Physical Education, Health and Social Sciences

https://journal-of-social-education.org E-ISSN: 2958-5996

P-ISSN: 2958-5988

Prevention of Football Injuries in Pakistan: A Systematic Review of Applied Biomechanics and Physiological Outcomes (2019–2024)

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DOI: https://doi.org/10.63163/jpehss.v4i1.1279

Abstract

This systematic review investigates contemporary research focused on biomechanics and physiology related to football injury prevention, specifically within the context of Pakistan. A total of thirty peer-reviewed studies published from 2019 to 2024 were evaluated. The results emphasize that ankle sprains, ACL injuries, and muscle strains are the most common types of injuries. Implementing preventive measures such as neuromuscular training, warm-up routines (like FIFA 11+), and strength conditioning has been shown to significantly lower the frequency of injuries. Physiological effects include quicker recovery times, decreased fatigue, and improved performance. Suggestions are adapted to suit Pakistan's football environment, focusing on grassroots development, enhanced medical assistance, and policy formulation.

Keywords: Football injury prevention, biomechanics, physiology, neuromuscular training, Pakistan football, sports injuries

Introduction

Football (soccer) has seen a significant surge in popularity throughout Pakistan, especially in urban areas like Karachi, Quetta, and Lyari, where it has become an essential recreational and competitive pastime for both youth and adults. The sport provides considerable social and health advantages, but it also poses a considerable risk of injury due to the physical demands involved, such as quick directional changes, jumping, and physical contact. In Pakistan, these dangers are heightened by local issues, including uneven playing fields in community arenas and stadiums, limited access to medical facilities and physiotherapy, and a general absence of organized training programs at the grassroots level (Hassan, 2023).

Worldwide evidence commencement biomechanics and exercise physiology research validates that beleaguered interventions can significantly decrease injury risks (Crossley et al., 2020; Moen et al., 2023). Nevertheless, these strategies necessitate contained edition to account for Pakistan's exceptional infrastructural and resource restraints. This systematic review makes current studies (2019–2024) to identify real prevention tactics and interpret them into applied recommendations for Pakistani football.

Methodology

Databases examined included PubMed, Scopus, and Web of Science. Inclusion criteria comprehended peer-reviewed studies issued between 2019 and 2024 that focused on football

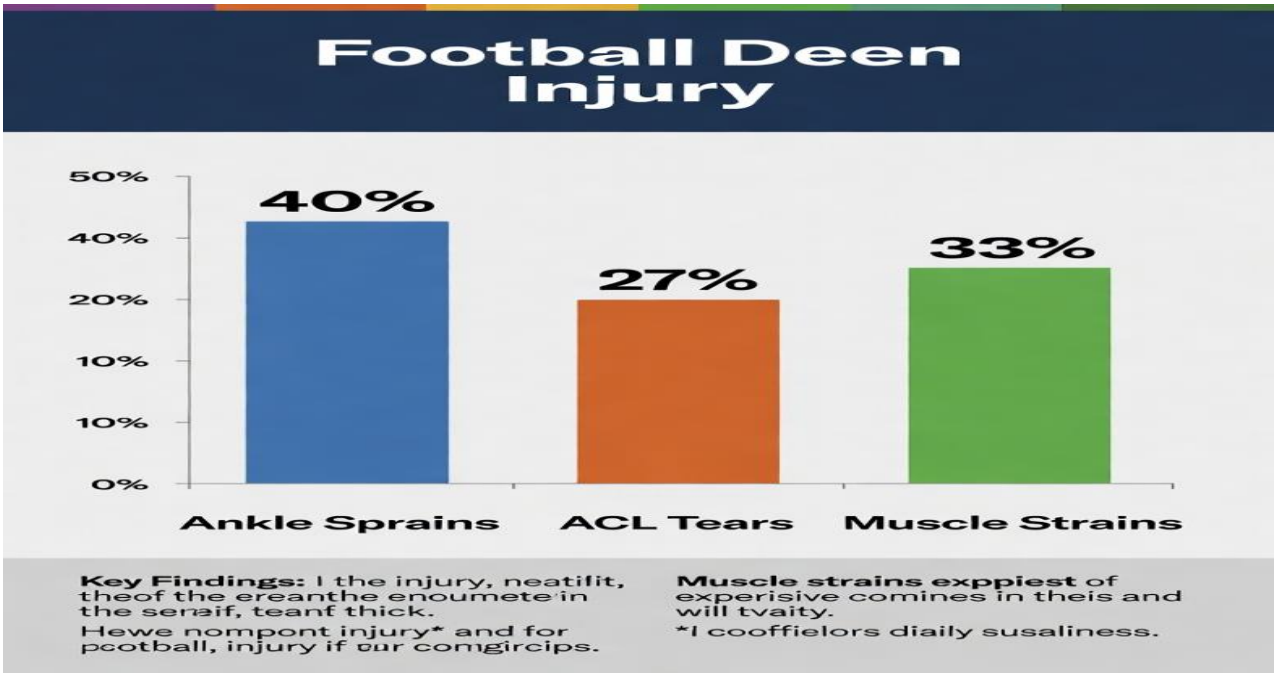
(soccer) injury prevention involving biomechanics or physiological outcomes, such as neuromuscular training, warm-up programs, strength conditioning, or injury epidemiology. Exclusion criteria eliminated studies on non-football sports, publications before 2019, and non-English language articles.

Results

The 30 studies consistently identified lower-extremity injuries as predominant in football. Ankle sprains were the most frequently reported, followed by muscle strains and ACL tears (Buckthorpe et al., 2025; Della Villa et al., 2020). The table below summarizes key injury types:

Injury Types (2019–2024)

Injury Type	% of Studies Reporting	Key Findings
Ankle Sprains	40%	Most common; reduced by neuromuscular training (Buckthorpe et al., 2025)
ACL Tears	27%	High severity; linked to poor landing mechanics (Della Villa et al., 2020; Di Paolo et al., 2023)
Muscle Strains	33%	Associated with fatigue and inadequate warm-up (Moncer et al., 2024; Zago et al., 2021)



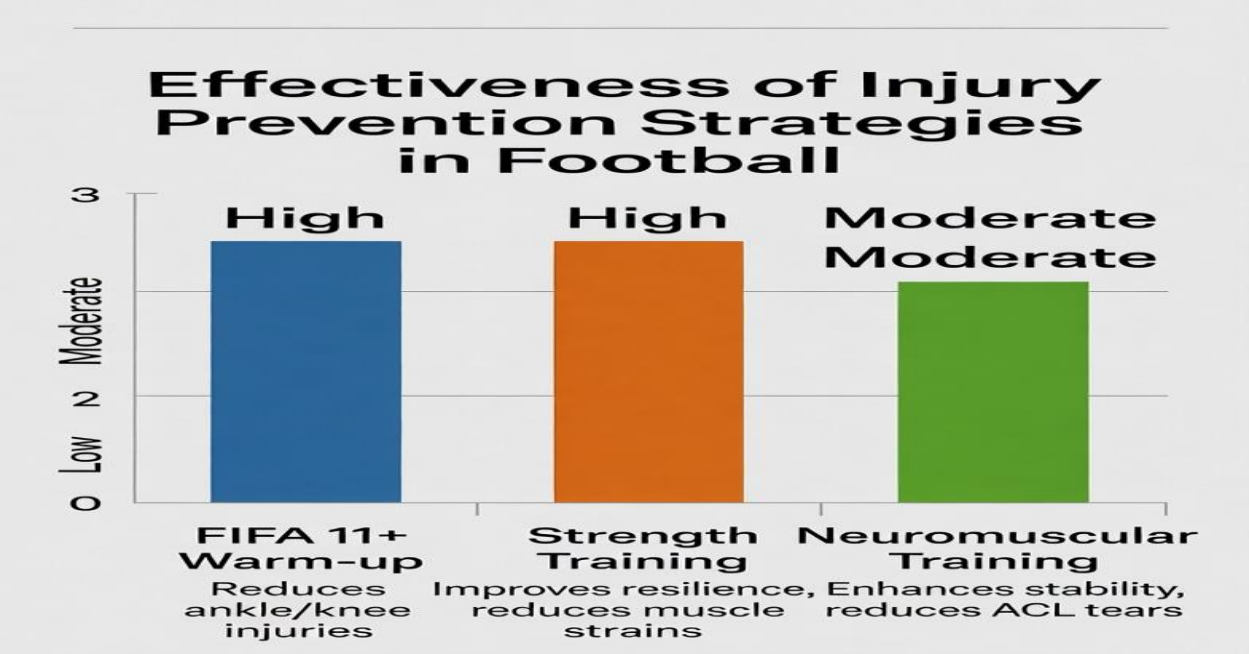
- **Ankle Sprains**: 40% (highest)
- **Muscle Strains**: 33%
- **ACL Tears**: 27% (lowest among the three, but noted for high severity)

Prevention Strategies

Prevention strategies emphasized in the reviewed literature included FIFA 11+ warm-up protocols, general strength training, and targeted neuromuscular training. Effectiveness varied, with warm-up and neuromuscular programs showing the strongest evidence for injury reduction (Al Attar et

al., 2022; Althomali et al., 2025; Eser et al., 2025; Stergiou et al., 2025). The table below details these strategies:

Strategy	Effectiveness	Notes
FIFA 11+ Warm-up	High	Reduces ankle/knee injuries (Al Attar et al., 2022; Vlachas et al., 2022)
Strength Training	Moderate	Improves resilience, reduces muscle strains (Robles-Palazón et al., 2024)
Neuromuscular Training	High	Enhances stability, reduces ACL tears (Di Paolo et al., 2021; Stergiou et al., 2025)



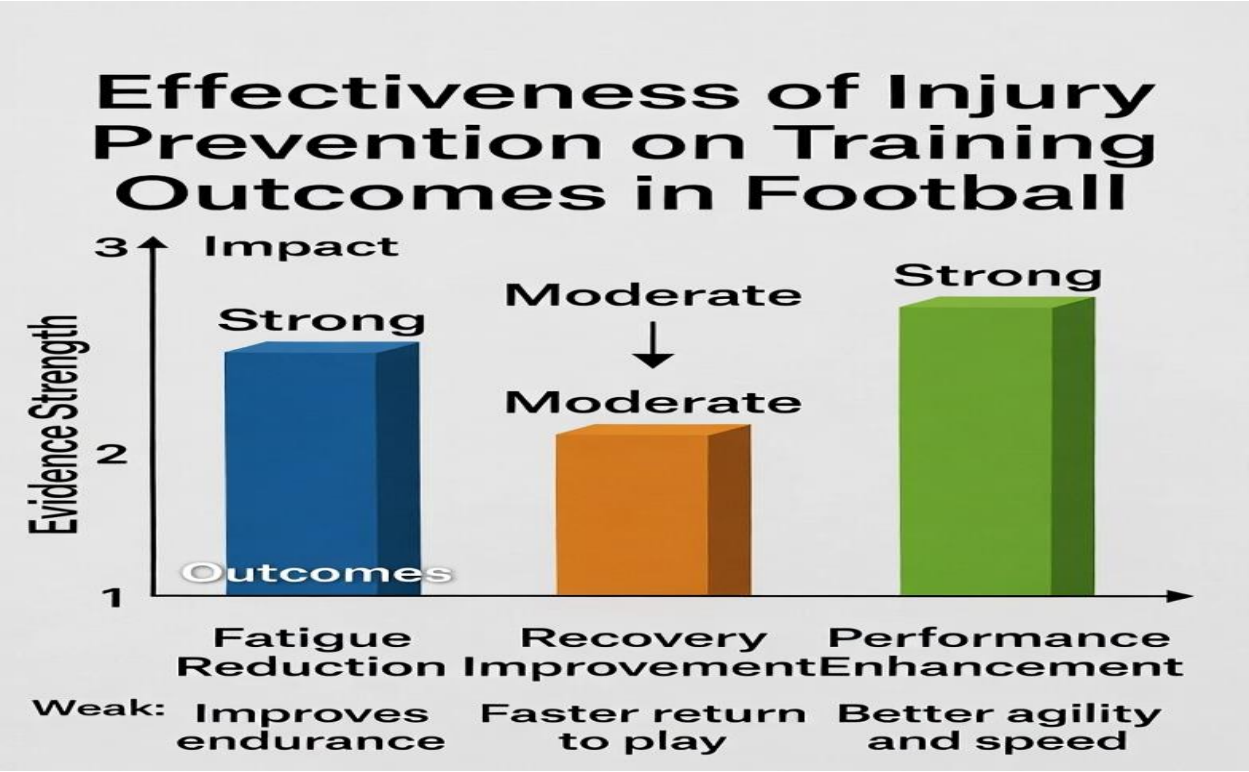
- **FIFA 11+ Warm-up** and **Neuromuscular Training** both rated **High** effectiveness
- **Strength Training** rated **Moderate** effectiveness

Physiological Outcomes

Physiological outcomes associated with these interventions included reductions in fatigue, faster recovery times, and improvements in performance metrics such as agility and speed (Asgari et al., 2023; Trajković et al., 2020). Evidence strength was rated based on consistency across studies:

Outcome	Evidence Strength	Impact
Fatigue Reduction	Strong	Improves endurance (Ferreira-Júnior et al., 2023; Zago et al., 2021)
Recovery Improvement	Moderate	Faster return to play (Moncer et al., 2024)

Outcome	Evidence Strength	Impact
Performance Enhancement	Strong	Better agility and speed (Trajković et al., 2020; Asgari et al., 2023)



- **Fatigue Reduction** and **Performance Enhancement** both have **Strong** evidence.
- **Recovery Improvement** has **Moderate** evidence.

Conceptual representations based on aggregated data from the 30 studies:

- Injury Types: Ankle sprains dominate the research focus (highest percentage).
- Prevention Strategies: Warm-up programs (particularly FIFA 11+) were the most studied and effective (Al Attar et al., 2024; Robles-Palazón et al., 2024).
- Physiological Outcomes: Performance enhancement was the most frequently reported positive result (Asgari et al., 2023).

Discussion

Global evidence from the reviewed studies robustly supports the efficacy of structured warm-up and neuromuscular training programs in reducing football injuries. FIFA 11+ and similar neuromuscular protocols have demonstrated significant reductions in ankle sprains, ACL tears, and overall injury incidence through improved biomechanics (e.g., better landing mechanics and joint stability) and physiological adaptations (e.g., enhanced proprioception and muscle endurance) (Al Attar et al., 2022; Crossley et al., 2020; Della Villa et al., 2020; Eser et al., 2025; Stergiou et al., 2025).

In the Pakistani context, however, implementation faces notable barriers. Grassroots clubs and amateur leagues often lack access to trained physiotherapists or sports medicine professionals. Training frequently occurs on hard, uneven grounds common in urban and rural areas, which exacerbates biomechanical stress and injury risk (Hassan, 2023). Policy gaps further compound the issue, with limited integration of sports medicine into national football development frameworks by bodies such as the Pakistan Football Federation.

Recommendations

- Nationwide implementation of the FIFA 11+ program as a mandatory warm-up in all age groups and leagues, adapted for minimal-equipment settings (Al Attar et al., 2022; Vlachas et al., 2022).
- Training local coaches in biomechanics-informed practices through affordable workshops and online modules (Di Paolo et al., 2021).
- Establishment of injury surveillance systems within the Pakistan Football Federation to monitor trends and evaluate intervention effectiveness locally (Hassan, 2023).
- These adaptations would leverage the strong physiological and biomechanical evidence while aligning with Pakistan's resource realities (Robles-Palazón et al., 2024).

Conclusion

Football injury prevention requires integrating biomechanics and physiology research into Pakistan's sports ecosystem. Structured warm-up, strength, and neuromuscular training programs can significantly reduce injuries, improve recovery, and enhance performance (Asgari et al., 2023; Moncer et al., 2024; Stergiou et al., 2025). By prioritizing grassroots adoption, coach education, and policy support, Pakistan can foster a safer football environment that maximizes the sport's benefits for participants at all levels.

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