

Digital Intelligence and Women's Sports in Higher Education: Opportunities, Challenges, and Institutional Responses

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Abstract: *In the digital intelligence era, university sports education faces both unprecedented opportunities and profound challenges, with women's sports emerging as a critical site for transformation. Digital technologies not only enable pedagogical innovation and personalized student development but also shift women's roles from passive participants to proactive leaders, thereby advancing equity and modernization in physical education. However, the integration of digital intelligence also raises significant concerns, including data security risks, the digital divide, and persistent gender biases. In response, universities must implement robust data governance frameworks, optimize resource allocation, and strengthen institutional support for female athletic talent cultivation, ensuring that more women can excel and lead in collegiate sports while contributing to the broader goals of educational equity and social progress.*

Keywords: Digital intelligence, Women's sports, Higher education, Gender equity, Pedagogical innovation, Data governance.

1. Introduction

Reviewing the development process of world sports, female athletes have held up "half of the sky". They have strived tenaciously and shown resilience, using "her power" to create shining moments that belong to them, leaving behind the glory of female athletes in sports history. From rejecting women from participating due to perceived danger, to appreciating the elegance and beauty of women on the field, today, "her power" has fully participated in sports competitions. With the rapid advancement of technology today, various technologies of the digital intelligence era have achieved breakthrough applications and developments in various fields. People are about to witness an unprecedented revolution sparked by new technologies represented by digital technology in the sports field — the rise of "digital sports"[1]. Digital sports is a new form combining digital technologies and methods such as information technology and media technology with traditional sports, a new development integrating e-sports, video games, and other factors with sports, a product of the times, and a new phase in the development of sports itself. Its essence is the new manifestation of technological progress in the sports industry, and digitally empowered sports are about to create a brand-new sports ecosystem through innovations in human-computer interaction. As the main battleground for sports education, universities have also ushered in new changes in the age of digital intelligence. This article analyzes the opportunities, challenges, and development strategies for women's sports in universities against the backdrop of the digital intelligence era from a female perspective.

2. Opportunities for Women's Sports in Universities in the Age of Digital Intelligence

The era is both the "question setter" and the "dream enabler." It bestows upon women in the sports industry the glorious mission of being the "half of the sky," entrusting them with the responsibility of driving industry development while offering boundless opportunities. In cutting-edge fields like 5G, artificial intelligence, and big data, they can write their own chapter of the times through professionalism and passion.

2.1 Intelligent Technology Empowering Teaching Innovation

In the process of achieving Chinese-style modernization, digital empowerment for women's sports development is an important topic. When universities provide physical education to women, they utilize digital technologies and tools to enhance women's abilities, opportunities, and efficiency in sports, thereby improving their living conditions and social status [2]. In the digital age, emphasizing skill enhancement and empowerment in women's sports is not only a necessity for women's development but also essential for society to fully mobilize and utilize human resources. Digital sports offer new forms, content, and concepts in sports; digital sports create new environments, spaces, and directions for sports; digital sports provide participants with new experiences, momentum, and lifestyles; digital sports present new arenas and pathways for competitive sports and sports industrialization; digitized sports and gamified sports have reshaped the sports ecosystem, forming a new pattern where traditional and digital sports coexist in contemporary society, bringing new productive forces to future sports education, sports culture, and even the sports industry, greatly alleviating or even solving the real issue of imbalanced and insufficient development of sports educational resources across regions in the country.

Today, digital technology is comprehensively integrating into every aspect of human life with new concepts, business formats, and models. The continuous updates of digital technology are propelling the rapid development of the digital economy, empowering comprehensive innovation and development in women's sports [3]. In university sports education, intelligent technology is becoming a powerful engine for advancing women's sports. Smart sports platforms, as significant products of the digital age, enable universities to monitor and provide feedback on exercise data in real-time, design monitoring plans specifically for women, and offer female college students more personalized and scientific exercise programs. For example, in a "smart fitness" project at a university in Beijing, AI motion recognition cameras and

smart sensors were installed on the playground and in the gym. When students engage in activities such as running, yoga, or dance, the system automatically records their heart rate, exercise intensity, and movement trajectory. From a female perspective, it analyzes women's exercise characteristics and recommends the most suitable exercise plan for their physique and goals using big data algorithms. Intelligent technology has not only revolutionized teaching methods but also substantially empowered women with the capability and space to participate in sports. It allows "her power" to shine with greater vitality in the digital age and injects new momentum into building an inclusive, fair, and diverse sports education system.

2.2 Promoting Personalized Physical Education for Women

As higher education accelerates towards scientific and inclusive approaches driven by innovative technologies, physical education is simultaneously undergoing profound transformations fueled by digital intelligence. Technologies such as artificial intelligence and big data can systematically tap into the potential of female athletes and optimize training systems based on female characteristics, thereby providing new sustainable momentum for women's sports [4]. University teachers used to select talented individuals based on intuition, but now they rely on data. Take shooting as an

example: universities have introduced smart triggers, which use sensors to capture real-time pressure values, timing precision, and stability when athletes pull the trigger, converting subjective feelings into objective data. In the past, coaches could only depend on visual observation or experience to assess an athlete's condition and performance during training, whereas now they can accurately and comprehensively grasp these details through backend data. Smart devices not only help identify promising candidates for shooting but also accumulate massive amounts of training data, enabling the creation of personalized growth profiles and assisting in formulating phased and tiered teaching plans. For universities, establishing a data-driven teaching mechanism holds significant importance, enhancing precision and effectiveness in instruction while offering a fairer and more scientific platform for discovering and nurturing female sports talents. For instance, due to physiological differences between men and women, it is difficult for students to find the most suitable approach in track and field, swimming, and gymnastics using traditional teaching methods. However, if universities adopt AI motion capture systems, they can analyze movement trajectories, rhythm, and body coordination through big data, delivering personalized feedback and dynamic adjustments tailored to different physical conditions and skill levels, allowing every female student to discover her optimal growth path under the guidance of a "data coach."



Figure 1: AI Motion Capture System

Digital intelligence technology propels women's sports in higher education from a "broad irrigation" model to "precision drip irrigation," transitioning from uniformity to personalized development, truly realizing the educational philosophy of "student-centeredness." In this process, women are not only beneficiaries of the digital sports reform but may also emerge as active leaders and promoters. In the future, women's sports in higher education will flourish with even more vibrancy and diversity powered by technological advancements.

2.3 Enhancing the Influence of Women's Sports

According to the "Statistical Data on the Status of Women and Children in China" and the "China Social Statistics Yearbook", from 2013 to 2020, the number of female graded athletes in China increased rapidly, with a total of 141,000 female graded athletes developed, averaging 17,600 female graded athletes developed annually. Among them, a total of 480 international-

level female master athletes, 4,144 national-level female master athletes, 39,983 first-class female athletes, and 96,408 second-class female athletes were developed. Among athletes of different levels, the cumulative number of female international master athletes accounted for 57.1%, consistently occupying a high proportion, showcasing the competitiveness of top female athletes in China. Women's participation in sports is an important component of national sports development and also a significant aspect of women's social participation. Since entering a new era, the achievements of China's sports industry have been remarkable, with notable progress and development in women's sports as well. According to the "2022 China Fitness Industry Data Report", female fitness consumers exceeded 62% that year. Data from various dimensions and perspectives show that female power in sports exhibits a flourishing trend, and the female population is leading the transformation in sports.



Figure 2: Shui Qingxia and the Chinese Women's Football Team

Digital technology is not only a tool but also a cultural leadership force that is reshaping the connotation and boundaries of women's sports, allowing women's strength to be seen, respected, and amplified in more diverse, freer, and broader spaces. In this process, universities undoubtedly become key platforms for the rise of women's sports influence. Introducing digital technology into physical education in universities can effectively enhance women's digital skills, eliminate the gender digital divide, and promote gender equality. Women generally exhibit more nurturing tendencies than men. Even in 热血 sports like soccer, basketball, and volleyball, some trainees may require more encouragement and support than others. Women are often better at adapting to any emotional and psychological changes happening around them and handling these situations in a gentler manner. Even athletes with overflowing masculinity can experience discomfort, fear, and lack of confidence in the initial stages; women's softness can better alleviate this phase of discomfort [5]. A method of patient and gradual training is a better way to help novice athletes start and persist.

Digital sports platforms give women a space to express and showcase themselves. The introduction of digital technology in universities can maximize the advantages of women, further enhancing their influence and leadership in the sports field. Outstanding female athletes are not only strong on the field but also become "digital communicators," "health advocates," and "youth role models" in campus sports culture. For example, in "Smart Campus Sports Meets," many universities have set up live broadcasts and online interaction systems where athletes can share their data results, training stories, and exercise insights in real time during competitions. The gentle way women present themselves allows more people to understand the charm of women in sports, shaping a new ecosystem for campus sports while increasing the visibility and voice of women in public sports spaces.

Driven by digitization, female physical education in universities has made step-by-step progress, no longer limited to cultivating students' physical fitness but standing on a broader dimension, paying more attention to optimizing students' physical and mental health, improving leadership,

and social responsibility. For instance, some universities have established "AI sports clubs" or "smart health assistant programs" that encourage girls to take on roles as project operators, data analysts, or health consultants, enhancing their organizational and communication skills through participation in management and even laying a professional foundation for future careers in sports-related industries. This multi-dimensional participation opportunity is a unique dividend offered to university women in the digital intelligence era and represents a truly meaningful development path of "moving from sports to society" [6].

3. Challenges for Female University Sports in the Digital Intelligence Era

AI is changing the world; however, just like the two sides of a coin, opportunities and challenges always go hand in hand. Although the digital intelligence era has brought revolutionary changes to sports, the technical fields covered by digital sports are very broad, and how to better apply digital technologies in the future to cultivate female sports talents in universities remains an open question.

3.1 Data Security Issues for Female University Students

While digital technology empowers female sports in universities, it also brings unprecedented data ethics challenges. AI products with general large models of hundreds of billions of parameters are like digital oceans, and the specific content they generate is highly unpredictable. The digital economy provides important support for the development of education and is a key driving factor for digital education models. For female university students, privacy is crucial. During physical education, data about female students will inevitably be recorded. Wearable devices, motion capture cameras, physiological monitoring sensors, and other equipment frequently collect data on female students' physical conditions, movement trajectories, physical changes, and health statuses. If this information leaks, it will not only harm the personal privacy of female students but may also trigger a series of psychological pressures, social anxiety, and even gender discrimination chain reactions. Society still

holds relatively harsh standards for women. If individual female students' body shapes or physical fitness data are uploaded to online platforms and excessively analyzed or labeled by malicious individuals, they will undoubtedly bear additional judgment and pressure invisibly. Especially in an environment where social media is highly developed, some platforms might share female students' sports data, training footage, or performance rankings without their consent, which would greatly affect female university students. Given their young age and weaker stress resistance, severe cases could lead to anxiety or depression. How to balance technological innovation with privacy issues, prevent privacy breaches, and protect students' interests is a major issue universities currently face. As technology continues to develop, universities must stay on the "fast lane" of digitization while also building strong "firewalls" for privacy protection, achieving simultaneous progress in technological innovation and humanistic care. Only then can we truly create a safe, healthy, and sustainable environment for women's sports.

3.2 Impact on Traditional Physical Education Models

Traditional sports need inheritance and continuous innovation; governments, universities, and enterprises are making active efforts. Digital sports, based on the integration of innovative technology and traditional sports, have emerged accordingly. Digital technology touches upon human nature and stimulates user stickiness. For female students, digital technology brings more possibilities, such as children's love for digital products and adults' immersion in games. Digitization and gamification awaken human nature and instincts, which will also impact traditional physical education models [7].

Unlike traditional physical education concepts, digital sports represent a new industrial ecosystem that encompasses the ideas, content formats, and more of sports, including its individuality, popularity, and industrial nature. It is also a composite of all fields and elements of professional sports, mass sports, and competitive sports. It embodies developmental, contemporary, and historical concepts, with its essential characteristics being the combination of contemporaneity, regionalism, and subjectivity. From the classical era, ancient Greece and Rome, the Spring and Autumn and Warring States periods to modern sports, from industrial factors dominating to the current informatization, intelligent computing, and artificial intelligence, it has always been in a state of fluid change [8]. Therefore, the emergence and development of digital sports should be seen as the core element of a new form and phase in the evolution of the sports ecosystem, showcasing a cross-era transition from classical to modern to contemporary times. It is also the biggest variable in sports development, profoundly changing the forms, content, rules, and concepts of sports, elevating from original regionalization to a blend of virtual and real, human-computer interaction, breaking through external spatiotemporal and subject identity limitations. The greatest challenge in this transformation is that many traditional physical education teachers are not yet familiar with the operation and teaching integration of new technologies. Curriculum design and evaluation systems also struggle to quickly adapt to the new model of parallel virtual and real-world scenarios. Especially in female physical education, relying solely on equipment while neglecting emotional interactions and physical

experiences between people can easily lead to "technological alienation" phenomena such as decreased student motivation for exercise and weakened physical perception abilities.

3.3 Uneven Allocation of Intelligent Digital Resources

Although intelligent digital technology offers more precise, efficient, and personalized pathways for physical education, gender bias and technological barriers still exist in covert ways and may even be amplified by technology in practical applications. This poses deep challenges that must be addressed in the development of women's sports in higher education institutions. Gender biases and discrimination in AI technology and products could severely impact the progress of gender equality. Relevant reports from UNESCO point out that the widespread application of AI and existing gender biases increase risks for women in physical education, potentially offsetting decades of progress towards gender equality. The invisible technological threshold also widens the digital divide in gender participation. Although most college students are "digital natives," in specific intelligent digital sports practices, girls use advanced technological tools (such as data analysis software, smart wearable devices, self-service fitness platforms, etc.) less frequently and proficiently than boys. Some girls avoid using equipment due to fear of errors affecting performance or lacking confidence in tech-related courses, resulting in avoidance behavior. This "technological anxiety" somewhat undermines the popularity and fairness of intelligent digital sports, creating new gender barriers instead.

At present, there is still a certain structural gender imbalance in the setup of college physical education courses after the introduction of digital technology. In the advancement of smart sports, some colleges focus on the integration of "technology + competition," continuously strengthening aspects like physical fitness tests and skill competitions, while neglecting female students' demands for participation in sports regarding emotional support, community interaction, and interest extension. Overall, the guiding model is "emphasizing technology while neglecting emotion," causing some female students to feel alienated in digital courses and thus becoming reluctant to actively engage in physical education. Therefore, only by integrating the concept of gender equality into technology application, breaking the "invisible barriers," can women's development space in intelligent sports truly expand, achieving the original intention of promoting educational equity through intelligent technology.

4. Development Strategies for Women's Sports in Universities in the Digital Intelligence Era

The digital deconstruction/reconstruction, connection/sharing, reality/fiction, present/eternity of sports—these four dimensions define a new time-space, world, existence, and subject, representing a new form of human life and an inevitable outcome of information development. The "National Fitness Plan (2021-2025)" issued by the State Council explicitly proposes to "promote the digital transformation of the sports industry," which has accelerated the cultivation of a "smart sports" new business model. How to introduce digital intelligence technology, eliminate hidden discrimination, and benefit more female students has become

the main direction for the development of women's sports in universities in the digital intelligence era.

4.1 Optimize Campus Sports Environment and Build a Female-friendly School Sports System

In the context of digital empowerment, optimizing the campus sports environment means not only upgrading technical facilities but also represents an ideological innovation. Universities should uphold the educational philosophy of "people-oriented, prioritizing women" to create an inclusive and equal digital sports environment on campus. Incorporating a gender perspective into digital innovation and applications, strengthening gender equality evaluation, research, and supervision, and alleviating artificial intelligence gender bias. Improving women's physical access environment, enhancing the accessibility and affordability of digital technology, expanding data resources and data center construction for female students, ensuring that after introducing digital technology, universities can better empower girls through sports, enabling more girls to enjoy sports, experience happiness in sports, and cultivate various abilities and confidence among girls.

Female college students' cognitive thinking is not yet mature and can be easily influenced by external factors. To help them accept digital sports mentally, universities first need to liberate women from stereotypes, create attractive content and services for them, eliminate concerns about cybersecurity, support women in learning and using digital technology while building confidence, strengthen the construction of sports digital resources, and create exclusive sports spaces for women. For example, a women's fitness area can be established, offering exclusive courses such as Pilates, aerobic kickboxing, and dance fitness, combined with virtual reality technology to provide immersive experiences that enhance participation and engagement.

Physical education teachers in universities should incorporate more emotional support and interactive feedback into their teaching designs, fostering an inclusive and understanding

classroom atmosphere. They must encourage female students to actively participate in sports, not only to improve athletic performance but also because women hope to build self-confidence, health, and happiness through exercise, promoting a healthy lifestyle. Activities like "Digital Intelligence + Women's Growth" themed lectures and training camps can make sports not just an exercise method, but also an important path for women to enhance self-awareness, construct body consciousness, and strengthen social connections.

4.2 Promote the Advancement of Women'S Competitive Sports and Establish Scientific Training and Talent Selection Mechanisms

Currently, the integration trend of "digital intelligence + sports" is becoming increasingly significant. Traditional experience-based selection and extensive training methods can no longer meet the needs of cultivating athletes in the new era. Universities must integrate digital technology and AI throughout teaching, training, and research to establish a "teaching-research-training integration" model. By building sports performance analysis platforms and smart venue facilities, advanced technologies such as artificial intelligence and big data can systematically uncover athlete potential and optimize training systems. AI models can create multidimensional profiles of athletes, comprehensively evaluating physical fitness, psychology, tactical awareness, recovery ability, and more, breaking away from the traditional "physical fitness only" mindset to achieve full-process digital management from "talent discovery" to "scientific talent cultivation." This provides sustainable momentum for competitive sports and systematically enhances the efficiency of female talent development through technological innovation. Smart video analysis, motion capture technology, and deep learning algorithms can analyze female athletes' movement trajectories, muscle exertion patterns, and posture stability in real time during training, identify blind spots and technical flaws, and adjust training plans accordingly, truly achieving "needs-based training and precise implementation."



Figure 3: Intelligent Monitoring

At the same time, a more scientific training plan can be developed. For example, the intelligent screening and intervention system developed by the Institute of Sports Medicine of the National Sports General Administration can automatically assess the severity of issues like scoliosis by analyzing spinal detection results, and match corresponding solutions. Since there are hundreds of rehabilitation exercises, different movements are needed for different levels of severity to generate personalized recommendations. The intelligent screening and intervention system can also alleviate the shortage of educational resources. Similarly, wearable monitoring devices such as smart glasses and smart bracelets can help female college students address their own issues during training.

Regularly organize competitions and make outstanding contributions to the development of college physical education through diversified measures such as technology-empowered events and innovative online competition formats. Try the "online + offline" integrated event model, using digital technology to achieve remote live broadcasting, virtual spectating, and data visualization. Utilizing virtual reality technology will break the physical boundaries of spectating, enhance female participation and event outreach. Spectators can experience "being there" with smart glasses, track athletes' competitive status in real time, enrich the competitive stage for female college students, and promote the construction of campus sports culture and the creation of a digital sports brand.

4.3 Expand Social Sports Participation Space, Build a Digital Community for Women'S Sports in Colleges

In the context of digital intelligence, expanding the breadth and depth of women's participation in social sports in colleges is not only an important part of improving national health literacy, but also a key link in promoting digital fairness and social gender equality. Achieving high-quality development of women's physical education in the digital age and bridging the digital gender gap require the participation of multiple entities such as governments, enterprises, schools, media, the public, and international organizations. Therefore, colleges must expand social sports participation spaces, build digital communities for women's sports, collaborate with female role models, elite female athletes, and college student volunteers from various fields to inspire girls to express themselves and unleash their potential, while also creating a more supportive social environment for them.

By building a digital community for women's sports, universities can effectively break down the barriers of traditional physical space and achieve multi-dimensional interaction across time, region, and identity, enhancing female college students' sense of participation, belonging, and achievement. Relying on campus digital platforms to create an online women's sports community, sections such as "AI Intelligent Fitness Mini Program," "Girls' Exclusive Exercise Leaderboard," and "Exercise Achievement Showcase Wall" are set up. Combined with personalized recommendation algorithms, appropriate exercise courses and challenge tasks are pushed to female students with different interests and ability levels, stimulating their enthusiasm for independent participation. By collaborating with resources from community sports centers, fitness companies, and women's

health organizations, an "Open Sports Space" and "Digital Sports Volunteer Platform" aimed at female college students are created, providing girls with opportunities to showcase their talents and integrating university women's sports into a broader social sports system. At the same time, the positive role of digital media in dissemination and guidance should be fully utilized. Through short video platforms, WeChat Official Accounts, campus TV stations, and other media, the wonderful moments, growth stories, and touching episodes of female college students participating in sports activities are widely spread, shaping positive role models, creating a favorable public opinion atmosphere, and gradually promoting the deep-rooted concepts of "Women's Health," "Technology Sports," and "National Fitness." Universities should empower through technology, integrate resources, and collaborate diversely as pathways to continuously build digital communities for women's sports, truly achieving the full-chain transformation of "from campus to society, from individual to group, from interest to habit," empowering every woman to strengthen their bodies, grow confidently, and bloom bravely in the digital intelligence era.

5. Conclusion

In the vigorous development process of China's sports education, every pioneering event shines like a beacon, illuminating the path forward for the industry. In the digital intelligence era, with continuous technological iteration, digital sports have emerged, acting as the gateway to a new era filled with infinite possibilities, ushering university students into a future digital sports world where technology and sports intersect, breaking the boundaries of physics and time, brimming with endless innovation and imagination, allowing people to feel the infinite potential brought by digital sports. An increasing number of female athletes are riding the 东风 of the times, relying on their strength to become shining stars in sports competitions.

CCTV commentator once movingly described: "There are many girls whose bodies are cast in steel, whose spines are engraved with bravery, and whose blood is infused with freedom. In the future, words to describe girls will not only be delicate and beautiful but also brave, confident, and strong." As an important venue for implementing physical education, universities should fully balance the advantages and values of traditional physical education while promoting female sports education towards digitalization. They should focus on retaining the humanistic spirit and physical essence of sports education to form a compound teaching system that integrates tradition with modernity and reality with virtuality. Only by innovating through inheritance and developing through integration can we truly achieve the comprehensive advancement of female sports education, allowing every girl to gain health, confidence, and growth in the digital intelligence era.

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