Effect Monitoring of Physical Education Curriculum Based on Wearable Sensor in Intelligent Environment

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Abstract. Reasonable amount of exercise is the premise of physical education teaching. On this premise, in the process of students' physical education teaching, the appropriate degree of actual exercise amount will affect the effect of motor skill learning and physical exercise to a great extent. Through monitoring the amount of exercise and then evaluating the quality of physical education teaching is the focus of the implementation of physical education. Looking for simple and effective monitoring equipment has important practical significance. In this paper, through the analysis of the current situation of wearable sensor in the development of physical education teaching, put forward the effect monitoring of sports curriculum based on wearable sensor in intelligent environment. In this paper, 258 freshmen and sophomores who use wearable devices are selected for monitoring and analyzing, and the pertinence, accuracy and data of wearable sensor physical education course and traditional physical education course are compared and analyzed, and the results are discussed and analyzed. It is concluded that wearable sensor can promote physical education curriculum, not only can improve the teaching pertinence, strengthen the accuracy, but also can In order to improve the scientificity of physical education curriculum effect monitoring. The research in this paper has important practical significance for monitoring the effect of wearable sensors in physical education curriculum.

Keywords: Wearable Sensors, Physical Education Courses, Effect Monitoring, Feature Extraction

1. Introduction
With the rapid development of electronic information industry in recent years, intelligent wearable technology has gradually entered people's lives with its advantages of intelligence and portability [1]. It has important practical value in physical education and field rescue. Therefore, a wearable information monitoring system with environmental parameters and human physiological parameters
was tested on the basis of the effect monitoring of physical education curriculum based on wearable sensor in intelligent environment [2-4]. By using wireless sensor network technology, the monitoring nodes are arranged comprehensively, efficiently and economically, which liberates people from the wired equipment with complex and limited lines, so that the wearer has higher activity level and flexibility [5-6].

In recent years, with the rapid development of Internet technology, a variety of scientific and technological products are constantly changing the way of human life [7]. With the progress of sensor technology, Internet technology and other new products, wearable devices have gradually become a new favorite of the technology industry, entering the stage of rapid development [8-10]. Wearable devices are rarely used in college sports. In college sports, the application of wearable devices in physical education teaching is a highlight of reform in recent years. The application of wearable sensors in teaching is not only a breakthrough in teaching methods, but also an important measure to invigorate the country through science and technology [11-12].

In this paper, according to the actual situation of the effect of wearable sensor in the current intelligent environment of physical education curriculum, we found that compared with developed countries; there are still some deficiencies in the effect of wearable sensor in physical education curriculum. Therefore, in this paper, the effect monitoring of physical education curriculum based on wearable sensor is established in the intelligent environment. Through the effect of wearable sensor in physical education course, we can monitor the effect from many aspects, such as putting into use, using state, data monitoring and so on. Through the analysis of the monitoring results, this paper believes that the effect of wearable sensor in physical education curriculum is good, which can optimize the physical education curriculum and achieve good results.

2. Development Background of Intelligent Design and Wearable Devices

2.1. Intelligent Design

Intelligent thinking design technology is to enable designers to use advanced modern scientific thinking information technology management system technology. Intelligent design can be divided into three main levels according to its comprehensive design implementation ability. First of all, the basic attributes and design strategies of traditional industrial design in China are systematically planned. Intelligent logic system calls logic symbol and modeler to design logic under the interaction of inference engine. Second, the related mutual design, the main research direction of the existing related mutual design. This industrial design mode requires us to collect a large number of industrial design practice cases which are incomparable. Third, evolutionary algorithm design, which is based on natural selection of the whole biological world and evolutionary design mechanism based on nature. Intelligent software design system is a kind of software integration for industrial automation. It is an advanced industrial automation software design. It is an intelligent software integration system that users can automatically customize the design of large and complex software products.

2.2. Development Background of Wearable Devices

With the gradual maturity of mobile Internet technology, traditional labor and resources have been unable to meet the huge changes brought about by technological innovation. With the gradual reduction of innovation space such as smart phones and the saturation of the market, intelligent wearable technology has been widely recognized in various fields, and has become a branch of the Internet of things. Unlike the Internet of things, clothing manufacturers and jewelry manufacturers have joined the ranks of smart wear.

Wearable device is a kind of portable electronic device, usually in the form of accessories, clothing accessories or personal belongings. With the development of mobile Internet, more and more wearable devices enter the market and people's lives. People can sense and monitor the state through wearable devices. The continuous development of wearable devices is inseparable from the continuous development of wearable devices. Because intelligent wearable devices can monitor and prevent
human health indicators, the research and development of heart rate monitoring equipment is of great significance.

3. Investigation and Analysis on the Effect of Wearable Devices in Physical Education

Through the comprehensive use of intelligent wearable teaching equipment, the quality data of physical education indicators of the majority of students in college sports teaching are collected in real time, and the teaching data analysis is carried out in real-time storage and comprehensive analysis by using intelligent cloud computer and other technologies, and the data analysis and comprehensive calculation are carried out through the analysis of teaching results, It can effectively control and increase the quality index of college sports teaching.

According to relevant statistics, the number of mobile phones owned by college students is close to 100%. Wearable sports equipment on the market mainly includes sports watches, energy bracelets, intelligent glasses, etc. through the monitoring and investigation of 258 freshmen and sophomores using wearable devices in our University (Table 1), 210 students who insist on using wearable devices will exceed 81%, their sports achievements will be significantly improved and their physical conditions will be improved. The survey also found that some students occasionally use wearable devices to record, but the effect of physical education courses is not obvious, accounting for 3.9% of the survey. A few students never use wearable devices to record; there is a certain gap between physical education courses and users. On the one hand, due to the price of wearable devices, the most important point is that smart phones have many functions of sports bracelets, so the advantages of wearable devices are not obvious. But in physical education teaching, mobile phones have certain limitations, obviously cannot replace wearable devices, combined with intelligent environment, wearable sensors in physical education courses have achieved good results.

Table 1. Effect monitoring of wearable devices in Physical Education

| Investigation items                  | Number of people (%) | Proportion (%) | Effect       |
|-------------------------------------|----------------------|----------------|--------------|
| Adhere to wearable device record    | 210                  | 81             | good         |
| Occasional use of wearable device records | 10                  | 3.9            | commonly     |
| Never record                        | 0                    | 0              | No effect    |

4. Discussion

4.1. Analysis of the Advantages and Disadvantages of Wearable Sensors in Sports Courses

(1) Advantage analysis

First is to establish a student "health cloud" database. As a regular course from primary school to university, physical education curriculum has not been paid enough attention by the outside world. The reason is that the changes of students' physical function in physical education class cannot be reflected by certain "scores", that is, the so-called quantitative data. The rapid emergence of intelligent wearable medical devices seems to be able to directly help students and teachers in school to establish a complete personal health monitoring database of students. Using the process data collection and comprehensive analysis of artificial intelligence and wearable mobile devices, and combining with cloud big data technology, the "healthy cloud" process database based on students' learning and growth is constructed. The second stage is the guidance of scientific psychology. Through this kind of intelligent video, we can analyze the students' physical activity data in the sports class on the side of sports equipment, which can be more standardized and scientific for guiding the classroom teaching of
physical education teachers and mobilizing students' autonomous learning, such as how to quickly reach the best teaching heart rate suitable for students in daily classroom teaching. At the same time, we can accurately distinguish and compare the body data obtained by students at different stages.

(2) Disadvantage analysis

First of all, the equipment is complex and the price is high, so it is difficult to achieve comprehensive network coverage of primary and secondary schools. As a "health doctor", intelligent wearable mobile device is not only a high-end hardware wearable device, but also has powerful wearable function through a variety of software interaction support, data interaction and cloud interaction. However, the market price of some emerging ultra-high-tech intelligent devices and some portable wearable smart devices is still very high. From the perspective of educational investment, it brings some difficulties to the overall and healthy development of fitness sports in primary and secondary schools. Secondly, the use of equipment cannot fully meet the actual needs of daily school physical education. At present, there are two kinds of intelligent wearable application devices which are popular in the domestic market. One kind of equipment is professional material basic equipment; the other is vocational skill basic equipment. Sports equipment is more common, skill training equipment is mainly used in the process of high-level sports skills training, and the equipment price is relatively expensive. Physical education and art teaching activities are mainly the physical quality of students and professional skills quality teaching organic combination of sports activities. At present, the quality data processing, monitoring and quality statistics of intelligent wearable sports equipment are mainly set by various intelligent hardware device developers themselves, which cannot fully meet the actual needs of daily school sports teaching.

According to the analysis results in Figure 1, the physical education course of wearable sensor has changed the traditional extensive physical education teaching mode, and the longer the use time, the more targeted and accurate the wearable sensor is. Some university workers do not know enough about the wearable sensor, and the channel to understand the wearable sensor is limited. They do not get enough attention in the comprehensive promotion and use of wearable sensor, which limits the promotion of wearable sensor.

![Figure 1](image_url)

**Figure 1.** Comparative analysis of pertinence, accuracy and data between wearable sensor physical education course and traditional physical education course

In this paper, in order to further analyze the satisfaction of wearable sensor in physical education curriculum effect, the results are shown in Figure 2. As can be seen from Figure 2, with the use of wearable sensors, satisfaction has been increasing year by year. After the popularization of wearable sensors, the monitoring form of physical education curriculum is enriched, and the level of physical
education teaching is also significantly improved. Through the investigation and analysis, it is shown that the advantages of wearable sensors outweigh the disadvantages in the physical education courses. It is very important to promote the wearable sensors to achieve good results in the physical education courses.

![Figure 2. Satisfaction analysis of wearable sensor in Physical Education Curriculum](image)

4.2. Monitoring the Effect of Wearable Equipment on the Rationalization of Physical Education

Reasonable amount of exercise can enhance students' physique, promote their growth and development, and improve their physical and mental health. This study first studies the relevant literature on the amount of physical exercise, and concludes that the research results in China mainly focus on the design and arrangement of the amount of physical exercise and the research on the reaction mechanism of different amount of exercise on students' body. However, with the development of science and technology, high-tech wearable devices have gradually entered the mass fitness industry, especially in some developed countries. Good results have been achieved in sports monitoring, and some unfavorable factors restricting the process of physical exercise have also been improved.

Purpose of this study is to monitor the physical education curriculum with wearable sensors, improve some unfavorable factors restricting the implementation of physical education, and improve the exercise effect of physical education on students. The research conclusions are as follows: first, high-tech wearable devices can monitor students' basic physical functions in the process of physical education teaching, and can monitor the speed of sports, students' sports, exercise intensity and amount of exercise, so as to avoid accidents of students in the process of physical education teaching. The second is the use of high-tech wearable devices to monitor physical education, which can change the situation of students' insufficient exercise and unreasonable arrangement. Under the monitoring, different sports use different intensity and duration of exercise, and avoid the lack of exercise arrangement due to individual differences of students. Third, some entertainment functions of high-tech wearable equipment can improve the boring phenomenon of students in the process of sports, and improve their exercise enthusiasm. The fourth disadvantage is that high-tech wearable devices are expensive, especially the more sophisticated the devices are, the more expensive they are for students and schools.

5. Conclusions
In the study of the effect of wearable sensor in physical education curriculum, this paper takes the application effect of wearable sensor in college physical education course as the main line of research. After research, this paper thinks that wearable sensor based on intelligent environment is an important part of college physical education curriculum. Through the monitoring and analysis of 258 freshmen and sophomores using wearable sensors, the effect data of using wearable sensors were obtained. In recent years, wearable sensor has been developed rapidly in intelligent environment, and has broken through the technical difficulties and key points, and is at the advanced level at home and abroad. Through data analysis, wearable sensors can improve the pertinence, accuracy and data of physical education courses, and can improve the teaching effect of college physical education courses. According to the research and analysis results of this paper, in order to make full use of wearable sensors in college physical education curriculum, we must combine the wearable sensor with the actual situation of college physical education curriculum and students' needs, pay attention to scientific introduction and reasonable supervision, effectively formulate reasonable sports curriculum strategy of wearable sensor, and ensure the effect of physical education curriculum. This research has achieved ideal results, and has made a certain contribution to the research on the effect monitoring of physical education curriculum based on wearable sensor in intelligent environment.

Acknowledgements
This paper is based on the following projects: Research on the construction and practice of University Physical Education Curriculum under the construction of smart campus (2019JGA341), Project of undergraduate educational reform of Guangxi Higher Education in 2019; and Project of Guangxi Vocational Education and Teaching Reform in 2020, The Construction and Practical Research of GUAЕ collaborative education mechanism for leisure Sports major in application-oriented tourism Colleges (GXGZJG2020A044). The paper is also on one of the research subjects from Research on Integrative Development of Guangxi leisure Sports Industry and Tourism Industry (17FTY004) phased achievements, and one of the research results funded by Guangxi University's 100 Talents Program Research funding project.

References
[1] Elsayed, W., Elhoseny, M., Sabbeh, S., & Riad, A. (2018). Self-maintenance model for wireless sensor networks. Computers & Electrical Engineering, 70, 799-812.
[2] Ghasemzadeh, H., Amini, N., Saeedi, R., & Sarrafzadeh, M. (2015). Power-aware computing in wearable sensor networks: an optimal feature selection. Mobile Computing IEEE Transactions on, 14(4), 800-812.
[3] Siegmund, G. P., Guskiewicz, K. M., Marshall, S. W., Demarco, A. L., & Bonin, S. J. (2016). Laboratory validation of two wearable sensor systems for measuring head impact severity in football players. Annals of Biomedical Engineering, 44(4), 1257-1274.
[4] Koldenhoven, Rachel M., & Hertel, J. (2018). Validation of a wearable sensor for measuring running biomechanics. Digital Biomarkers, 2(2), 74-78.
[5] A, T. X., B, L. Z., C, Y. W., D, Y. W., & E, X. W. (2019). Graphene-based supercapacitors as flexible wearable sensor for monitoring pulse-beat. Ceramics International, 45(2), 2516-2520.
[6] Lambert, K., & Penney, D. (2020). Curriculum interpretation and policy enactment in health and physical education: researching teacher educators as policy actors. Sport, Education and Society, 25(4), 378-394.
[7] Asshit Kumar Dutta, Mohamed Elhoseny, Vandra Dahlya, K. Shankar, An efficient hierarchical clustering protocol for multihop Internet of vehicles communication, Transactions on Emerging Telecommunications Technologies, First Online 29 July 2019
[8] Lee, S. J., & Park, K. S. (2017). Research of the curriculum of graduate school of education through the pre-service middle school physical education. Korean Society for the Study of Physical Education, 22(2), 71-81.
[9] Kumar, N., Manjaly, J. A., & Sunny, M. M. (2015). The relationship between action-effect monitoring and attention capture. Journal of Experimental Psychology General, 144(1), 18-23.

[10] Baldea, & Anthony, J. (2015). Effect of aging on renal function plus monitoring and support. SurgClin North Am, 95(1), 71-83.

[11] Schneider, G., Sjoling, S., Wallin, E., Wrede, P., &Heijne, G. V. (2015). Feature-extraction from endopeptidase cleavage sites in mitochondrial targeting peptides. Proteins-structure Function & Bioinformatics, 30(1), 49-60.

[12] Indahl, U. G., &Naes, T. (2015). Evaluation of alternative spectral feature extraction methods of textural images for multivariate modelling. Journal of Chemometrics, 12(4), 261-278.