Scientific Fitness Programs for University Students in the Perspective of Smart Sports

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Abstract: National fitness is inseparable from people's lives, especially among college students. Physical education and training in colleges and universities is an important way to cultivate good fitness methods and habits. However, due to the traditional teaching method, limited space, unfettered time, and lack of resources, it is difficult for college students to do fitness exercise. Therefore, the integration of the concept of smart sports can improve the problems and shortcomings in the physical education and fitness methods of college students, promote the formation of a systematic, scientific and convenient physical fitness system, and encourage college students to invest more in scientific fitness programs. In this paper, it is concluded by means of questionnaire survey and comparative analysis that students are highly satisfied with the application of smart sports in university physical fitness, with a minimum of 84%, which indicates that smart sports do bring a lot of convenience to university students. In addition, it can be concluded from the comparison that the fitness hours after the application of smart sports are 1.34-2.73 times longer than those in the traditional mode, and the application of smart sports has played a great role in promoting scientific fitness for university students.

1. Introduction

Physical education is not only an important part of the university curriculum, but also an important way for students to practice and learn physical education. At present, most universities still use traditional physical education as the main teaching method. However, as technology continues to develop and people's requirements for fitness become higher and higher, traditional physical education can no longer meet the learning needs of students for physical exercise, let alone scientific fitness. In view of this, universities need to reform traditional physical education from a

scientific point of view, combining the needs of the times and technological means to reform the fitness mode of college students.

The study of scientific fitness programs for school students in the perspective of smart sports is an emerging research area, which is being studied by many experts and scholars. Among them, Guo Q, introduces artificial intelligence technology to intelligently collect and analyze data through the design of artificial intelligence system. From the perspective of physical education, the functional exercise test based on artificial intelligence meets the essential meaning of physical fitness test and helps to improve the awareness of physical exercise among college students. And the AI-based intelligent remote multimedia physical education system makes the process of physical education flexible and unrestricted by time and place, allowing different teaching strategies to be adopted and personalized teaching to be implemented according to the different situations of students [1]. Postma D B W introduced a new, systematic taxonomy of sports interactive technologies (Sports ITech), which defines the existing and future design space for work. His research provides a description of a design space for designing, deploying and adapting sports IT technologies through existing work in a way that is appropriate to support designers, technologists and design-minded sports people [2]. Zhang J provides an in-depth analysis of the relationship between big data and the development and application of information technologies such as the Internet, Internet of Things and cloud computing. Artificial intelligence will enable changes in data collection, management decisions, governance models, education and teaching, research services, assessment and evaluation, and physical education and teaching in universities [3]. Xie M argues that with the development of information technology, the educational curriculum and teaching methods in schools are also greatly affected. Modern communication technologies, because of the Internet and mobile 5G, have led to a breakthrough in physical education and sports in schools, which is an intelligent vision based on smart vision technology [4]. Although they have conducted preliminary studies in this direction, they are not specific enough and lack guiding recommendations on the subject of fitness for school students.

The purpose of this paper is to study the scientific method of smart sports to improve the current situation of fitness among school students, enhance the enthusiasm of fitness, and achieve the effect of real scientific fitness and strong body.

2. Research on Scientific Fitness Programs for School Students in the Context of Smart Sports

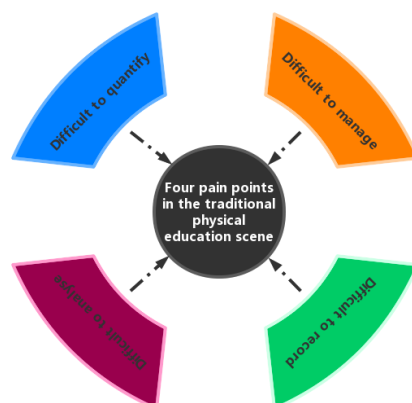### 2.1 Scientific Fitness for College Students

Figure 1. Diagram of the four pain points of traditional physical education

Four major pain points of the traditional sports teaching and training scene (Figure 1).

Difficult to record - inefficient and error-prone

Traditional sports training data collection is mainly done by "paper + pen + scoreboard", and the data need to be entered by the teacher in a purely dynamic way, which makes the data collection process tedious and the data results prone to errors. In addition, there is a lack of long-term tracking and recording and management of students' electronic growth files (basic information, technical characteristics), as well as the display of individual historical sports results and milestones [5].

Difficult to quantify - single dimension and inaccurate

Traditional physical education relies on the experience of coaches and teachers to judge, and there is no uniform standard. In addition, there is a lack of long term knowledge of the students and they can only use sports results to judge the students' sports performance, but they cannot measure the students' sports absorption effect from their training intensity, physiological function and other multi-dimensions.

Difficult to analyze - lack of basis and not intuitive

Due to the lack of physiological data during physical education classes, teachers can only make visual judgments about students' "physical education uptake" (e.g., how much they sweat, how fast they breathe, etc.), and they are not able to do everything. It is also impossible to determine the potential risks (heart attack, high blood pressure, rapid heart rate, etc.).

Difficult to manage - with risks and blind spots

In most cases, one teacher/coach is responsible for several students, especially when the number of students is large or the space is large. Therefore, when teaching, it is difficult for teachers/coaches to accurately understand the movement of each student, there will be blind spots, and after-school physical training is a process that cannot be monitored.

2.2 Smart Sports

The launch of "smart sports" aims to implement the national fitness strategy and develop sports, focusing on the use of information technology to improve the operation of sports facilities as a way to meet the growing demand for physical fitness and make physical fitness an indispensable way of life for public health [6-7].

In terms of technology, "smart sports" is the application of new technologies, such as the Internet of Things, mobile Internet technology and 5G communication technology, as well as the use of various ubiquitous sensors to monitor and record users' movement behavior. Big data algorithms such as cloud computing can also be used to fully integrate, analyze and process sports data, user data and management data to make intelligent feedback and decision support for various needs. The infrastructure of smart sports is built to serve the public by spreading a digital network [8-9](Figure 2).
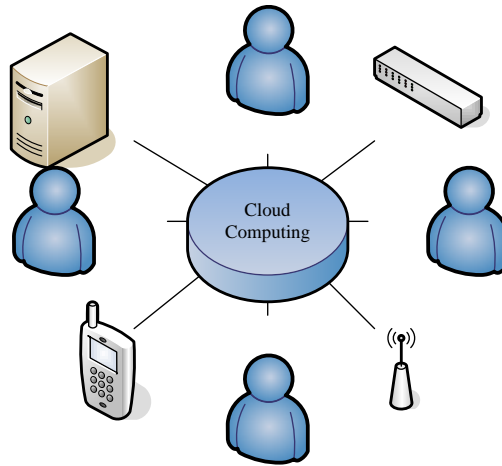
Figure 2. IoT computing model

In this paper, the analysis is based on scientific algorithms under cloud computing [10-11].

Branch definition algorithm is an algorithm for finding a specific optimal solution for a large number of optimization problems, especially for discrete combinatorial optimization. The two-branch formulation can be derived from the master problem as follows.

$$\text{Maxinmize } 4x_1 + 9x_2 + 6x_3 \tag{1}$$

$$\text{Subject to } 5x_1 + 8x_2 + 6x_3 \leq 12 \tag{2}$$

Where X1,X2,X3 are binary variables.

From a mathematical point of view, gradient descent (Gradient descent) is an optimization algorithm. Its objective function is.

$$G(\theta_o, \theta_1) = \frac{1}{2m}\sum_{i=1}^{m}(h_\theta(x^{(i)}) - y^{(i)}) \tag{3}$$

Q-learning algorithm is a reinforcement learning algorithm which is done by learning action value functions. And it has the advantage of being able to compare the expected utility of adoptable actions without the need for an environment model.

$$R = \begin{bmatrix} -1 & -1 & -1 & -1 & 0 & -1 \\ -1 & -1 & -1 & 0 & -1 & 100 \\ -1 & -1 & -1 & 0 & -1 & -1 \\ -1 & 0 & 0 & -1 & 0 & -1 \\ 0 & -1 & -1 & 0 & -1 & 100 \\ -1 & 0 & -1 & -1 & 0 & 100 \end{bmatrix} \tag{4}$$

Where -1 represents a null value, such as no arrow between two states.

The conversion rule equation for Q-Learning is

$$Q(s, a) = R(s, a) + \gamma \cdot {}^{max}_{\tilde{a}}\{Q\tilde{s}, \tilde{a}\} \tag{5}$$

Where s,a denotes the current state and behavior, and $\tilde{s}, \tilde{a}$ denotes the next state and behavior of s, and γ is the learning parameter and satisfies $0 \leq \gamma < 1$.

2.3 Research on Scientific Fitness Programs for School Students in the Perspective of Smart Sports

Smart sports is an emerging scientific topic of our time. Nowadays, many college sports enthusiasts have different and individual needs. They are not satisfied with the current model of sports development, but also want fitness to become easier, more convenient, more scientific and more diversified. In terms of their physical condition, many people do not know which sports they are suitable for leading to a trend of blindness in sports. Some sports enthusiasts are suitable for explosive and short duration strength training, while others are suitable for long lasting endurance training. How to let sports enthusiasts know the pattern and condition of their body functions in the first place requires the development of intelligent sports technology. Smart sports is actually a complex application of modern sports, advanced information technology and intelligent technology integration. The main function is to provide time-tested sports experience based on sports services and innovative applications for integrated management of sports [12-13].

Smart sport focuses on improving the fitness environment through the following three phases: before, during and after exercise [14].

The digital reform of pre-sports lies in solving the problem of intelligent supply and demand matching between users and sports venues. At the user side, the digital platform is used to show the basic information of the venues, such as location, environment, facility resources, coaching resources, fees, reservation status, etc. It can also go further to show the real-time sports numbers and the friend users who participate in sports, and with the help of the Internet and social relationship chain, solve the problem of information mismatch between users and venues, and provide enough support to users' decision making.

The optimization of the sports process is the whole process from the arrival of the user to the departure of the sports venue. When entering the venue, the digital ID on the app or the face recognition and code verification functions on the access control equipment do the identification of the user and automatically record the arrival. Senseless automatic billing for user entry and exit also eliminates the need to spend labor costs on repetitive identification and instead focuses on bringing users a more comfortable fitness experience and providing better service. During exercise, users can use smart exercise equipment, body fat weighing equipment, smart bathing and hot water equipment and lockers with the help of smart wristbands to achieve the goal of exercise effect monitoring and offline service acquisition, helping users to solve problems encountered during the fitness process in the first place [15].

While the traditional fitness experience ends after the user leaves the field, the Smart Sports model allows users to access exclusive sports data reports in the sports app even after they leave the field. Not only that, but a motion capture system can be used to generate highlights and highlight reels of the user's game, giving them a better understanding of their workout. In addition, there will be many professional free teaching resources available to users. All these data can be shared to third-party social platforms, which greatly increases users' motivation and interest in sports, forming a virtuous circle.

3. Experimental Analysis of Scientific Fitness Program Research of School Students in the Perspective of Smart Sports

3.1 Student Experience Satisfaction Survey Analysis

A survey was conducted on 500 first-year students at University A on their satisfaction with the smart sports application experience in terms of portability of operation (course booking, course

check-in, online payment, free team formation) and personalized services (exercise duration, course preference, free resources, fitness report) (multiple choice), and the results are shown in Table 1.

Table 1. Survey on students' satisfaction with smart sports application experience at University A

Type		Satisfaction level	Type		Satisfaction level
Portability of operation	Course Booking	95%	Personalised service	Length of exercise	97%
	Course sign-in	98%		Course Preferences	86%
	Online Payment	84%		Free resources	95%
	Free teaming	92%		Physical Fitness Report	94%

According to the data of the questionnaire, the number of people who are satisfied with the portability of the operation: 475 people are satisfied with the course reservation, 95%; 490 people are satisfied with the course check-in, 98%; 420 people are satisfied with the online payment, 84%; 460 people are satisfied with the free group, 92%. The number of people who are satisfied with the personalized service: 485 people are satisfied with the exercise length, 97%; 430 people are satisfied with the course preference, 86%; 475 people are satisfied with the free resources, 95%; 470 people are satisfied with the physical fitness report, 94%. It can be seen that students are highly satisfied with the application of smart sports in college physical fitness, and smart sports do bring a lot of convenience to college students.

3.2 Comparative Analysis of Students' Fitness Hours

Taking the students of University A in running, yoga, badminton, tennis, basketball and swimming as examples, a comparative analysis was made between the length of fitness after the smart sports application and the length of fitness in the traditional mode, and the results are shown in Figure 3.
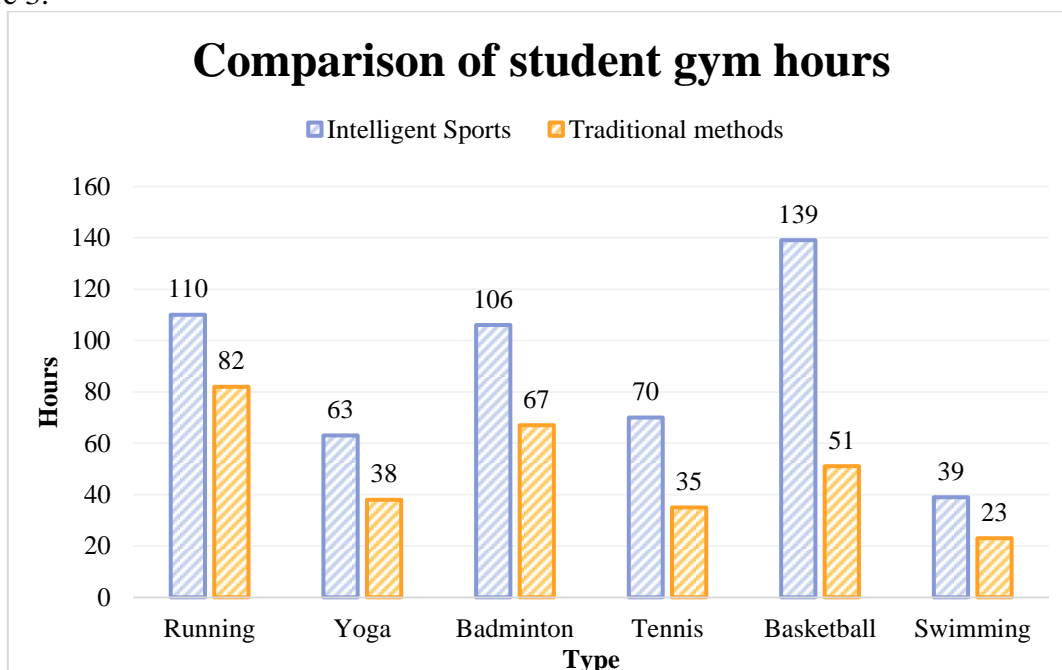

Figure 3. Comparison of students' fitness hours

From Fig. 3, it can be seen that the time spent by students of University A in running, yoga, badminton, tennis, basketball and swimming in the traditional mode are 82, 38, 67, 35, 51 and 23 respectively, while the time spent in fitness after the application of smart sports is 110, 63, 106, 70, 139 and 39 respectively. In basketball, it is as high as 2.73 times, so the application of smart sports has played a great role in promoting the scientific fitness of university students. At the same time, it can be seen that the more technically difficult and complex the fitness activities are, the more obvious the improvement effect is.

4. Summary

At present, the fitness mode implemented in domestic universities is still dominated by traditional lectures, which is difficult to match the growing fitness needs of students. In this paper, through the combination of descending intelligent sports and college students' fitness, diversified fitness programs are provided, personalized services are offered, the operation process of fitness is simplified, the barrier of lack of time and venue teaching resources is broken, and the independent fitness enthusiasm of college students is greatly enhanced, and the fitness effect is qualitatively leaped. However, the amount of data in this paper is limited and cannot be generalized comprehensively, and more meticulous and systematic research is needed. As long as people are concerned about health and fitness, the pace of research on smart sports will never stop.

Funding

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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