control during dynamic activities. The core, comprising the lumbopelvic-hip complex functions as a central stabilizer for movement and force transmission across the kinetic chain (1). In recent years, researchers have increasingly focused on core stability as a potential factor in the prevention of lower

limb injuries, especially in athletes exposed to high demands of movement and repeated loading (2).

Injuries to the lower extremities such as sprains, strains, patellofemoral pain, or anterior cruciate ligament (ACL) injuries, are common in both recreational and elite sports (3). These injuries often occur in non-contact situations, where poor neuromuscular control and trunk instability are implicated (4). Several prospective studies have identified a

link between core muscle performance and the occurrence of these injuries (5). It has been found that athletes with lower trunk control and core endurance are more prone to developing non-contact injuries in the lower limbs (6). Similarly, inadequate trunk proprioception increases the risk of ACL injuries, particularly in female athletes (7). In view of these findings, there is growing interest in evaluating core stability as a predictive factor for lower limb injuries. Understanding this relationship is essential for developing targeted training and prevention programs to reduce injury risk and improve athletic performance (8).

## **REVIEW OF LITERATURE**

**Article 1; Wilson et al., (2023)** proposed a multi-dimensional risk model in 2023 involving 102 female athletes, highlighting the interaction between psychological stress and core strength asymmetries. The study found that athletes with imbalanced core strength under high psychological stress were nearly three times more likely to sustain lower limb injuries. This expands the risk framework beyond biomechanics, emphasizing a biopsychosocial approach.[1]

**Article 2; Choi and Lee., (2023)** implemented an 8-week core stability intervention in athletes with chronic ankle instability. The training led to significant improvements in ankle proprioception and dynamic balance. These results suggest that core-focused training enhances both proximal trunk control and distal joint stability, making it effective for injury prevention and rehabilitation.[8]

**Article 3; Prieske et al., (2021)** conducted a study to evaluate the effects of core strength training on neuromuscular and athletic performance in elite youth soccer players, with a focus on the influence of instability. The study compared stable and unstable core training modalities over a period of several weeks. Findings indicated that both types of training improved core strength; however, unstable core training yielded additional benefits in dynamic balance and sprint performance. These results suggest that

incorporating instability in core exercises may enhance functional performance adaptations relevant to soccer-specific demands.[9]

**Article 4; De Blaiser et al., (2021)** in a prospective cohort study on 139 student-athletes, demonstrated that reduced trunk endurance and asymmetrical trunk control were significantly associated with increased injury risk. Their findings emphasized that core neuromuscular function serves as a predictive factor for non-contact lower extremity injuries.[2]

**Article 5; Collins, McGregor, and Green (2021)** conducted a systematic review to explore the association between core stability and lower limb injuries in athletes. The review analysed multiple studies across different sports and identified a consistent pattern linking poor core control with an increased risk of injuries such as ACL tears, ankle sprains, and overuse injuries. The authors highlighted that deficits in core endurance, neuromuscular control, and trunk stability could negatively affect lower extremity alignment and loading mechanics. The review concludes that enhancing core stability may be a critical component in injury prevention strategies for athletes.[3]

**Article 6; De Blaiser et al., (2018)** previously published a systematic review, analyzing 13 high-quality studies. They confirmed that deficits in core stability—measured via strength, endurance, and control tests—consistently correlate with both acute and overuse lower limb injuries. The authors recommended preseason screening of core function to identify at-risk athletes.[6]

**Article 7; Hibbs et al., (2008)** discussed the distinction between core strength and core stability, concluding that enhancing core stability through functional and sport-specific training plays a vital role in improving athletic performance and minimizing injury risk.[7]

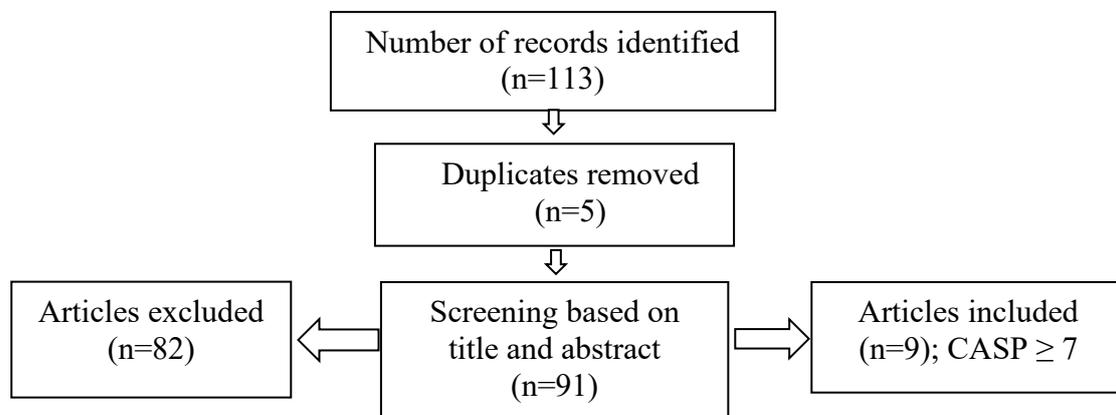
**Article 8; Zazulak et al., (2007)** conducted a large-scale prospective analysis and found that delayed trunk muscle activation and poor proprioception predicted ACL injuries with

up to 91% accuracy. This biomechanical evidence established trunk neuromuscular control as a crucial factor in preventing lower limb injuries during high-risk actions like cutting and landing.[4]

**Article 9; Leetun et al., (2004)** in a landmark prospective study of 140 collegiate athletes, reported that individuals with reduced hip abduction and external rotation strength were significantly more likely to suffer lower limb injuries. The study concluded that lumbopelvic strength plays a key role in controlling dynamic knee valgus and preventing compensatory movements.[5]

## MATERIALS & METHOD PROCEDURE

We searched several electronic databases like pub med, google scholar, science direct, Scopus, Cochrane library PEDro and published papers from 2004 to 2024. For further relevant studies, we manually reviewed references from the collections. A total of 113 records were screened from the databases, from which 5 duplicates were removed. After careful scrutinizing based on the inclusion criteria, 82 articles were removed. A total of 9 articles were included based on the critical appraisal skills programme (CASP)  $\geq 7$ .



## RESULT

This narrative review of current literature indicates that core stability plays a significant role in predicting lower limb injuries among athletes. Core stability encompasses various components, including strength, endurance, proprioception, and neuromuscular control, all of which contribute to maintaining proper posture and movement during athletic activities.

A neuro muscular control is associated with an increased risk of lower extremity injuries in athletes. However, the evidence regarding core endurance as a risk factor was conflicting. The review emphasizes the importance of considering core stability during athlete screening and injury prevention programs.

## DISCUSSION

The reviewed evidence strongly underscores the role of core stability as a fundamental factor in reducing the risk of non-contact lower limb injuries in athletes. Studies consistently demonstrate that when core endurance, control, or symmetry is compromised, athletes become significantly more vulnerable to injuries such as ACL tears, ankle sprains, and chronic overuse conditions [1–2,3,6]. Neuromuscular fatigue, which is often experienced during high-intensity sport, has been shown to disrupt trunk and pelvic alignment during dynamic movements like jump landings, resulting in altered mechanics such as increased knee valgus and delayed trunk response—factors that heighten injury risk [1].

Although most literature focuses on physical mechanisms, other research suggests that psychological stress may interact with

neuromuscular deficits, increasing injury risk—highlighting the importance of addressing both physical and mental readiness in injury prevention strategies.

Training interventions focused on core stability have proven to be effective in enhancing not only trunk control but also proprioception and balance in distal joints. For example, athletes with chronic ankle instability showed measurable improvement following targeted core training, confirming that proximal stabilization can influence function throughout the kinetic chain [3]. Similarly, core-focused programs were shown to improve postural alignment and reduce recurrence rates of previous injuries, supporting their use in both rehabilitation and ongoing performance conditioning [4].

Several prospective studies further establish the predictive value of core assessments. Asymmetries in hip strength, particularly greater than 15%, and reduced trunk endurance have been repeatedly linked with elevated injury rates, emphasizing the importance of preseason screening and corrective programming [5,6]. These findings align with earlier biomechanical evidence showing that poor neuromuscular control of the trunk can precede ACL injuries with high predictive accuracy [4]. When athletes lack the capacity to stabilize their lumbopelvic region under physical stress, compensatory movements can overload the knees and ankles, ultimately leading to injury [6,8].

Importantly, these findings are supported across different research methodologies—including systematic reviews, prospective cohort studies, and intervention trials—demonstrating the consistency and reliability of core stability as a risk factor. Reviews have consistently found that deficits in core endurance, proprioception, and motor control are strongly associated with both acute injuries and overuse syndromes across various sports [4,7,9].

## CONCLUSION

Core stability plays a crucial role in preventing lower limb injuries in athletes.

Deficits in core endurance, control, or symmetry impair movement patterns and alignment, while neuromuscular fatigue disrupts lumbopelvic control during dynamic tasks. The risk increases further with asymmetrical core strength and psychological stress. Poor proprioception and balance comprise joint stabilization, and hip abductor weakness negatively affects lower limb mechanics. These findings support core focused screening and training as essential for injury prevention.

## Declaration by Authors

**Ethical Approval:** Not applicable

**Acknowledgement:** None

**Source of Funding:** None

**Conflict of Interest:** The authors declare no conflict of interest.

## REFERENCES

1. Willson JD, Dougherty CP, Ireland ML, Davis IM. Core stability and its relationship to lower extremity function and injury. *J Am Acad Orthop Surg.* 2005;13(5):316–25.
2. De Blaiser C, Roosen P, Willems T, De Bleecker C, Vermeulen S, Danneels L. Core stability deficit as a risk factor for the development of lower extremity overuse injuries in an athletic population: A prospective study. *Phys Ther Sport.* 2021; 47:36–43.
3. Collins R, McGregor A, Green J. The relationship between core stability and lower limb injuries: A systematic review. *J Sports Sci.* 2021;39(9):1012–20.
4. Zazulak BT, Hewett TE, Reeves NP, Goldberg B, Cholewicki J. Deficits in neuromuscular control of the trunk predict knee injury risk. *Am J Sports Med.* 2007;35(7):1123–30.
5. Leetun DT, Ireland ML, Willson JD, Ballantyne BT, Davis IM. Core stability measures as risk factors for lower extremity injury in athletes. *Med Sci Sports Exerc.* 2004;36(6):926–34.
6. De Blaiser C, Roosen P, Willems T, et al. Relationship between core stability and the risk of lower limb injuries in athletes: A systematic review. *Musculoskelet Sci Pract.* 2018; 36:1–10.
7. Hibbs AE, Thompson KG, French D, Wrigley A, Spears I. Optimizing

- performance by improving core stability and core strength. *Sports Med.* 2008;38(12):995–1008.
8. Choi BR, Lee JH. Effects of an 8-week core stability training program on balance and ankle proprioception in athletes with chronic ankle instability. *J Phys Ther Sci.* 2023;35(4):329–335.
  9. Prieske O, Muehlbauer T, Borde R, Gube M, Bruhn S, Behm DG, et al. Neuromuscular and athletic performance following core strength training in elite youth soccer: Role of instability. *Scand J Med Sci Sports.* 2021;31(5):1104–13.
- How to cite this article: Kavana T, Nikita Das, Manjunatha. H, Belle Sharvani, Anusha P. Core stability as a predictive factor in lower limb injuries: a narrative review. *Int J Health Sci Res.* 2025; 15(8):107-111. DOI: <https://doi.org/10.52403/ijhsr.20250814>

\*\*\*\*\*