

# Dilemmas and Breakthrough Paths in the Management of Physical Fitness and Health of College Students from the Perspective of Smart Sports

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## KEYWORDS

*Smart Sports;  
Physical Fitness;  
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## ABSTRACT

With the rapid development of information technology, smart sports has gradually become an important means to improve the efficiency and quality of physical health management for college students. It utilizes technologies such as the Internet of Things, big data, and artificial intelligence to monitor and analyze students' health status in real time and provide personalized guidance. However, Chinese universities still face challenges in the application of smart sports, including insufficient technical support, data management issues, and an imperfect policy system. This paper analyzes the application difficulties of smart sports in college physical health management through a combination of literature analysis, questionnaire surveys, and in-depth interviews. Based on domestic and international university cases, it proposes breakthrough paths such as optimizing technology application, improving management systems, increasing student participation, strengthening data protection, and increasing financial investment. Research shows that smart sports has broad application prospects, but to achieve comprehensive promotion, challenges in technology, management, and funding need to be overcome to promote the scientific and personalized management of college students' physical health.

## INTRODUCTION

With the rapid development of information technology, smart sports, as an important component of modern sports management and education, is gradually becoming an innovative means to improve the efficiency and quality of students' physical health management [1]. By combining big data, the Internet of Things, and artificial intelligence technologies, smart sports can monitor, analyze, and manage students' physical health status in real time, providing personalized health advice and guidance, and promoting the scientific management and precise intervention of physical health [2]. However, the physical health status of university students in my country still faces many challenges. According to recent health survey data, many university students suffer from declining physical fitness, insufficient exercise, and unscientific health management, especially against the backdrop of exam pressure, academic burden,

and a fast-paced lifestyle, where these health management problems are becoming increasingly serious [3]. Therefore, how to promote the improvement of students' physical health through technological means has become an important issue that urgently needs to be addressed in the education field. This study focuses on the perspective of "smart sports," exploring the dilemmas and breakthrough paths in the physical health management of university students. By analyzing the current application status of smart sports and exploring its potential in physical health management, it aims to provide scientific theoretical support and practical solutions for higher education and management.

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## 1. Research Ideas and Methods

This study explores the challenges and breakthroughs in the physical health management of Chinese university students from the perspective of smart sports. Through literature analysis, it outlines the theoretical foundation, development trends, and current application status of smart sports in physical health management, and identifies the main problems existing in current management models. To further validate and supplement the literature review, this study conducted an empirical survey of university faculty, students, and administrators in China using a combination of questionnaires and in-depth interviews. The study selected 15 universities from both northern and southern China, including 3 teacher training colleges, 3 comprehensive universities, and 9 sports colleges, to ensure the representativeness of the sample in terms of region and type. A total of 350 questionnaires were distributed to university students and 46 to faculty and administrators, with 364 valid responses received, representing a 93% effective response rate.

## 2. Research Content

### 2.1. Theoretical Framework and Current Application Status of Smart Sports

#### 2.1.1. Theoretical Framework

Smart sports utilize technologies such as the Internet of Things (IoT), big data, and artificial intelligence (AI) to monitor, analyze, and manage sports activities in real time, aiming to enhance the scientific, personalized, and intelligent aspects of exercise [4]. Its core framework includes data collection and monitoring, big data analysis and personalized exercise plans, intelligent feedback, and intelligent management (Fig 1). Exercise data is collected in real time through IoT devices and wearable devices. The system provides personalized exercise plans based on the analysis results and adjusts them according to real-time data. Intelligent feedback mechanisms help provide immediate health guidance, while the smart sports platform provides decision support for schools or sports institutions, helping administrators monitor students' physical health in real time and develop scientific intervention strategies.



Fig.1. Core Components of Smart Sports Management

#### 2.1.2. Current Application Status

In some developed regions of southern China, the application of smart sports equipment has been gradually promoted. For example, wearable devices such as smart treadmills, smart body composition analyzers, and smart bracelets are widely used to track students' exercise status and record key data such as heart rate, steps, and exercise intensity. Some universities have also combined smart sports with health management systems to develop big data-based physical health assessment and intervention platforms. By integrating and analyzing student health data, schools can accurately grasp students' physical condition and provide customized exercise and health advice for each student. Although the application of smart sports has made some progress in universities in some developed regions, overall, it still faces problems such as untimely equipment updates, insufficient technical support, and uneven student participation. Many schools' equipment still faces challenges of low accuracy and poor stability, and some students have low awareness and participation in smart sports. However, with the continuous development of technology and gradual investment of funds, smart sports are gradually becoming an important tool for improving students' physical health management in universities in these regions, laying the foundation for future promotion in a wider area [5].

### 2.2. Challenges in the Application of Smart Sports in Physical Fitness Management of Chinese Universities

#### 2.2.1. Technological Application Bottlenecks

The survey revealed that most universities still use traditional physical education classes, while a few

universities have outdated modern equipment that cannot meet current technological requirements, resulting in insufficient accuracy and stability of data collection. Furthermore, some universities have not yet established comprehensive data collection and analysis platforms, leading to the inefficient integration and real-time processing of large amounts of health data, and a lack of effective data support. This limits the application effect of smart sports and consequently affects the overall development of physical fitness management in universities.

### **2.2.2. Insufficient Management System and Policy Support**

In some universities, the management system for smart sports is not yet perfect, lacking a clear institutional framework. This problem is particularly prominent in universities in northern China. Many schools lack dedicated teams or departments responsible for the planning and implementation of smart sports, leading to a disconnect between technological applications and actual needs. Collaboration between sports management departments and information technology departments is poor, lacking effective communication and resource integration, which further restricts the construction and application of smart sports.

### **2.2.3. Student Participation and Health Awareness Issues**

Students' health management awareness remains relatively weak, especially in physical health management. Many students lack the motivation and awareness to actively participate. Although smart sports equipment can provide personalized health advice and feedback [6], many students do not fully recognize the importance of these functions and often neglect the importance of regular exercise and health management. Many students only pay attention to their health during physical examinations, lacking sustained attention to exercise and health management at other times, resulting in the application of smart sports failing to reach its maximum effectiveness. Furthermore, the health management platforms of most universities have relatively basic functions, and the depth and accuracy of personalized services are far from expected. The exercise plans provided by the platform are too simplistic and fail to be precisely adjusted according to students' specific health conditions and

exercise habits, resulting in insufficient student engagement and satisfaction when using these platforms.

### **2.2.4. Data Privacy and Security Issues**

With the popularization of smart sports technology, data privacy and security issues have become a major challenge [7]. The core of smart sports relies on the collection and analysis of large amounts of health data, which includes students' physical condition, exercise habits, and health problems personal privacy information [8]. How to effectively utilize this data while ensuring data privacy has become a crucial issue facing smart sports. Research has found that many universities have failed to take sufficient data protection measures, making students' health data vulnerable to leakage. Improper use or leakage of this data will seriously infringe on student privacy.

### **2.2.5. Funding and Resource Allocation Issues**

Research has found significant differences in the application of smart sports in universities in the north and south, especially in local or economically disadvantaged institutions where insufficient funding is more prominent. This funding constraint restricts the construction and upgrading of smart sports equipment and technology platforms. Even with some funding support, how to rationally allocate resources and ensure equipment maintenance and timely technology upgrades remains a critical issue that urgently needs to be addressed. Aging equipment and lagging technology updates not only directly affect the application effect of smart sports but also reduce the student user experience, thus hindering the comprehensive promotion of smart sports in university physical health management (Fig2).



**Fig.2.**Challenges in Smart Sports Implementation

### 2.3.Exploring Breakthrough Paths under the Vision of Smart Sports

By analyzing the challenges of smart sports in university physical health management, the following breakthrough paths are proposed. First, optimizing technology application should involve strengthening the construction of intelligent hardware facilities, improving the accuracy of data collection and analysis, and promoting the integration of IoT, big data, and artificial intelligence technologies to create a personalized health management platform. Second, regarding the improvement of the management system, a sound management system for smart sports needs to be established, promoting collaboration among schools, teachers, and students to ensure the effective implementation of technology. Enhancing student participation should be achieved through health education and training to strengthen students' health management awareness and promote their active participation. Regarding data security, a sound data protection system should be established to ensure the security and privacy of students' health data. Finally, regarding funding and resource allocation, increased investment and rational resource allocation are needed to ensure equipment updates and maintenance, promoting the comprehensive application of smart sports. Through the implementation of these measures, the application effect of smart sports in university physical health management will

be significantly improved.

## 3.Results and Discussion

The application of smart sports in university physical health management presents both significant opportunities and challenges. Based on the data collected through questionnaires and in-depth interviews, several key findings emerged.

### 3.1.Effectiveness of Smart Sports in Enhancing Health Management

The survey results showed that universities that have implemented smart sports systems have seen improvements in students' physical health management. A significant proportion of students reported feeling more motivated to exercise and monitor their health due to the personalized health advice and feedback provided by smart sports equipment. The integration of IoT devices, big data, and artificial intelligence enabled real-time monitoring of students' physical conditions, which helped in identifying health issues early and provided timely interventions. However, despite these positive outcomes, the overall effectiveness of smart sports was limited by several factors, including the lack of comprehensive infrastructure and low participation among students. While some universities have successfully implemented smart sports equipment, others face challenges in the reliability and accuracy of these devices, particularly when it comes to tracking more complex health metrics.

### 3.2.Technological Challenges

The analysis revealed that technological application bottlenecks remain one of the most significant challenges. In many universities, outdated equipment and lack of proper integration of smart systems hinder the effectiveness of health monitoring. Many institutions still rely on traditional physical education methods, with minimal integration of new technologies. Furthermore, data collection platforms are often underdeveloped, resulting in slow processing and poor integration of the data collected from various smart devices. This issue not only affects the quality of health management but also limits the system's capacity to provide personalized health plans for students.

### **3.3. Insufficient Management Systems and Policy Support**

Another major finding was the lack of a standardized management system for smart sports. Most universities have not yet established clear policies or departments specifically dedicated to smart sports implementation. This has resulted in fragmented management and poor coordination between different departments, such as physical education and information technology. Effective communication between these departments is critical to ensure the smooth implementation and monitoring of smart sports systems. Additionally, the absence of a coherent policy framework makes it difficult to integrate smart sports into the broader educational strategy.

### **3.4. Student Participation and Health Awareness**

The research highlighted that student participation in smart sports remains relatively low. While some students expressed interest in using smart sports equipment, many were not fully aware of the benefits of such systems. A significant number of students reported a lack of long-term commitment to their health management. This is primarily due to insufficient health education and awareness about the importance of regular physical activity beyond the mandatory physical exams. As a result, many students only engage with smart sports systems during health assessments, rather than consistently using them for health management throughout the semester.

### **3.5. Data Privacy and Security Concerns**

Data privacy and security emerged as a critical issue in the implementation of smart sports. With the collection of sensitive health data, including heart rates, exercise patterns, and other personal health information, universities face the challenge of protecting students' privacy. Many respondents expressed concerns about the potential misuse or unauthorized sharing of their health data. While some universities have taken steps to ensure data protection, many have yet to implement comprehensive data security measures.

### **3.6. Financial and Resource Constraints**

The survey results also revealed that financial constraints pose a significant obstacle to the broader implementation of smart sports in universities, particularly in economically disadvantaged regions. Many institutions struggle to secure sufficient funding for purchasing smart sports equipment, maintaining infrastructure, and updating technology. This issue has led to discrepancies in the quality of smart sports programs across different universities, further exacerbating inequalities in access to high-quality physical health management.

To enhance the effectiveness of smart sports and address current challenges, universities should prioritize investments in modern technology and the development of robust data platforms. A standardized management system, supported by dedicated teams for planning, implementation, and monitoring, is crucial. Strong collaboration between physical education and IT departments is essential for success. To boost student engagement, targeted health education programs should be introduced, emphasizing the long-term benefits of fitness and the importance of consistent health monitoring. In addition, universities must establish secure data protection protocols to ensure privacy and build trust with students. Finally, securing increased funding through government grants, private partnerships, and alumni donations will support the ongoing development and expansion of smart sports programs. By taking these steps, institutions can unlock the full potential of smart sports and significantly improve student health management.

### **Conclusion**

This study explored the current status and challenges of smart sports in university physical health management and proposed corresponding breakthrough paths. Although smart sports has potential in improving student physical health management, it still faces challenges in technology, management, and funding. By optimizing technology application, improving management systems, increasing student participation, and ensuring data security, the comprehensive application of smart sports can be effectively promoted, thereby enhancing the effectiveness of university physical health management. In the future, with technological advancements and policy support, smart sports will play an even greater role in university health management.



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