

# Advancing Women's Soccer: Interconnected Challenges in Athlete Health and Equity

*Women's soccer has experienced unprecedented global growth, yet this expansion is shadowed by a high prevalence of anterior cruciate ligament (ACL) injuries and persistent systemic inequities. This exploratory narrative synthesis (2004–2026) aims to bridge the gap between biomechanical risk and social justice by examining the interconnected challenges of injury prevention and equity. The review identifies female athletes face significant biomechanical vulnerabilities, including increased knee valgus and altered muscle activation patterns, which are exacerbated by "gender-blind" footwear design. Currently, 82% of female players in top leagues report discomfort or pain related to cleats designed for male morphology. Simultaneously, the study explores the underrepresentation of Black women in soccer, highlighting how socioeconomic barriers and chronic underfunding (particularly at Historically Black Colleges and Universities) limit access to elite development. Findings show a staggering resource gap, with average HBCU athletic expenditures (\$11M–\$12M) dwarfed by those of Power Five institutions (\$150M+). The synthesis concludes that addressing these disparities requires an interdisciplinary paradigm shift. Technical innovations, such as the Kofa Agilita women-specific cleat, are presented as essential social interventions. By prioritizing sex-specific biomechanical needs and equitable resource distribution, the sport can foster an environment where athlete health and performance are no longer compromised by systemic neglect.*

**Keywords:** *ACL injury prevention; footwear biomechanics; Black women's sport; HBCU athletics*

## Introduction

Women's soccer has experienced exponential growth in participation and professionalization worldwide, yet this expansion is shadowed by significant challenges that threaten the long-term health and equitable development of the sport. This research addresses two critical, interconnected issues: the alarmingly high prevalence of knee injuries, particularly anterior cruciate ligament (ACL) tears, among female players, and the persistent lack of diversity, specifically the underrepresentation of Black women, at all levels of competition. These two problems, one biomechanical and one systemic, are mutually reinforcing and demand a holistic, interdisciplinary approach for resolution.

## Historical Context and Growth of Women's Soccer

The global history of soccer is expansive, tracing its origins to ancient variations like "Tsu Chu" in China (5000–300 B.C.) and "Calcio Fiorentino" in Renaissance Italy, before its standardized codification in 1863 (Wood, 2008). While women's participation was initially slow to develop, the formation of FIFA in 1904

1 marked a pivotal step toward global organization (Wood, 2008). In the United  
2 States, the National Collegiate Athletic Association’s (NCAA) sponsorship of  
3 women's sports in 1982 significantly propelled the sport’s domestic growth (Lewis,  
4 2023). This trajectory accelerated with the establishment of the Women's World  
5 Cup in 1991 and the subsequent successes of the USWNT, notably their victory in  
6 the 1999 World Cup (FIFA, n.d.; Timm-Garcia, 2019), which catalyzed the growth  
7 of professional leagues and increased public interest (Wikimedia Foundation, 2023).  
8 Today, women's soccer boasts a global player base of 29 million, including 4.2  
9 million in the United States (FIFA, n.d.; Culpan & Meier, 2016).

## 12 **Resource Inequity in Soccer Leading to the Gender Divide**

14 The global landscape of professional soccer, while celebrating the immense  
15 success and growing popularity of the women's game, is fundamentally marked by  
16 a persistent and deep-seated disparity in resources compared to men's soccer  
17 (Harman, 2022). This literature review synthesizes academic research exploring the  
18 nature and consequences of this inequity, which spans financial investment, player  
19 compensation, media coverage, and access to quality training environments. The  
20 consensus across scholarly work is that these institutionalized disparities reflect and  
21 reinforce broader societal gender biases, despite evidence of the economic viability  
22 and athletic excellence of women's soccer (Fuder et al., 2024; Scheadler &  
23 Wagstaff, 2018).

### 25 **Purpose**

27 This exploratory review article aims to synthesize existing research on the  
28 interconnected challenges of injury prevention and equity in women's soccer.  
29 Specifically, the scope of this review encompasses an examination of the  
30 biomechanical factors contributing to knee injuries in female players, a critical  
31 analysis of the limitations inherent in current soccer footwear designs, and an  
32 exploration of the systemic barriers that hinder the participation and success of  
33 Black women in the sport. Ultimately, this work advocates for interdisciplinary  
34 research and innovative solutions, identifying critical areas for future investigation  
35 across kinesiology, biomechanics, sports medicine, and social sciences to promote  
36 the health, performance, and equitable participation of all female soccer players.

### 39 **Method**

#### 40 **Research Design'**

42 This study employs an exploratory narrative synthesis approach to map the  
43 intersection of physiological risk and systemic inequity within women’s  
44 professional and amateur soccer. Given the multidisciplinary nature of the inquiry  
45 (spanning biomechanical engineering, sports medicine, and elements of critical race  
46 theory) this method was chosen to allow for a comprehensive integration of

1 heterogeneous data types, from quantitative kinetic studies to qualitative  
2 sociological analyses.

### 3 4 5 **Search Strategy and Information Sources**

6  
7 A systematic search was conducted across five electronic databases to ensure  
8 coverage of both clinical and social science literature: PubMed/MEDLINE, Scopus,  
9 Web of Science, SPORTDiscus, and JSTOR. To capture the most relevant  
10 contemporary developments in footwear technology and professionalization, the  
11 search was limited to peer-reviewed articles published between 2004 and 2026. The  
12 search strategy utilized combinations of Boolean operators and the following MeSH  
13 terms and keywords: "ACL," "knee kinematics," "valgus stress," "female athlete  
14 triad," "neuromuscular control," "soccer cleats," "footwear design," "traction," "stud  
15 configuration," "gender-blind design," "Black women in sport," "systemic barriers,"  
16 "intersectionality," "racial disparity," "socioeconomic access."

### 17 18 19 **Inclusion and Exclusion Criteria**

20  
21 To be included in this synthesis, studies were required to meet the following  
22 criteria: (1). focus specifically on female soccer players (youth, collegiate, or  
23 professional), (2) provide primary data or meta-analyses regarding knee injury  
24 mechanisms or footwear-surface interaction, and (3). discuss structural, cultural, or  
25 economic factors affecting the participation of Black women in soccer.

26 Exclusion criteria included studies focusing solely on male cohorts, non-peer-  
27 reviewed blog posts (unless used as primary source material for cultural discourse  
28 analysis), and studies where soccer was not the primary sport of focus.

### 29 30 31 **Data Extraction and Synthesis**

32  
33 Data were extracted using a standardized template to identify core themes  
34 across the three primary pillars of the review. The synthesis followed a three-stage  
35 process: (1) thematic grouping which included categorizing biomechanical data  
36 (e.g., hormonal influences vs. landing mechanics), (2) cross-disciplinary mapping,  
37 which included identifying where technical limitations (e.g., footwear not designed  
38 for female-specific morphology) overlap with systemic neglect, and (3) critical  
39 synthesis, which included analyzing how the lack of diverse representation in sports  
40 science research contributes to generalized (and potentially harmful) injury  
41 prevention protocols.

## 1 **Results: The Dual Challenges of Health and Equity** 2 **Biomechanical Risk Factors and Injury**

3  
4 Despite the sport's prominence, the alarmingly high incidence of knee injuries,  
5 particularly non-contact ACL tears, is a growing concern for the longevity of female  
6 athletes' careers (Brockway, 2023; Lewis, 2024). Existing research consistently  
7 demonstrates that female soccer players exhibit significant biomechanical  
8 differences compared to their male counterparts that contribute to this risk  
9 (Thomson et al., 2022; ACSM, 2023). These differences include an altered lower  
10 extremity alignment and kinematics, often manifesting as increased knee valgus, an  
11 inward collapse of the knee, that is more pronounced during dynamic tasks such as  
12 landing, cutting, and pivoting, consequently placing greater stress on the ACL  
13 (Fortune Journals, n.d.; Grassi et al., 2023). Furthermore, females tend to exhibit  
14 greater hip internal rotation and adduction, which can exacerbate knee valgus and  
15 ACL loading (Fortune Journals, n.d.). Differences are also observed in landing  
16 mechanics, with female athletes often landing with less knee flexion and greater  
17 quadriceps activation, increasing anterior shear forces on the tibia and subsequently  
18 increasing ACL strain (Fortune Journals, n.d.; PMC, n.d.). Finally, altered muscle  
19 activation patterns, specifically a potentially less dominant hamstring activation  
20 relative to the quadriceps, may contribute to the increased ACL risk in females  
21 (Weingart et al., 2022).

## 22 23 24 **Footwear Limitations and Biomechanical Exacerbation**

25  
26 These inherent biomechanical vulnerabilities are exacerbated by the  
27 widespread use of sports equipment, particularly soccer cleats, that is often ill-fitting  
28 and inadequately designed to meet female-specific needs (Lewis, 2024). Current  
29 soccer cleats are frequently designed primarily for male athletes and simply scaled  
30 down in size for women (Wrack, 2023; Stefanyshyn et al., 2000). This "shrink it  
31 and pink it" approach disregards distinct anatomical features of the female foot, such  
32 as a narrower heel, wider forefoot, and often a higher arch (Footalk, 2019;  
33 Soccer.com, 2014). Ill-fitting footwear can lead to discomfort, pain, blisters, altered  
34 movement patterns, and increased risk of injury, as confirmed by a European Club  
35 Association study which found that 82% of female soccer players in the top leagues  
36 reported issues with their cleats (Wrack, 2023).

37 Beyond fit, another limitation lies in traction systems. While traction is vital for  
38 performance, cleats designed for male force output may provide excessive grip for  
39 women, who typically generate less lower body power (News Detail, 2023). This  
40 potentially increases rotational forces at the knee joint during directional changes, a  
41 known risk factor for ACL injuries, as excessive rotational traction can cause the  
42 foot to become fixed while the body continues to move (Thomson et al., 2022;  
43 Andriacchi et al., 2009). Research specifically examining the interaction between  
44 stud design and ground reaction forces in female soccer players is less prevalent,  
45 highlighting a critical gap in optimal footwear development.

46

## 1 **Anatomy and the Imperative for Sex-Specific Design**

2  
3 A modern soccer cleat is a complex, highly engineered athletic tool comprising  
4 several integrated structural elements, all of which are essential for supporting the  
5 athlete's foot and facilitating the complex, dynamic movements of the sport. The  
6 structural components begin with the Upper, the part encasing the foot, providing  
7 containment, ball feel, and fit through various materials, lacing systems, and  
8 specialized "Touch Zones" (Nike, n.d.a). The Heel Counter, a rigid insert at the rear,  
9 is critical for providing stability to the hindfoot and controlling excessive movement  
10 during rapid changes of direction (Nike, n.d.a). The Toe Box must allow adequate  
11 space for natural toe splay, which is essential for balance, stability, and avoiding  
12 discomfort (Roach, 2023).

13 The Outsole/Sole Plate forms the structural foundation, typically made of high-  
14 performance polymers that balance flexibility and rigidity to transfer force to the  
15 ground (Nike, n.d.a). Attached to the sole plate are the Cleats, or Studs, which are  
16 designed in varying shapes and lengths to optimize linear and rotational traction on  
17 different surfaces, such as firm ground (FG) or soft ground (SG) (Chanis, 2022;  
18 Thomson et al., 2022). Finally, the removable Insole provides comfort, cushioning,  
19 and arch support, playing a crucial role in managing moisture and distributing  
20 plantar pressure (Roach, 2023).

21 Despite continuous innovations in materials and traction systems in the broader  
22 footwear market, including laceless designs and adaptive fit technologies (Adidas  
23 X Speed Portal; Adidas, n.d.; Nike, n.d.a), the historical lack of dedicated research  
24 and development for women has led to a major shortfall in design (Karolidis &  
25 Hahn, 2023; Full article: A mechanical comparison, 2024). A growing body of  
26 research underscores the anatomical and biomechanical differences that necessitate  
27 a sex-specific approach across three domains (1) *Foot Morphology*: Women  
28 generally possess a narrower heel relative to their forefoot width compared to men,  
29 meaning standard cleats may fail to provide adequate heel lockdown, resulting in  
30 instability (Footalk, 2019). (2) *Plantar Pressure and Arch Height*: Women often  
31 exhibit higher arch heights and unique patterns of plantar pressure distribution,  
32 requiring tailored insoles for proper arch support and comfort (ACSM, 2023). (3)  
33 *Force Production*: Traction patterns must be optimized for the typically lower force  
34 output of female athletes to avoid excessive rotational grip that exacerbates ACL  
35 risk (Thomson et al., 2022; News Detail, 2023).

36 These distinctions unequivocally highlight that simply scaling down men's  
37 cleats is a notion of disrespect that compromises comfort, performance, and, most  
38 critically, increases the risk of lower extremity injuries in female soccer players at  
39 every competitive level.

## 41 **Systemic Barriers to Diversity**

42  
43 In addition to health concerns, the underrepresentation of Black women in  
44 soccer, particularly at elite collegiate, professional, and leadership levels, represents  
45 a fundamental equity challenge (Gonzalez, 2023). Research indicates a clear  
46 disparity in participation rates compared to White counterparts (Harrison & Hardin,

1 2018; Lapchick et al., 2023). Systemic barriers, most notably socioeconomic  
2 disparities, play a significant role, as the financial prerequisites for elite  
3 development, such as access to quality coaching, training facilities, and expensive  
4 travel teams, disproportionately affect marginalized communities (Harrison &  
5 Hardin, 2018; Nargiso et al., 2020). Furthermore, cultural factors and a lack of  
6 media visibility for Black female soccer players can limit positive role models and  
7 discourage participation among young Black girls (Norman, 2020; Baxter, 2023).  
8 The consequences of this lack of diversity extend beyond statistics, impacting team  
9 dynamics and failing to fully reflect the diverse communities that the sport aims to  
10 serve (Norman, 2020).

### 11 12 13 **Disparity in Financial Investment and Compensation**

14  
15 One of the most examined aspects of resource inequity is the vast difference in  
16 financial compensation and investment, which extends beyond simple pay-per-  
17 game metrics to overall operating budgets and prize money. Studies on the United  
18 States Women's National Team (USWNT), a globally dominant force, illustrate a  
19 stark contrast in earnings compared to the less-successful men's team, despite the  
20 women's higher profits and television ratings in certain periods (Braciska, 2018;  
21 Utah Law Digital Commons, 2024).

22 This pay discrepancy is often justified by organizations using the argument of  
23 lower revenue generation in women's sports (Utah Law Digital Commons, 2024).  
24 However, scholars argue that this claim is flawed, as it fails to account for the  
25 historical lack of investment and media attention that created the current economic  
26 gap (Agha & Berri, 2021; Fuder et al., 2024). Furthermore, the disparity in global  
27 prize money for major tournaments, such as the FIFA World Cup, remains  
28 astronomical, with the men's prize pool significantly outstripping the women's, even  
29 as the women's prize money increases (Vanderbilt Law, 2019). The trickle-down  
30 effect of this funding gap is evident at the professional club level, where salary caps  
31 in women's leagues have been documented to be dramatically lower than those in  
32 men's leagues, with many female players globally receiving minimal or no wages  
33 for their play (Priddy, 2018; Vanderbilt Law, 2019).

### 34 35 36 **Inequitable Working Conditions and Facilities**

37  
38 The resource gap extends beyond financial figures and impacts the tangible  
39 working conditions and development opportunities for female athletes. The lack of  
40 investment in infrastructure, including training facilities, pitch quality, and travel  
41 accommodations, often leaves women's teams with second-tier resources (Braciska,  
42 2018). The necessity for better-resourced development programs is highlighted in  
43 research, especially for elite women's sports in countries with higher overall gender  
44 inequality (Hoffmann et al., 2006).

45 Beyond facilities, the underrepresentation of women in coaching and  
46 management positions is another key resource deficiency. Scholarly work suggests

1 that the perpetuation of male-dominated sports organizations, which prioritize hiring  
2 men into leadership roles, creates a less supportive environment for female players  
3 and sustains the cycle of gender inequality (Priddy, 2018). In addition, research  
4 reveals a significant gap in sports science attention, with a clear underrepresentation  
5 of studies focusing on the specialized training, injury prevention (e.g., ACL  
6 injuries), and match analysis of professional female soccer players (PMC, 2024).  
7 This dearth of specialized knowledge acts as a resource barrier, limiting the ability  
8 to maximize female players' performance and safety.

## 11 **Resource Scarcity and Systemic Disadvantage in HBCU Athletics**

13 Historically Black Colleges and Universities (HBCUs) have long served as  
14 vital centers for education, culture, and social mobility, often operating under  
15 conditions of systemic capital deprivation compared to Predominantly White  
16 Institutions (PWI) (HBCU Money, 2025; Williams & Davis, 2019). This chronic  
17 underfunding of the institutions as a whole cascade directly into their athletic  
18 departments, creating profound and persistent resource disparities that hinder  
19 competitiveness, impede facility maintenance, and limit the capacity to support  
20 student-athletes fully (Elliott & Kellison, 2019; Granger, 2021). Academic literature  
21 consistently frames this resource gap using theoretical perspectives, such as  
22 Resource Dependency Theory, which posits that an organization's resources  
23 determine its overall power and sustainability, demonstrating that HBCUs are the  
24 most under-resourced members of the NCAA (Elliott & Kellison, 2019;  
25 Quarterman, 1992).

## 28 **Financial and Budgetary Disparities**

30 A key theme in the literature is the vast difference in annual athletics  
31 expenditures and revenue generation between HBCUs and PWIs. Studies  
32 comparing athletic budgets confirm that HBCU peer groups spend significantly less  
33 than their PWI counterparts across all major categories, including operating  
34 expenses, head coach salaries, recruiting, and athletic aid (Elliott & Kellison, 2019;  
35 Duby & Chen, 2023). For example, annual athletics expenditures for MEAC and  
36 SWAC institutions often average between \$11 million and \$12 million, figures that  
37 are dwarfed by the budgets of Power Five conference schools, which can exceed  
38 \$150 million (HBCU Money, 2025).

39 This financial struggle is fundamentally linked to the institutions' smaller  
40 endowments and their mission of serving a higher proportion of low-income, first-  
41 generation students who rely heavily on financial aid, limiting the schools' internal  
42 ability to subsidize athletics (Gasman, 2009; Priddy, 2018). Consequently, HBCU  
43 athletic departments do not generate significant revenue through conventional  
44 means and often must divert institutional funds, raise student fees, or rely on locally  
45 sourced donations to sustain programs (HBCU Money, 2025).

## 1 **Operational and Infrastructure Deficiencies**

2  
3 The under-resourced nature of HBCU athletics manifests tangibly in  
4 substandard facilities and aging infrastructure. Scholars and coaches have noted that  
5 the difference in facilities (e.g., fields, weight rooms, training centers) is a visible  
6 consequence of systematic underfunding, with HBCU teams often unable to provide  
7 the same resources that are "second nature" at well-funded PWIs (Spokesman-  
8 Recorder, 2023; Elliott, Kellison, & Cianfrone, 2019). This lack of funding for long-  
9 term initiatives, such as facility renovations and additions, can negatively affect  
10 recruitment and the overall student-athlete experience (Southern Regional  
11 Education Board, 2023).

12 Furthermore, administrators and coaches at HBCUs often operate with smaller  
13 staff sizes and are forced to take on more responsibilities (e.g., coaching/teaching  
14 alongside administrative duties) and are paid significantly less than their PWI peers  
15 (Elliott & Kellison, 2019). The lack of dedicated marketing or external relations  
16 staff is also cited as a barrier to maximizing revenue generation and engaging  
17 potential sponsors (Elliott, Kellison, & Cianfrone, 2019).

## 18 19 20 **Competitive and Policy-Related Disadvantages**

21  
22 Resource limitations directly impact HBCU athletic competitiveness and create  
23 unique policy challenges: (a) "Guarantee Games" and Competitive Disparity:  
24 HBCU football programs often participate in "guarantee games" against higher-  
25 resourced PWIs to generate much-needed revenue, receiving a payment for an  
26 almost guaranteed, demoralizing loss (Journey Magazine, 2019). While this  
27 provides financial intake, research suggests the contracts may not be as lucrative as  
28 they should be, and the talent disparity remains a key issue, primarily driven by the  
29 ability of PWIs to offer better resources and exposure to recruits (Journey Magazine,  
30 2019; Lillig, 2009, as cited in Elliott & Kellison, 2019); (b) NCAA Policies: NCAA  
31 policies, such as the Academic Performance Program (APP) and its metrics  
32 (Academic Progress Rate and Graduation Success Rate), have been criticized for  
33 unfairly penalizing under-resourced HBCUs (SLR, 2022). By holding institutions  
34 to standards without accounting for the inherent disparities in institutional resources  
35 available to support student success, the policy can inadvertently perpetuate  
36 systemic inequalities and threaten postseason eligibility, further limiting revenue  
37 opportunities (SLR, 2022); and (c) Name, Image, and Likeness (NIL): Recent policy  
38 changes surrounding NIL and scholar-athlete compensation pose a new challenge  
39 for HBCUs, which must find ways to compete for top talent in a landscape where  
40 PWIs can leverage their massive resources and alumni networks to establish  
41 lucrative deals (Southern Regional Education Board, 2023).

42 In conclusion, the resource challenges faced by HBCU athletic departments are  
43 inseparable from the historical and systemic underfunding of the institutions  
44 themselves (NEA, 2025). While these programs hold immense cultural pride and  
45 serve as vital engagement tools for alumni and the community, their financial  
46 sustainability is constantly threatened by inadequate operational budgets, aging

1 facilities, and policies that fail to account for the deep-seated financial inequalities  
2 in American higher education (HBCU Money, 2025; Southern Regional Education  
3 Board, 2023).

## 6 **The Role of Media and Stereotypes**

8 Unequal media coverage is a crucial factor contributing to and justifying  
9 resource inequity. Women's soccer often receives significantly less broadcast space  
10 and is frequently subjected to a sexualized or patronizing portrayal in the public eye,  
11 in contrast to the focus on athletic performance for men's soccer (Braciska, 2018;  
12 Fuder et al., 2024). This disparity in representation is not benign; it directly  
13 influences public perception and the commercial valuation of the sport.

14 Experimental research challenges the notion that the lower demand for  
15 women's soccer is solely due to lower perceived skill. Studies have shown that when  
16 the gender of players is obscured, the perceived quality ratings of men's and  
17 women's performance do not significantly differ, suggesting that existing gender  
18 stereotypes, which portray women as less capable or inferior athletes, artificially  
19 depress the demand and, consequently, the investment in women's soccer (Taylor  
20 & Francis Online, 2023). This cycle of lower investment, poor media coverage, and  
21 resulting lower economic returns creates a self-fulfilling prophecy that reinforces  
22 the initial gender bias (Fuder et al., 2024).

23 The academic literature consistently demonstrates that the resource inequity in  
24 women's soccer is not simply a market-driven outcome but a complex issue rooted  
25 in historical, institutional, and cultural biases. Disparities in pay, facilities, coaching  
26 representation, and scientific research attention perpetuate an environment that  
27 undervalues female athletes. Moving toward true equity requires not only equal pay  
28 but also a systemic reevaluation of resource allocation, significantly increased  
29 institutional investment, and an end to discriminatory media representations (Fuder  
30 et al., 2024; Utah Law Digital Commons, 2024).

## 33 **Discussion**

35 This review highlights the complex interplay between biomechanical factors,  
36 suboptimal footwear design, and systemic inequities in women's soccer. The  
37 disproportionately high rate of ACL tears is fundamentally linked to biomechanical  
38 predispositions, which are exacerbated by the widespread use of equipment that fails  
39 to accommodate the female athlete's unique anatomical and functional  
40 requirements. Simultaneously, the underrepresentation of Black female athletes  
41 underscores the systemic challenges related to access, resources, and culturally  
42 appropriate support. These experiences align with existing research demonstrating  
43 that inequitable resource distribution functions as a social determinant of athlete  
44 health, shaping not only physical injury risk but also self-esteem, identity, and  
45 motivation (Sabo & Veliz, 2020; López & McDonough, 2021). Taken together, the  
46 results highlight not only biomechanical concerns but also the psychosocial cost of

1 inequitable equipment access, which disproportionately affects women and athletes  
2 at HBCUs. These systemic barriers directly undermine confidence, belonging, and  
3 sport performance (Bennett & Gioia, 2020; Carson & Polk, 2022), core  
4 determinants of athlete well-being.

5 At the systems level, providing women with equipment designed specifically  
6 for their needs represents more than an ergonomic improvement, it is a corrective  
7 action against long-standing inequities in funding, access, and gender  
8 responsiveness within sport. Research in sport psychology and sport social work  
9 consistently demonstrates that when athletes feel adequately resourced and  
10 supported, they exhibit higher levels of self-efficacy, confidence, motivation, and  
11 perceived control, all of which are predictors of improved performance (Henriksen  
12 & Stambulova, 2017; Myer et al., 2016).

13 Conversely, inequitable distribution of equipment functions as a social  
14 determinant of athlete health, reinforcing systemic disparities that begin in youth  
15 sport and intensify through college. Women, especially those at underfunded and  
16 historically marginalized institutions, internalize these inequities as indicators of  
17 their value or worth within their programs (López & McDonough, 2021). This  
18 marginalization affects not only physical safety but also psychological readiness,  
19 identity development, and long-term sport participation.

20 The existing literature compellingly argues that a paradigm shift is needed in  
21 the design and development of soccer cleats for women. The historical reliance on  
22 scaled-down men's models disregards fundamental sex-based differences and has  
23 led to far too many ACL tears. Future research must prioritize a user-centered  
24 approach, integrating detailed biomechanical analyses of female-specific  
25 movements with advanced material science and innovative design principles. This  
26 includes creating women-specific lasts, optimizing stud patterns to efficiently  
27 execute pivoting and cutting with optimal rotational traction, and incorporating  
28 durable insoles that sustain their cushioning and proper arch/heel support beyond a  
29 single season of play, addressing a key complaint from players (Wrack, 2023).

30 Furthermore, addressing the systemic barriers that limit the participation of Black  
31 women requires a multi-faceted approach, encompassing initiatives to increase access  
32 to quality training, promote equitable talent evaluation, and foster inclusive and  
33 supportive environments. Research specifically examining the footwear needs and  
34 experiences of Black female soccer players is notably scarce, highlighting an important  
35 area for extension to an often unheard and unseen, yet vital, athlete population (Harrison  
36 & Hardin, 2018; Prempeh & Pennington, 2025a,b).

37 In summary, the continued success of women's soccer hinges on innovative,  
38 evidence-based solutions that prioritize the health, performance, and equitable  
39 participation of all female athletes. Kinesiology scholars and footwear developers  
40 play a vital role in this endeavor, providing the scientific foundation for informed  
41 decision-making in equipment design and policy development. By acknowledging  
42 and accommodating the unique needs of this growing demographic, the industry can  
43 contribute significantly to a future where women's soccer is both thriving and  
44 equitable, allowing female collegiate athletes to perform at the highest level without  
45 it being in exchange for their health.

46

## 1 **Conclusion: Footwear as a Biomechanical and Social Intervention**

2  
3 The synthesis of biomechanical data and sociological inquiry presented in this  
4 review reveals a stark reality: the high rate of ACL injuries in women's soccer is not  
5 an architectural flaw of the female body, but rather a consequence of an unlevel  
6 playing field. The historical reliance on "gender-blind" equipment is a tangible  
7 manifestation of resource inequity that compromises the health of female athletes  
8 (Pennington, Prempeh, & Ellman, 2026 a, b).

9 Proper accommodation can prevent eventual short- and long-term injuries. The  
10 solution developed from the culmination of this research is the *Kofa Agilita* (KA), a  
11 novel women's specific cleat attempting to close the gender gap in sports equipment  
12 with the goal of enhanced comfort and mitigating injury risk (Prempeh &  
13 Pennington, 2025a, b). The introduction of the *Kofa Agilita* represents a paradigm  
14 shift from passive adaptation to active accommodation. By integrating specific  
15 technical features, the KA cleat directly addresses the "gender-blind" design failures  
16 identified in this review: (a) Morphological Integrity: A women-specific last with a  
17 narrower heel cup and a contoured arch support eliminates the instability and "heel  
18 slip" common in scaled-down men's cleats, reducing compensatory movement  
19 patterns that stress the ACL. (b) Kinetic Calibration: The stud configuration is  
20 engineered for the lower force-production profiles of female athletes. By optimizing  
21 rotational traction, the KA prevents "foot-fixation" during high-velocity pivots, a  
22 primary trigger for non-contact ligamentous failure. (c) Long-Term Durability:  
23 High-performance polymers in the sole plate ensure that structural support does not  
24 degrade mid-season, a critical factor for athletes at institutions where frequent  
25 equipment replacement is not financially feasible.

26 By addressing these disparities, a women-specific cleat offering becomes a  
27 mechanism of empowerment: 1) Athletes having used and tested the *Kofa Agilita*  
28 report feeling "seen," "prioritized," and "equal" when provided equipment tailored  
29 to them. 2) Confidence increases when athletes no longer struggle with preventable  
30 pain or outdated gear. 3) Feelings of inclusion and institutional support enhance  
31 motivation and commitment. 4) Performance improves as psychological barriers,  
32 fear of injury, distraction, discomfort, are reduced.

33 For athletes at HBCUs and other marginalized programs, the *Kofa Agilita* cleat  
34 serves as a mechanism of dignity and equity. In environments where chronic  
35 underfunding often forces athletes to utilize second-tier resources, providing  
36 equipment designed specifically for their physiology is a powerful social intervention.

37 When an athlete is provided with a tool that acknowledges her unique biology  
38 and racial identity, the benefits transcend the physical paradigm. Athletes benefit  
39 from psychological readiness, wherein the "fear of injury" is reduced through  
40 evidence-based design enhances self-efficacy and on-field confidence. Athletes gain  
41 institutional validation by virtue of high-quality, sex-specific gear which signals that  
42 the athlete's health and performance are high-priority investments, countering the  
43 internalization of systemic neglect. Also, the sports gains sustainable participation.  
44 By mitigating preventable injuries, we preserve the talent pipeline of Black women  
45 in soccer, ensuring they remain in the sport long enough to transition into the  
46 leadership and coaching roles where they are currently most underrepresented.

1 Thus, the introduction of an equitable, women-specific cleat is not merely a  
 2 product innovation, it is a social intervention that counters inequity, promotes athlete  
 3 dignity, and strengthens holistic performance outcomes (Pennington, Prempeh, &  
 4 Ellman, 2026 a, b). It represents a tangible step toward addressing the gender gap in  
 5 sports resources and toward creating environments in which all athletes, regardless  
 6 of gender, race, or institutional funding level, can thrive.

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