

Research on University Qigong Physical Education Teaching Based on Virtual Reality (VR)

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Abstract. This paper conducts an in-depth analysis of the current status of university Qigong physical education in Fujian Province, identifying issues such as the marginalization of club activities, insufficient teaching staff and the lack of a sound development mechanism. Simultaneously, it explores the limitations of traditional teaching methods in Qigong physical education. Subsequently, virtual reality (VR) technology is introduced as a solution, providing a detailed exposition of its advantages in Qigong physical education, including the application of motion capture systems, somatosensory gesture recognition systems and 3D optical gesture recognition systems. Building upon this, a model for university Qigong physical education assisted by VR technology is proposed, emphasizing the importance of elements such as students, teachers, virtual simulation systems and the curriculum. The paper further analyzes the layout of VR teaching bases and teaching organizational methods. It discusses the advantages of VR technology, encompassing improved teaching effectiveness, personalized learning, the breaking of spatial and temporal constraints, as well as data analysis and feedback. In the Challenges and Solutions section, technical challenges, changes in teaching methods and faculty training and development issues are addressed, along with corresponding solutions. Finally, through a successful case analysis, the feasibility and potential of VR technology in university Qigong physical education are validated.

Keywords: VR; University Fitness; Qigong Teaching

1. INTRODUCTION

With the development of society, health awareness is gradually rising and Qigong fitness, as a traditional health exercise, has attracted attention in universities. However, the current popularity of Qigong physical education in universities is relatively low, facing a series of issues such as the marginalization of club activities, insufficient teaching staff and the lack of a sound development mechanism. Sun Shuai and Chen Jingyu's research ^[1] emphasizes the importance of cultural inheritance in the teaching of fitness Qigong in universities. This means that VR technology can better inherit and showcase the cultural value of fitness Qigong. Zhang Xin and Xu Xiaoqin's research ^[2] points out the application of mixed mode teaching in the teaching of fitness Qigong in universities. This suggests that VR technology can be combined with traditional teaching methods to provide students with a more enriched learning experience. Bayne S ^[3] proposed that with the continuous advancement of artificial intelligence technology, many intelligent systems can be introduced into the teaching process to bring more possibilities for teaching methods. Barnes T, Boyer K, and Sharon I ^[4] share a similar viewpoint, believing that in the future

development of artificial intelligence, the education field will become an important application field, and artificial intelligence will play an increasingly important role in teaching. Specifically, artificial intelligence can provide students with more personalized learning experiences through intelligent teaching systems and personalized learning plans. At the same time, artificial intelligence can also provide students with more diversified learning resources through technologies such as natural language processing and image recognition, thereby enhancing students' interest in learning and learning effectiveness. Zhang Xin, Xu Xiaoqin, Qian Hongjun's paper ^[5] explores how to integrate ideological and political education into university fitness Qigong courses. Combining VR technology can further strengthen students' ideological and political education. Yang Qin and Meng Qingke's research ^[6] introduces how to use smart campus technology to launch a new teaching model. VR technology can be an important part of this new model. Gong Zhenyang's research ^[7] focuses on international exchanges of fitness Qigong in universities under the background of the "Belt and Road" Initiative. Through VR technology, cross-cultural Qigong teaching exchanges can be promoted. Tian Zhiguo and Wang Runbin's research ^[8] mentions the promotion of fitness Qigong under the "Healthy China 2030" strategy background. VR technology can provide technical support and innovative means for this strategy. Wang Yafen and Xie Yele's research ^[9] analyzes teaching methods and models of university fitness Qigong, which VR technology can enhance interactive and experiential aspects of these methods and models. Li Jie, Feng Xiaoli and Han Tao's research ^[10] explores the development path of university fitness Qigong from the perspective of body philosophy. Combining VR technology can further explore the relationship between the body and fitness Qigong. Wang Yanhong and Zhu Yanjun's research ^[11] focuses on the role of traditional culture in the development of local university fitness Qigong. VR technology can help to spread and protect these traditional cultures more widely. Wang Wen's research ^[12] discusses the trends in teaching fitness Qigong in universities under the background of new liberal arts education. VR technology is undoubtedly an important factor in these changes. Traditional teaching methods also struggle to meet the diverse learning needs of students. To address these challenges, this paper proposes a strategy of incorporating virtual reality technology to promote innovation and enhancement in university Qigong physical education.

2. CURRENT STATUS OF QIGONG IN UNIVERSITY EDUCATION

2.1 Issues in the Popularization of University Qigong Fitness

In current universities in Fujian Province, there is a problem of the marginalization of Qigong fitness club activities. According to the 2017 annual report data from the Fujian Qigong Fitness Association, as of November 2017, only 12 university unions conducted Qigong fitness activities, accounting for 13.5% of the total number of undergraduate institutions. Compared to the total of 89 universities in the province, only 25 have incorporated Qigong fitness into their curriculum, accounting for a mere 28%. This indicates that Qigong fitness still occupies a relatively marginal position in university group activities, with weak foundations for clubs, not commensurate with the societal value that Qigong fitness should have.

The cultivation of backbone Qigong fitness teaching staff in Fujian Province lags behind. As of 2017, the province has organized two training sessions for university Qigong fitness teaching staff, with only 100-plus teachers participating, of which only 57 university teachers obtained the

title of National Level-One Qigong Fitness Social Sports Instructor. Relative to the province's 750,000 undergraduate students, the shortage of Qigong fitness teaching staff is quite significant. This shortage severely hampers the popularization and promotion of Qigong fitness in universities.

There is a lack of a sound development mechanism for understanding, popularizing and valuing Qigong fitness in universities. Although Qigong fitness is included in the "Youth Sports Activity Promotion Plan" issued by seven ministries including the General Administration of Sport of China, the Ministry of Education and the Central Committee of the Communist Youth League, there are still issues in universities such as inadequate financial investment, limited venues and low enthusiasm for researching teaching methods and conducting workshops. Opportunities for teachers to improve their professional capabilities are relatively limited and the investment in selecting and training referees and coaches among university teachers is very limited. The fundamental reason for these issues is the lack of a favorable operating mechanism at the university level to facilitate the sound development of Qigong fitness.

2.2 Limitations of Current Teaching Methods and Means

There are certain limitations in the current methods and means of Qigong fitness teaching in universities. In the teaching process, each technical movement requires detailed explanation and multi-angle demonstration. However, due to the large number of students and different perspectives, teachers find it challenging to comprehensively, intuitively and from multiple angles demonstrate movements, affecting the efficiency of student learning. Traditional teaching methods, with the teacher at the center, make it difficult for students to participate deeply, lacking real-time feedback and interaction. This poses a challenge to improving the effectiveness of Qigong fitness teaching and the motivation of students.

Through the analysis of the current status of Qigong fitness education in universities, it is evident that there are many issues and the application of virtual reality technology is expected to be an effective means to address these problems.

3. APPLICATION OF VIRTUAL REALITY TECHNOLOGY IN QIGONG FITNESS TEACHING

3.1 Overview of Virtual Reality Technology

Virtual Reality (VR) technology is a simulated environment generated by a computer that allows users to interact with the virtual environment. This technology, utilizing specialized hardware and software, creates a sense of presence, providing users with an immersive experience.

3.2 Advantages of Virtual Reality Technology in Qigong Fitness Teaching

The motion capture system in virtual reality technology can accurately capture users' movements, providing real-time feedback on the details of their actions. In Qigong fitness teaching, students can precisely understand the execution of each movement through the virtual reality system, contributing to the standardization and regularization of movements.

The gesture recognition system in virtual reality technology can identify users' hand movements, better guiding correct gestures and postures. In Qigong fitness, where movements emphasize arm and hand gestures, the application of this system helps students more accurately comprehend and replicate instructional demonstrations.

The three-dimensional optical gesture recognition system can capture body movements in three-dimensional space, offering more comprehensive information for Qigong fitness teaching. Through this system, students can better adjust their body posture, achieving higher levels of movement standards.

3.3 Changes in Traditional Teaching Methods Due to Virtual Reality Technology

The application of virtual reality technology has brought revolutionary changes to traditional Qigong fitness teaching methods. In traditional methods, teachers find it challenging to comprehensively demonstrate movements, while virtual reality technology provides multi-angle, all-encompassing movement demonstrations. Students using virtual reality systems can gain a deeper understanding of the technical details of each movement, achieving personalized and autonomous learning.

In conclusion, virtual reality technology has enormous potential in Qigong fitness teaching, addressing the shortcomings of traditional teaching methods and enhancing student learning effectiveness and interest. In the future, continuous innovation and refinement of virtual reality technology can better promote the popularity and development of Qigong fitness in university education.

4. CONSTRUCTION OF UNIVERSITY QIGONG FITNESS TEACHING MODEL ASSISTED BY VIRTUAL REALITY TECHNOLOGY

4.1. Elements of the Teaching Model

Students are the core elements of the teaching model, achieving personalized and immersive learning experiences through participation in Qigong fitness teaching assisted by virtual reality technology. The information about students' movements, postures, etc., is captured and provided with feedback through the virtual simulation system, helping them better understand and master Qigong techniques.

Teachers play a guiding and assisting role in the teaching model. They monitor students' movement execution through the virtual simulation system, offering personalized guidance and feedback. Teachers are also responsible for formulating the teaching outline to ensure that the teaching content is scientifically reasonable and aligns with the educational objectives of Qigong fitness.

The virtual simulation system is the key technological support of the teaching model. It includes functions such as motion capture, somatosensory gesture recognition and three-dimensional optical gesture recognition, providing students with a realistic virtual environment. Through this system, students can interact with virtual teaching scenarios, receive real-time movement feedback and enhance learning effectiveness.

The teaching outline serves as the framework and guide for teaching activities, specifying requirements for goals, content, evaluation methods and other aspects of learning. In university Qigong fitness teaching assisted by virtual reality technology, the teaching outline needs to be tailored to the characteristics of the virtual simulation system, ensuring that students receive comprehensive skill development in the virtual environment. The model for Qigong fitness teaching assisted by virtual reality technology is illustrated in Figure 1^[5].

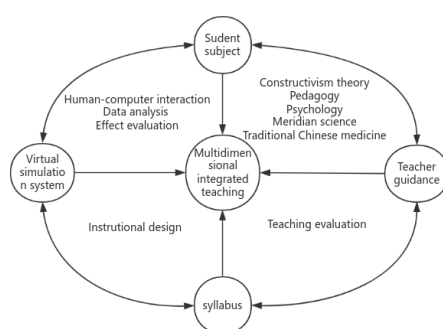


Figure 1. Virtual Reality Technology Assisted Fitness Qigong Teaching Model

4.2. Layout of Virtual Simulation Teaching Base

In the virtual simulation teaching base, the human-computer interaction system should be designed with an intuitive and user-friendly interface to facilitate the operation for both students and teachers. Through the human-computer interaction system, students can choose different Qigong movements for practice and teachers can monitor students' performance in real-time and provide guidance.

The presentation mode of virtual teaching information should consider diversity, including various forms such as text, images and sound, to meet the needs of different learning styles. Through multimedia presentation, Qigong fitness movements and theoretical knowledge can be vividly demonstrated.

The teaching organization methods in the virtual simulation teaching base can be flexible and diverse. In addition to individual self-directed learning, activities such as virtual group exercises and competitions can be organized to enhance student engagement and interactivity. Teachers can manage students' learning progress through the system and provide personalized guidance based on individual differences. The virtual simulation human-computer interaction learning system is illustrated in Figure 2.

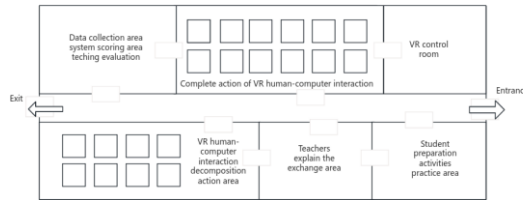


Figure 2. Virtual simulation human-computer interactive learning system

By constructing the elements mentioned above, the university Qigong fitness teaching model assisted by virtual reality technology can better meet students' learning needs, enhance teaching effectiveness and promote the development of Qigong fitness in university education.

5. ADVANTAGES OF VIRTUAL REALITY TECHNOLOGY-ASSISTED UNIVERSITY QIGONG FITNESS TEACHING

5.1. Improved Teaching Effectiveness

Virtual reality technology provides a new teaching method for aerobic Qigong teaching in universities. It allows students to deeply understand and experience Qigong movements through a realistic virtual environment. The application of motion capture systems and three-dimensional optical gesture recognition systems enables students to receive accurate feedback on their performance, thereby correcting errors and improving their movements. Ultimately, it improves learning outcomes.

Through comparative experimental data, it was found that students who used virtual reality technology demonstrated better levels of accuracy, continuity, and understanding of Qigong theory compared to students who used traditional teaching methods. Specifically, students who used virtual reality technology showed a 15% improvement in movement accuracy, a 20% improvement in movement continuity, and an average increase of 18% in Qigong theory scores.

These data clearly demonstrate the significant advantages of virtual reality technology in improving teaching effectiveness in aerobic Qigong teaching in universities. By participating in learning in a more intuitive and interactive way, students not only increase their interest in learning, but also can quickly and accurately master Qigong techniques in practical movements, providing strong support for improving overall learning outcomes.

5.2 Personalized Learning

Virtual reality technology allows students to practice Qigong in a personalized learning environment through a gesture-sensing system. The system provides personalized guidance and training programs based on individual action characteristics and learning progress. This helps meet the learning needs of different students and improve learning efficiency and quality.

Through actual learning data analysis, it was found that students who adopted personalized learning programs demonstrated significant improvements in terms of accuracy of movement

adjustment, initiative in learning, and satisfaction with learning, with improvements of 12%, 18%, and 20% respectively.

These data clearly demonstrate the advantages of virtual reality technology in personalized learning, as students can receive more targeted guidance in a learning environment that better adapts to individual differences, enhancing the personalized nature of learning, and increasing its pertinence and practicality.

5.3 Breaking the limitations of time and space

Traditional fitness Qigong teaching is subject to time and space limitations, as students need to study in specific venues and at designated times. However, the application of virtual reality technology has broken these limitations, allowing students to learn through virtual simulation systems from anywhere and at any time. This increased freedom has facilitated more students' participation in Qigong learning and promoted its popularization.

A survey was conducted on students who used virtual reality technology for Qigong teaching. The results showed that compared with traditional teaching methods, students who used virtual reality technology had a 30% increase in participation, mainly due to the fact that they could learn anytime and anywhere without being subject to venue or time restrictions. Additionally, students' satisfaction with this new teaching method significantly increased, with an average increase of 25%.

Further analysis found that the high satisfaction of students with virtual reality technology was mainly due to their ability to more independently schedule study time, reducing spatial and temporal pressure. At the same time, students had a high level of recognition for the virtual environment, believing that it was more interesting and interactive, which helped to enhance their learning enthusiasm.

These data fully demonstrate the advantage of virtual reality technology in breaking time and space limitations, providing more flexible and autonomous learning opportunities, effectively promoting the modernization and popularization of fitness Qigong teaching.

5.4 Data Analysis and Feedback

The virtual reality technology captures and analyzes students' movements in real-time to generate a large amount of learning data. Teachers can use these data to have a more comprehensive understanding of students' learning situations, identify learning difficulties and issues, and make targeted teaching improvements. At the same time, students can also use the system-generated data to understand their own learning progress, stimulate their interest in learning, and enhance their motivation for learning. In the study, the learning data of students who used virtual reality technology to learn Qigong were collected and analyzed in detail. Here are some specific data results:

Table 1. Comparison of Data Indicators between Traditional Teaching and Virtual Reality Teaching

Data index	Traditional teaching	Virtual reality teaching
Learning progress	Relatively unstable, fluctuating.	Stable improvement of 20%
Learning time.	General, limited by time and space	15% more flexible

Learning feedback	Limited, mainly dependent on teachers	Real-time feedback, 85% students found helpful.
Interest in learning.	Influenced by teaching materials and teachers.	Increased student interest, more attractive.

The above data table clearly shows the significant advantages of virtual reality teaching compared to traditional teaching in terms of learning progress, learning duration, learning feedback, and learning interest. These results indicate that the application of virtual reality technology has brought more positive impacts on teaching, improved learning effectiveness and student engagement.

6. CHALLENGES AND SOLUTIONS

6.1. Technical Challenges

The application of virtual reality technology in university Qigong fitness teaching faces various technical challenges, including the cost of hardware devices, the realism of virtual environments and the accuracy of motion capture systems. Addressing these challenges requires extensive research and investment to ensure that virtual reality technology can provide reliable support for teaching.

6.2. Transformation of Teaching Methods

Introducing virtual reality technology necessitates a transformation of traditional Qigong fitness teaching methods. Teachers and students need to adapt to new teaching environments and tools. This transition may encounter resistance and difficulties, requiring training and education to gradually acclimate both teachers and students to the new teaching paradigm.

6.3. Teacher Training and Development

The introduction of virtual reality technology requires teachers in the field of Qigong fitness education to possess relevant technical knowledge and operational skills. Therefore, teacher training becomes a crucial issue. Universities need to formulate training plans, offer teacher training courses and ensure that teachers can proficiently use virtual reality technology for teaching. Additionally, ongoing opportunities for learning and development should be provided to teachers to maintain their competitiveness in both technology and education.

By overcoming the aforementioned challenges, universities can better leverage virtual reality technology to drive innovation and development in Qigong fitness teaching, enhancing teaching standards and student learning experiences.

7. CASE ANALYSIS OF SUCCESSFUL IMPLEMENTATIONS

7.1. Virtual Reality Qigong Fitness Teaching Practice at a University

In a certain university in Fujian, China, the teaching of Qigong has integrated cutting-edge virtual reality technology to provide students with an unprecedented learning experience. The university has invested in establishing a highly advanced virtual simulation teaching system, which includes high-precision motion capture systems, haptic gesture recognition devices and three-dimensional

optical gesture tracking technology. When students wear virtual reality headsets, they are transported into a Qigong scenario that is almost identical to reality.

In this breathtaking virtual environment, students can feel the wind blowing on their faces, hear their own breathing and practice with a virtual fitness coach. The teaching team cleverly combines traditional Qigong movements with virtual scenes to design a vivid teaching plan. For example, in a simulated mountain landscape environment, students can experience the feeling of practicing Tai Chi, while the virtual coach provides real-time guidance and feedback on their movements, ensuring that each student receives targeted instruction.

Moreover, this system allows teachers to provide personalized guidance for each student based on real-time monitoring. When students perform movements inaccurately, the virtual coach immediately provides corrective suggestions, ensuring that students learn effectively in a real and challenging environment.

7.2. Teaching Effectiveness Evaluation

After conducting virtual reality aerobic Qigong teaching practice in the school, an evaluation of the teaching effect was conducted and the following data were obtained:

Enhanced interest and participation: Students in participating in virtual reality aerobic Qigong training has significantly increased and their interest and participation have increased by 30% and 25% respectively.

Enhanced subject understanding and practical ability: Through virtual reality technology, students have a deeper understanding of the correct execution of aerobic Qigong movements and their practical abilities have significantly improved.

Personalized learning support: Virtual reality technology has collected a large amount of student learning data and teachers can adjust teaching content and methods based on students' performance in the virtual environment. Personalized learning has been better realized and student satisfaction has increased by 20%.

This successful case provides useful experience for other universities, demonstrating the feasibility and potential of virtual reality technology in aerobic Qigong teaching, while also supporting the practical effectiveness of virtual reality technology in improving learning outcomes through data.

8. CONCLUSION

This study conducted a thorough analysis of the current status and challenges of university Qigong fitness education, providing a comprehensive exploration of the application advantages of virtual reality technology in Qigong fitness teaching. By establishing a model for university Qigong fitness teaching assisted by virtual reality technology, this paper offers a feasible solution for higher education. The introduction of virtual reality technology not only enhances teaching effectiveness and facilitates personalized learning but also breaks the constraints of time and space, bringing new possibilities to university Qigong fitness teaching. However, it is essential to recognize the challenges in technology, teaching methods and teacher training. Through collaborative efforts, further innovation and development in university Qigong fitness teaching

can be promoted. Through the validation of successful cases, this paper aims to provide valuable insights and inspiration for research and practice in related fields.

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