Executive Summary

Women Footballers and ACL Injuries Under the Microscope: Physiological and Psychological Insights into Injury Patterns and Prevention Strategies

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Women's football is experiencing unprecedented professional growth, yet anterior cruciate ligament (ACL) injuries and lower-limb disorders continue to impose a disproportionate burden on female players. Traditional prevention models have largely focused on biomechanical risk factors, overlooking the broader physiological and psychological dimensions that shape injury vulnerability.

This project addresses that gap by implementing the first large-scale, multidimensional, field-based investigation integrating biomechanical analysis, pelvic floor health, menstrual-related variables, psychological profiling, patient-reported outcome measures (PROMs), and prospective injury surveillance within elite and youth women's football in Italy.

A total of 390 players (185 Senior, 205 U19) were assessed between July 2025 and January 2026 through validated questionnaires (KOOS, WHO-5, LESCA, PPS, PFDI-20, ICIQ-SF), standardized injury reporting aligned with FIFA consensus guidelines, and markerless motion-capture biomechanical testing during change-of-direction and single-leg squat tasks. All procedures were conducted directly within team training environments, demonstrating high feasibility and scalability for real-world football settings.

Three major findings emerged. First, substantial inter-individual variability was observed across knee-related symptoms, pelvic floor measures, and psychological readiness, despite generally favorable baseline health profiles. This highlights that elite status does not equate to uniform functional integrity and underscores the need for individualized monitoring systems. Second, specific domains showed seasonal modulation. The KOOS "Symptoms" subscale of the right knee demonstrated consistent longitudinal changes, suggesting that symptom-based PROMs may serve as sensitive, load-responsive indicators. Pelvic floor symptoms and psychological well-being also varied across the season, reinforcing the dynamic nature of female athlete health. Third, injury occurrence, particularly knee and ACL injuries, was associated with distinct PROM profiles at midseason, with non-contact mechanisms predominating. These findings support multifactorial vulnerability models and emphasize the central role of neuromuscular control and load management. Years of experience alone did not explain injury risk.

Biomechanically, players demonstrated favorable seasonal adaptations during change-of-direction tasks, characterized by increased hip and knee flexion without escalation of dynamic knee valgus. However, persistent variability in frontal-plane knee control during single-leg tasks indicates that targeted neuromuscular interventions remain necessary. Exploratory evidence also suggests that pelvic floor engagement may influence lower-limb alignment, identifying a novel and promising avenue for future research.

Overall, this project demonstrates the feasibility and scientific value of a multidimensional injury-monitoring model in women's football. Integrating biomechanical, psychological, and pelvic health domains provides a more comprehensive understanding of athlete vulnerability than traditional single-factor approaches. The findings support the structured implementation of routine PROM-based monitoring, systematic pelvic health screening, scalable field-based neuromuscular profiling, and longitudinal psychological readiness assessment.

By adopting a biopsychosocial framework, this project lays the groundwork for sex-specific, integrated injury-prevention strategies capable of reducing the persistent ACL burden and promoting safer, more sustainable development pathways within the global women's game.