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# Feasibility Analysis of VR Technology in Physical Education and Sports Training

Chengbao Li<sup>1,a</sup> and Yupeng Li<sup>2,b\*</sup>

<sup>1</sup>Paichai University, Daejeon 302735, Korea

<sup>2</sup>Linyi University, Linyi 276000, China

<sup>a</sup>anhuilichengbao@163.com

\*Corresponding author Yupeng Li (e-mail: <sup>b</sup>liyupengty@lyu.edu.cn).

**ABSTRACT** VR technology can simulate the complex environment; break through the limitations of traditional physical education curriculum on sports venues, equipment, safety and other aspects. It can provide scientific and accurate guidance for learners and obtain more technical knowledge by visualizing the complex and abstract sports theoretical knowledge. Compared with the traditional sports teaching activities, virtual reality technology can not only simulate the sports scene by generating VR panorama. On this basis, it can effectively improve learners' enthusiasm and motor skills. At present, due to the immaturity of VR technology and the high price of related equipment, people are cautious about the use of VR technology, so VR technology has not been popularized in education. In view of this situation, this paper studies whether VR technology can be effectively applied to physical education teaching and sports training. This paper is divided into four parts: the first part is the research of VR panorama; the second part is the research of VR video; the third part is the application of VR technology in physical education; the fourth part is the investigation. It is found that VR, as a new technology, has great application potential. As long as it is scientifically and reasonably used, VR can greatly promote the improvement of sports scene and the level of sports.

**INDEX TERMS** VR Technology, VR Panorama, VR Video, Physical Education

## I. INTRODUCTION

Virtual reality (virtual reality technology, referred to as VR) [1-3] is a human-computer interaction technology developed in the United States in the late 1980s. It is mainly composed of five basic modules: detection, feedback, sensor, control and three-dimensional modeling. The detection module and the feedback module can detect the instructions issued by the user, and then transmit and control the instructions through the sensor module and the control module. Finally, combining the real world with the virtual world, users can "enter" into the computer-generated virtual environment. VR technology has the following three main characteristics: First, multi-perception. VR technology can bring users a variety of sensations such as strong vision, auditory sensation, tactile sensation and even taste sensation that traditional human-computer interaction [4-5] cannot provide. This is because VR technology firmly grasps the five senses of the human body and constructs a 1:1 three-dimensional model of the real world and the virtual world [6], so that

users can have an "immersive" feeling and experience in various aspects when using it; second, it is interactive. VR devices can provide feedback based on user instructions to achieve human-computer interaction; third, they are immersive. Users can better immerse themselves in various preset virtual scenes, which can greatly increase user interest. Therefore, in VR devices, users can interact well in virtual scenes, thereby enhancing the authenticity experience of VR devices.

Physical education and sports training have special requirements for sports venues and mechanical equipment. If you can't meet the needs of the scene in sports training, you can only carry out a few sports training courses, which not only boring and tedious, but also greatly reduces the students' Enthusiasm for learning also weakens the overall physical fitness of the people to a certain extent. VR technology can break through the boundaries of time and space, and build a comprehensive sports scene and environment according to the needs of physical education, so that students can not only exercise scientifically and

reasonably, but also grasp theoretical knowledge and related skills more deeply and choose reasonable ones. Exercise methods to avoid muscle damage. At present, many schools are unable to reproduce various complex scenes only by relying on the teaching venues and sports equipment when setting up physical education courses, which cannot make students feel a sense of crisis and cannot enhance their interest in learning. However, using VR equipment can simulate various complex and dangerous scenes, such as fighting with gangsters, competitive games, and being hijacked by others. The application of VR technology in physical education is a revolutionary exploration. On the basis of changing the traditional physical training and teaching, using VR equipment to introduce students into different sports environments and arouse students' interest in sports, which is not only conducive to the implementation of physical education. To a certain extent, has reduced the investment in sports equipment. However, investigations have shown that if students use too much electronic equipment such as VR, and their self-control ability is relatively poor and there is no guidance from the instructor, they will be immersed and unable to extricate themselves, which will also lead to the lack of communication between students. Therefore, in order to better put VR technology into physical education, the following points need to be achieved: first, explain to students about VR equipment and operation applications, so that students can operate the equipment themselves, to achieve independent learning to a certain extent Second, teachers need to explain the relevant knowledge of physical education, and then use VR equipment for detailed learning and practical exercises to ensure the smooth development of physical education, so as to provide basic conditions for the application of VR technology in physical education.

The research in this paper is mainly divided into four parts: The first part is the VR panorama [7-9] research. VR panoramas are 3D virtual images built on the basis of 360-degree real images. Compared to ordinary images, VR panoramas cover more comprehensive scene information. By using the head-mounted device to unfold the visual images of all parties in real time, the user can independently select the images to be viewed to achieve an "immersive" experience. On this basis, VR panoramic images have been used in medical, film, entertainment, education and other fields; the second part is VR video [10] research. VR video, as a combination of video information and computer technology, produces a new way. The 3D virtual environment it produces can create a strong sense of immersion in the user's vision and be placed in a virtual environment that is difficult to distinguish between true and false; the third part is VR Research on the application of technology in physical education. In the physical education teaching process, skills that are difficult to grasp such as movement postures and details during the

movement can be displayed through VR devices, which can enable students to feel and understand the essentials of movements, stimulate students' interest in sports, and achieve better Exercise effect; the fourth part is investigation and research. Survey data shows that the introduction of VR equipment in sports,

Under the premise of reasonable use of VR equipment, it can greatly improve the students' skills, skills and physical qualities. It can also greatly improve the students' ability to respond on the spot during sports training, which is of great help to sports. However, VR devices are a double-edged sword. At present, the development of VR technology is immature, which makes VR devices [11] not easy to wear, and it is easy to immerse students in using VR devices. Pros and cons of a comprehensive study, to study the feasibility of the application of VR equipment in physical education and sports.

## II. VIRTUAL REALITY TECHNOLOGY

VR is an emerging technology that simulates real-life scenarios. It is a virtual environment generated by a computer, and is an interactive 3D dynamic scene in which a variety of information is fused. Compared with ordinary human-computer interaction devices, VR technology not only provides users with strong vision and hearing, but also can simulate scenes that cannot be touched in reality. Although VR technology has appeared in the twentieth century, it has only gradually developed in recent years. The emergence of VR technology allows users to get the most vivid visual and tactile experience without leaving the house, making "immersive" Reality. The value of VR technology is reflected in the following aspects: First, simulate real activities. Allow users to use VR equipment to experience some activities that cannot be done in reality. For example, some people want to experience the fire extinguishing process of firefighters, which is impossible in reality, then they can wear VR equipment and enter a virtual fire scene to extinguish fire, which can be used as survival training; Second, VR technology can be applied to education. For example, in educational activities, teachers or students want to understand knowledge and skills more vividly and realize some of their own ideas, but they cannot be completed due to the constraints of real conditions. VR equipment can be used for simulation and practice for a long time; third, it helps to construct abstract thinking. In human production and practical activities, there are many skills that cannot be mastered by simple imagination, so abstract thinking needs to be embodied. Therefore, the use of VR device visualization [12-13] can help people better construct abstract thinking. With the rapid development of computers and related technologies, conditions have been created for the development and wide application of VR technology. Therefore, this article first discusses the concept and characteristics of VR technology, then puts forward the relevant principles of applying VR technology

to physical education, and finally puts forward the practical method of applying VR technology to physical education.

### A. VR PANORAMA

VR panorama is usually a complete scene picture collected by VR technology based on image processing using digital SLR camera, fisheye lens, panoramic gimbal, tripod and other equipment. Since the 19th century, panoramic technology has been continuously developed and successfully involved in business, science and culture. The advantages of VR panoramas are: First, the image of the panorama is larger than the normal effective angle of view of the human eyes, and it can even form a  $720^\circ$  complete scene that cannot be reached by the human eye observation range. The panorama is composed of multiple sets of photos and can reflect Enough visual information. After wearing the VR device, the user can change the angle of view by twisting the head to have a more real space experience. Compared with ordinary pictures, the space experience of the VR device is unparalleled; secondly, the material collection of VR panorama is relatively simple, and the data can be easily obtained. Therefore, VR technology has a wide application prospect.

At present, there is no VR panorama app. People can only use map software and network pictures to understand when traveling or querying a place. Therefore, taking a sports training place as an example, the steps for making a panorama are as follows:

(1) Realize multi-directional on-site shooting through the VR panoramic camera to collect panoramic images of the training site;

(2) Extraction step (1) Acquire the panoramic images and classify the images. The classification is to distinguish similar panoramic images, and then, in order to determine whether there are duplicate pictures, pre-process the panoramic images of the same category. Including geometric distortion correction and noise suppression on the collected images, and finally, all images with high similarity are processed through registration and stitching;

(3) Open the image processed in step (2) in the VR editing tool, import the image and edit the VR panorama;

(4) Publish the VR panoramic view obtained in step (3) in the format of Flash VR or Flash VR -exe or Flash VR -swf or Html-5.

After the above steps, the VR panoramic view produced by the methods of acquiring VR panoramic images, stitching images, editing VR views, and publishing VR views can fully describe all the information of the training venue, and can be constructed as a VR virtual environment to allow physical exercise personnel Feel the sense of being in it during exercise and help trainers better master motor skills. Therefore, the use of VR equipment can not only make users familiar with the training environment, but also improve training safety awareness, effectively avoid possible accident risks, and improve sports efficiency.

### B. VR VIDEO EXPERIENCE

In terms of user experience, the content of VR video is more immersive, interactive and imaginative than ordinary flat video. However, due to the huge difference in scheduling and camera language between VR video and ordinary video, the subject range of VR video also varies greatly. VR video is suitable for the following content: VR sports live broadcast, VR animation film, VR travel, real estate video needs, and VR scene video with dialogue function, etc.

#### (1) Immersion

The main function of VR video is to bring users an immersive experience from the user's perspective. For example, in live VR for sports competitions, if a VR shooting device can be installed on each athlete, so that the audience can "append" to participate in the competition on their favorite athletes to achieve a stronger sense of excitement of the audience. Or like the movie "This man is from the earth", if the audience can use the VR device as one of the members to participate in the movie, and even can make interactive choices to affect the final outcome of the movie, then this will also be a new novel experience.

#### (2) Interactive sense

The interactivity of VR video is also more attractive than ordinary video. You can enhance the viewing experience of VR video users by controlling eye attention, sound, touch, and even qi.

#### (3) Liquidity

At present, the wearing comfort of VR devices is not very good. If it is used for a long time, it will not only cause dizziness and fatigue, but also cause unstable standing. With the further research on virtual reality technology and the reduction of the volume of the component devices, it is believed that VR equipment will overcome the difficulties in this regard.

## III. RESEARCH ON VR TECHNOLOGY IN PHYSICAL EDUCATION

The application of VR technology in college physical education will transform the traditional single teaching into a diversified comprehensive professional teaching, and make all kinds of physical education more profound, which is a reform of traditional physical education.

### A. NECESSITY OF COMBINING VR TECHNOLOGY WITH COLLEGE PHYSICAL EDUCATION

VR technology is a research project that extends from the field of artificial intelligence networks. The application of VR technology in the field of physical education and sports training has opened a new exploration of the physical education model. It greatly changes the traditional face-to-face teaching method, improves the learning initiative of students, uses VR equipment to guide students into the built sports training environment, enhances the students' sports fun, and is conducive to the smooth progress of sports training. The application of VR equipment will

prolong the time of physical exercise, which can not only achieve a face-to-face teaching effect, but also enhance students' knowledge reserves, can promote physical education to a certain extent, and spend on teaching equipment and education funds Investment can be reduced accordingly. In sports training, there are a large number of competitive sports. These competitive sports often have accidents in actual training, which are gradually eliminated. The development and utilization of VR technology can eliminate the hidden danger of accidents, and allow the wearer to carry out sports training under comfortable conditions. In addition, VR technology can also better simulate sports events that require high teaching equipment and sports venues, reflecting the humanized creation of the teaching environment. The application of VR technology in physical education can make up high-end equipment and venues, so that students can truly experience joyful operation and exercise, so as to achieve the goals of physical education and sports training reform.

In order to realize the effective application of VR technology in college physical education, the application direction is: design of campus environment simulation [14], physical education classroom simulation [15], actual teaching environment simulation [16] and interactive courseware [17]. Campus environment simulation is to use the above-mentioned method of constructing VR panoramas to generate realistic, three-dimensional, virtual campus environments that give students a strong sense of reality. Sports classroom simulation is to expand the time and space of sports classroom teaching, establish a more

realistic virtual training environment, and adopt rich interactive teaching methods, which is easy to implement sports training activities; simulating the actual teaching environment requires effective and effective data on sports teaching facilities. Real entry, thereby reducing the relevant funding input; the design of interactive courseware is to use the relevant technology to achieve the purpose of resource sharing and achieve classroom interactivity.

### B. COMPARISON OF TRADITIONAL MEDIA TEACHING AND VR TECHNOLOGY IN EXPERIMENTAL TEACHING

In traditional physical exercise time teaching, teachers are generally taught on a single training venue to teach sports skills and skills in physical education courses by dictation, and then show them through simple movements. Therefore, under this condition, most students lack curiosity and enthusiasm for sports, and they always learn and exercise in a passive way. Therefore, many students cannot master detailed and comprehensive sports skills. Therefore, using VR devices to apply to sports, students have a strong understanding of the ways and means of sports. By interacting with virtual sports scenes in VR devices, they can promote students' sports interests and even their social development. Use VR panoramas, VR videos, and virtual scenes in the teaching system, and use sensor devices to immerse learners and better enhance practical skills. Comparison of traditional media teaching and virtual reality technology in experimental teaching (see Table 1).

TABLE I  
COMPARISON OF TRADITIONAL PHYSICAL EDUCATION AND VR TECHNICAL PHYSICAL EDUCATION

Compare items	Traditional physical education	VR technology physical education
Teaching content	Exercise methods and techniques	VR panorama, VR video, virtual scene
Teaching methods	One-way professor	Two-way interaction
Teaching characteristics	Practice less	Immersive one-on-one teaching

### C. PRINCIPLES OF VR APPLICATION IN PHYSICAL EDUCATION

It can be seen from the above conclusions that VR technology has very distinctive characteristics and can apply VR devices to sports activities. However, the following principles need to be observed during use:

#### 1) STUDENTS AS THE MAIN BODY

Students are the main body of teaching. Therefore, in the process of physical education, the application of VR technology should also abide by the principle of student body, so the following points should be done:

(1) Teachers should give students full guidance to better improve students' enthusiasm for sports learning;

(2) The use of VR technology to develop students' independent thinking ability, VR technology can simulate the movement process, so in the actual operation process,

you can make full use of VR technology to train students' movement coordination ability.

#### 2) TEACHER GUIDANCE

In the practice teaching of VR, it is necessary to give full play to the guiding role of the instructor. Teachers must correctly recognize the unique auxiliary role of VR in sports teaching before they can fully play the application in the process of physical education. In addition, teachers need to change their traditional roles. In the process of physical training, they can give students more opportunities to play, and at the same time help students use VR equipment to complete the exercise training process.

#### 3) TEACHING ACCORDING TO APTITUDE

In order to better reflect the effect of VR teaching, it is necessary to follow the principle of teaching students according to their aptitude according to their physical functions:



(1) According to students' athletic ability, different virtual sports training scenarios can be applied to better promote the development of physical education;

(2) In the process of teaching, it is necessary to provide students with a space environment of relative freedom of movement, which can give full play to their potential sports ability.

#### **D. CASES OF OTHER DISCIPLINES USING VR**

At present, VR technology has relevant applications in domestic and foreign education fields such as English video teaching [18], animation teaching [19], and Chinese teaching [20].

Based on the full use of a large number of documents, it is found that VR application in English video teaching can enhance students' interest in learning and attention. With VR videos in the classroom, students can firmly grasp the use of English grammar, memory of words, and oral dialogue Skills; In the application of animation in VR, animation and VR are combined to develop a VR technology application method suitable for animation art experimental teaching, which can allow students to expand their thinking and use a variety of methods to complete the learning content; VR in Chinese teaching Application, using the three-dimensional world in VR to create rich and vivid scenes, using a combination of situations to allow students to experience the theme ideas in the article, and make good use of the advantages of language and thinking information carrier. Overall, the intuitiveness of VR video has a very strong visual appeal, which proves that the application of VR equipment in education has greatly enriched the diversity of teaching, and also provides new methods for the teaching of courses. To improve students' learning efficiency.

#### **E. REALISTIC PROBLEMS AND DISADVANTAGES OF VR TECHNOLOGY**

##### **1) THE DEVELOPMENT OF VR TECHNOLOGY IS CONSTRAINED BY COST AND PRICE**

Although VR technology has been proposed for a long time, it has not developed rapidly until recent years. At present, the development of VR technology is in a booming period, spending a lot of scientific research costs, and there are many computers product research and development companies, and product replacement is very fast. These factors have led to the cost of research and development of VR equipment has not been reduced. Due to the high cost, the VR devices on the market are very expensive. In addition, there are many companies that produce VR products on the market, so the quality of VR equipment cannot be guaranteed, so that pseudo VR products appear, causing the public to misunderstand VR products and to a certain extent hinder the development of VR technology.

##### **2) THE IMMATURITY OF VR HARDWARE AND SOFTWARE TECHNOLOGY**

At present, the development of VR technology is not mature enough. In the early days of VR devices, users will experience dizziness and nausea when wearing VR devices for a long time. Although VR technology has been developed to a certain extent, this drawback has not yet been completely overcome. Due to the constraints of integration technology, the volume of hardware equipment cannot be reduced or reduced, so it cannot be carried around during sports training. In software development, because the development time is longer, so there are not many types of software research and development products. Overall, there is still much room for improvement in the development of VR technology.

##### **3) VR TECHNOLOGY WILL WEAKEN USERS' SOCIAL RELATIONS**

Investigations have shown that if you use VR devices frequently, users will become dependent and immersed in the virtual world, unable to focus on the communication and learning of people around them. Many users of VR devices are young people, and they are susceptible to pressure from many aspects of life, and the use of VR devices is just to find a way to vent pressure. The content of VR is relatively fresh, and many young people are not strong in self-control. If they are not persuaded and guided in time, it is easy to produce autism.

##### **4) TEACHERS MAY RELY TOO MUCH ON VR EQUIPMENT**

VR equipment is like a double-edged sword. Reasonable use will promote the smooth implementation of physical education; on the contrary, it may make teachers prepare lessons passively. In sports training, the tools of VR equipment knowledge teaching and coaching students cannot replace the guidance position of teachers. Therefore, teachers need to clarify their own criticality and use VR equipment reasonably to achieve the improvement of teaching skills.

#### **VI. SURVEY RESULTS AND ANALYSIS**

In order to analyze and observe the application effect of VR equipment in physical education, this article tests the students of each class after two weeks of physical education in the experimental and control classes of the two schools, and calculates the original score. Investigate their interest in sports, training concentration, and preference for VR devices, and then analyze the application effects of VR devices in physical education in detail. The questionnaire survey is used to analyze students' interest and preferences of VR technology in physical education and sports training. For the investigation of concentration, this article selects the classroom observation table for analysis. In this study, in addition to collecting data through questionnaire surveys, you can also observe in sports practice training. This can verify the authenticity and accuracy of the experiment.

**A. ANALYSIS OF EXPERIMENTAL RESULTS**

The statistical scores of the experimental and control classes of the two schools are shown in Table 2 below.

TABLE II  
COMPARISON BETWEEN EXPERIMENTAL CLASS AND CONTROL CLASS

School	Class	Number of people	The average score	Standard deviation	Distinctiveness (P)
Experimental school 1	Experimental Class	70	69.7	19.1	P<0.01
	Contrast class	70	42.1	24.6	
Experimental school 2	Experimental Class	60	72.5	16.2	P<0.01
	Contrast class	60	48.3	21.3	

According to the results of Table 2, although the average score and standard deviation of the students in the two schools are different, the average score of the control class is lower than that of the experimental class, and the standard deviation is higher than that of the experimental class, so the polarization of the difference between the two is very significant.

**B. COMPARATIVE ANALYSIS OF LEARNING INTEREST**

The questionnaire survey was used to show students' interest and preference for VR technology in physical education and sports training. The results of the survey are shown in Figure 1.

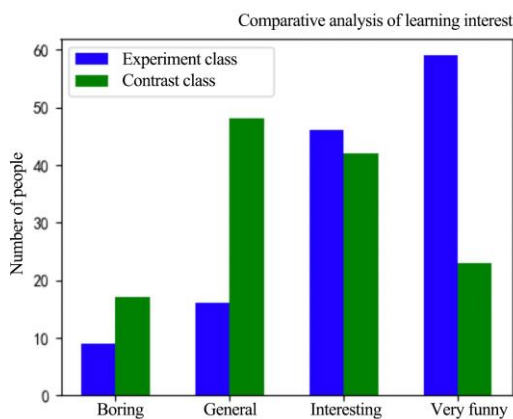


FIGURE 1. Students' interest in sports

In order to do a comparative analysis of learning interests, students' interest levels are divided into four levels: not interested, general, interested, and very interested. Compare the experimental class with the control class. As can be seen from Figure 1, the experimental class uses VR equipment. People who are interested and very interested in sports training account for a large proportion of the total number of people, and very few people are not interested. This part of the students may be caused by dizziness when wearing VR devices due to physical reasons. Compared with the experimental class, the control class is based on the traditional way of training the physical

education curriculum. The data of the control class is a good indication of the tedious single disadvantage of traditional physical education. It can be seen from the bar chart that the number of people who hold a general attitude towards the training course accounts for the largest proportion of the total. It can be seen that VR technology applied to physical education has been warmly expected by students.

**C. COMPARATIVE ANALYSIS OF TRAINING CONCENTRATION**

According to the questionnaires of the experimental class and the control class, the experimental data collated is shown in Figure 2.

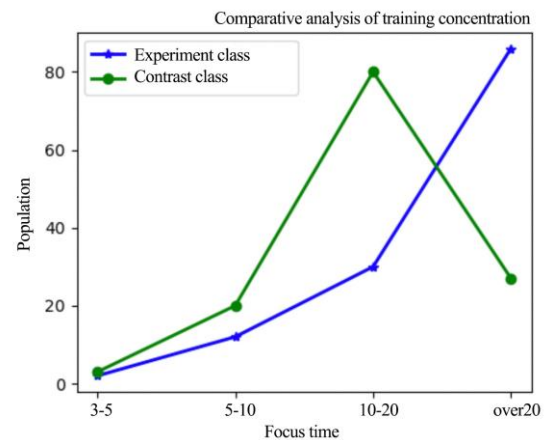
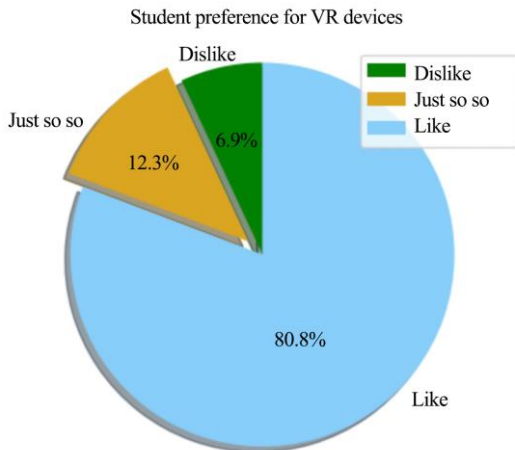


FIGURE 2. Contrastive analysis of training concentration between experimental class and control class

In the experiment, this paper divides the concentration time into 4 levels: 3 – 5 minutes, 5 – 10 minutes, 10 – 20 minutes, and 20 minutes or more. The experiment and the control class are used for comparative experiments. The experimental results are shown in Figure 2. The number of students in the experimental class and the control class in the concentration of 3 to 5 minutes is very small and almost the same; the number of people who can only concentrate on 5 to 10 minutes is more in the control group; the control in the range of 10 to 20 minutes The number of groups accounted for the largest proportion of the number of

people in the classification, while the number of experimental groups that can continue to train for more than 20 minutes accounted for the largest number of total experimental classes. After the above analysis, it can be seen that the strong immersion of the VR equipment makes the students' concentration very concentrated, which increases the length of the students' physical training and improves the students' sports skills to a certain extent.

**D. DEGREE OF PREFERENCE FOR VR DEVICES**

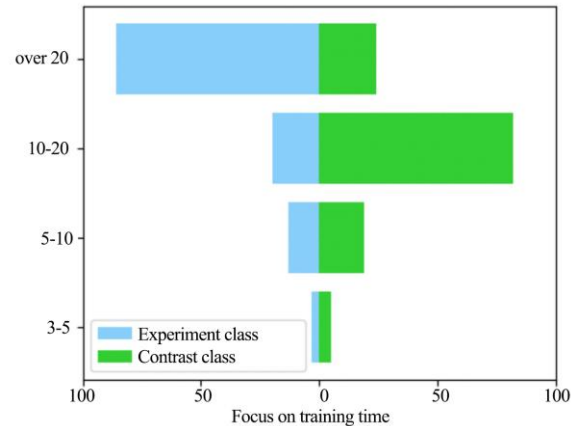


**FIGURE 3. The preference of experimental class for VR equipment**

Taking the total number of people in the experimental class as the data sample, we surveyed the total preference of 130 people in the experimental class after using VR devices. It can be seen from Figure 3 that the number of students who do not like VR equipment accounts for 6.9% of the total, while the number of students who like VR equipment accounts for 80.8% of the total, and the number of students who do not hold attitude accounts for 12.3%. It can be seen that the use of VR equipment has gained a lot of favor. As long as the VR equipment is used reasonably, the guidance role of VR can be fully utilized in sports training, which can greatly improve the students' enthusiasm for sports.

**E. APPLICATION EFFECT OF VR EQUIPMENT IN PHYSICAL EDUCATION**

In order to understand the concentration of students' attention in the physical education class, this article uses the method of classroom observation to answer "How much do you think your concentration in class?" The survey results are shown in Figure 4.



**FIGURE 4. Effect of VR equipment in sports**

Through the survey results of Figure 4, we can see that in the application of VR equipment in physical education, students' concentration in the classroom has increased significantly, and most students can maintain more than 20 minutes, which is significantly higher than the control group. Through the analysis of this article, it is believed that VR technology-based physical education and physical training provide great help for students' physical exercise. The application of VR equipment in physical education is conducive to improving students' interest in learning and attention in the classroom, so as to better improve students' level of physical exercise.

**V. CONCLUSIONS**

Reforming teaching methods through VR reality technology is one of the main ways of modern education. Physical education is an important part of my country's education. Making online VR panoramas and VR videos through VR technology can greatly enhance students' enthusiasm for learning. VR technology can simulate complex environments, breaking through the limitations of traditional sports courses on sports venues, equipment, safety, etc., and can provide complex and abstract sports theoretical knowledge through VR visualization to provide students with scientific and accurate guidance to Get more skills and knowledge. Compared with traditional sports teaching activities, virtual reality technology can not only simulate the motion scene by generating VR panoramas, but also bring learners into the immersive and interactive virtual reality world through VR video. Experience". This paper studies VR panorama research, VR technology in physical education application research and survey research. The advantages and disadvantages of applying VR technology to physical education are discussed in many aspects, as well as the current immature development of VR technology. Therefore, VR technology needs to overcome the current technical bottlenecks so that users will not feel uncomfortable during wearing. In addition, to apply VR technology to teaching, it is necessary to follow

certain principles, and strive to implement reforms in the field of traditional physical education under the premise of rational use of VR equipment.

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**CHENGBAO LI** was born in Yingshang County, Fuyang City, Anhui Province. South Korea Peicai University is studying for a doctor's degree. Research directions: physical education and physical training  
E-mail: anhuilichengbao@163.com



**YUPENG LI** was born in Shandong, P.R. China, in 1985. He is a teacher at Linyi University and is now a doctoral candidate at Pai Chai University in Korea. His research interests include: sports training, sports marketing, and sports industry.  
E-mail: liyupengty@lyu.edu.cn

