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Retraction

Retracted: Development Trend of Digital Physical Education Teaching by Integrating Intelligent Sensor Technology

Security and Communication Networks

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] J. Chen and B. Zeng, "Development Trend of Digital Physical Education Teaching by Integrating Intelligent Sensor Technology," *Security and Communication Networks*, vol. 2022, Article ID 3039349, 14 pages, 2022.

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Research Article

Development Trend of Digital Physical Education Teaching by Integrating Intelligent Sensor Technology

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Digital teaching has gradually banned traditional offline teaching, and its advantages are self-evident, but the current digital teaching has certain limitations. Especially in physical education, the key content of physical education is the changes in physical movements; the process is not only complex; the differences between movements are also extremely small; and ordinary digital cannot accurately teach these complex and subtle movements. In this context, this paper mainly studies the application of digitalization of fusion intelligent sensor technology in physical education teaching and combines the characteristics of high precision and recognizable actions of intelligent sensors with digitalization to improve physical education teaching. This paper mainly selects the students majoring in physical education in the second year of school A as the research object to test the effect of digitalization of fusion intelligent sensor technology in physical education teaching. Before the experiment, the research subjects were divided into groups and the *T*-test was performed, and it was concluded that there was no significant difference between the experimental group and the control group. On this basis, the experimental group and the control group were respectively taught table tennis, gymnastics, martial arts, football, and 100 meters and then tested and tested. The results showed that the experimental group was higher than the control group in table tennis, gymnastics, martial arts, football, and 100 meters test. In the 100 meter test, the boys in the experimental group were 7.13, 6.94, and 6.93 points higher than the control group, and the girls in the experimental group were 2, 1, and 2 points higher than the control group. Overall, after the improved digital teaching, both boys and girls in the experimental group performed better than the control group in table tennis, gymnastics, martial arts, football, and 100 meters. It shows that the effect of the improved digital physical education is remarkable, and it also provides a certain theoretical basis and guidance for the teaching improvement of other courses.

1. Introduction

In the context of the extremely rapid development of digitalization, Chinese sports competitions and school sports are gradually developing into a digital model, breaking the traditional offline teaching and training. The development of digital sports plays a vital role in promoting the spirit of sports culture and physical exercise. Under the influence of this digital teaching, many school classrooms have also begun to use digital for teaching activities and have achieved good results. For physical education, the advantages of digital teaching are particularly obvious. Students can take advantage of the rich resources of digital teaching; the teaching space is not limited to offline; and they can watch sports explanation videos in real time. It allows students to observe and study physical education courses in multiple dimensions and gradually improve their physical quality and physical state. However, digital teaching is not a panacea, especially with the lack of control over the subtle changes of movements in physical education, making it difficult for students to learn them. In this case, the sports action images can be captured with the help of sensors, and the action images can be analyzed by using the characteristics of high precision and intelligence of the sensors, and then the purpose of physical education teaching can be realized through digitization.

Under the impact of the trend of digitalization, many colleges and universities gradually use digitalization to carry out teaching activities for students, especially digital physical

education teaching. Combining physical education and digitalization in colleges and universities not only provides new ideas for the development of physical education in colleges and universities but also promotes the development of physical education in colleges and universities. Digital teaching can help students improve their learning skills, broaden their horizons, and at the same time improve teachers' teaching capabilities and enrich classroom content. However, in the current digital teaching mode, its teaching only stays on the digital surface. The unique advantages of digital teaching do bring great help to daily teaching activities. However, the current digital teaching cannot deeply analyze the problem. When teachers explain sports movements, some movements are very different, and it is difficult for students to grasp the true meaning of them, which greatly affects their mastery of the overall movements. Therefore, in view of these problems, this paper proposes to use sensor technology to capture sports action images, then decompose and analyze the actions in the images, and give feedback to students with the help of digital teaching so that students can truly understand the changing process and differences of actions. The application of this method has greatly improved the digital teaching ability, provided new ideas for the subsequent digital physical education teaching, and accelerated the development of digital teaching. During distance learning, modern teaching technology is a process of delivering information to students in the integrated form of text, graphics, images, sounds, animations, and videos. With pictures, images, animations, and other visual and audio information, it can also help clarify the key points and difficulties of the teaching materials and vividly inspire students to think actively and cultivate objective thinking and imagination.

With the popularization of Internet technology, digitization has gradually become known to people, and people have begun to apply digitization to their daily teaching activities, which not only innovated the teaching concept but also narrowed the urban-rural education gap. It can be said that in today's society, digital teaching can be seen everywhere, and the effect of digital teaching is more worthy of people's thinking. Many scholars have investigated and analyzed the effect of digitalization in teaching. Juditya tested the feasibility of digitalization in physical education through the ADDIE method, and the results showed that digital teaching is feasible in physical education in junior high schools, especially the learning of large-scale ball games [1]. Zhang found that digital teaching is of great help in medical anatomy, and its diversified interactive methods meet the requirements of the learning environment on different occasions, which greatly improves students' interest in learning and teaching effect [2]. Hamond taught three groups of teachers and students digital piano technology. Through data analysis, it was concluded that the application of this technology made the focus of the course clearer and made students more aware of their performance and learning process [3]. Laterza takes the digital teaching of higher education in Northern Europe as the research object, conducts research and analysis on the participants of digital education, and concludes that the digital teaching of higher education can lead to radical digital transformation and have a certain positive impact [4]. In general, digital teaching has been applied in various disciplines and achieved good results. In traditional digital teaching, teaching is only carried out with the help of digitally rich resources and open networks. As mentioned earlier, digitalization is indeed very helpful in physical education. However, there are many physical education courses, and the movements of each item are extremely complex. It is difficult to distinguish the nuances of movements in daily digital teaching. How to make digital teaching be able to distinguish the difference between sports actions; many scholars consider that sensors can identify object information from multiple dimensions such as vision, hearing, smell, and taste, so many scholars have carried out research on the application of sensors. Ballard designed a set of the intelligent sensor system, which reduces the data burden while improving the sensing capability. Through iterative analysis of the data-driven sensing results, low-cost and compact sensor implementation engineering is realized [5]. Kumar investigated the design of an ANN-based smart pressure sensor for measuring pressure in the 0–100 psig range with high accuracy and temperature compensation [6]. Research by Shaikh found that combining sensor technology with IoT technology can improve the efficiency and sustainability of shipping [7]. Dhingra found that the optical fiber sensor has the characteristics of high sensitivity, anti-interference, and long service life, which can have huge applications in the fields of physics, chemistry, and industry [8]. It can be seen that the sensor not only has excellent performance but also is widely used in practical life, which brings great convenience to people's life.

This paper takes digital physical education teaching as the research object. In the research process, the current digital physical education cannot make teaching improvements to the subtle differences between the changes in complex movements in physical education courses and the progress of students' front and rear movements during the learning process. After consulting a large number of references, he pioneered the combination of intelligent sensors and digital teaching with the help of the high precision, digital, and intelligent characteristics of sensors. The sensor is used to analyze the action images in teachers' physical education, identify the specific changes of students' actions before and after, and then deepen students' action cognition through digital teaching. In the experimental analysis, table tennis, gymnastics, martial arts, football, and 100 meters were selected for physical education teaching, focusing on the analysis of the key indicators in the five sports items. For example, the 100 meter test mainly analyzes the starting technology, the running technology on the way, and the finishing running technology. The research ideas are innovative to a certain extent.

2. Deconstruction of the Motion Detection System Based on Smart Sensors

When teachers teach physical education, they will decompose and teach a certain sports event so that students can clearly understand the state from the beginning to the end of each action. In this process, the subtle changes of each action will affect students' understanding and acceptance of the action [9]. Therefore, in order to ensure that students can really grasp the

essentials of movements, in the teaching process, there are small subtle differences in some movements, so the students cannot really understand the movements. For this reason, an action analysis and detection system is designed with the help of the characteristics of high precision, strong reliability, and diversified functions of intelligent sensors, as well as information storage and processing, automatic diagnosis, and data processing, which can intelligently detect the decomposed actions of teachers, and then feedback the detection data to students through digital teaching so that students can truly understand the connotation of actions [10].

2.1. Structure of Sports Action Intelligent Detection Systems. The purpose of the detection in the intelligent detection system of sports movements is to record the decomposition of teachers' physical movements in the process of physical education teaching. Then a complete set of the action decomposition process is carried out for action feature recognition, and all actions are compared and analyzed to distinguish the subtle differences between actions [11]. When designing a system, it is necessary to collect motion images through smart sensors. The clearer the motion images are, the more accurate the analysis results will be [12]. The sports action intelligent detection system designed in this paper is mainly composed of the light source lighting part, the optical imaging part, the image acquisition part, the image analysis part, the result comparison part, and the invalid action elimination part, and the latter four parts are completed by the intelligent sensor [13].

The optical part of the system is related to the depth of field, which is the spatial depth of the object at which a "sharp image" is obtained on the image plane [14]. The depth of field is related to the focal length, aperture value, and shooting distance of the lens. The depth of field is negatively related to the aperture, and the value of the depth of field decreases with the increase of the aperture. The depth of field is negatively correlated with the lens distance, and the value of the depth of field decreases with the increase of the lens distance; the depth of field is positively correlated with the shooting distance, and the value of the depth of field increases with the increase of the shooting distance. Its depth of field calculation formula is as follows:

$$\begin{aligned}
\text{prospects are deep}: \Delta L_1 &= \frac{F\delta L^2}{f^2 + F\delta L},\\
\text{rear depth of field}: \Delta L_2 &= \frac{F\delta L^2}{f^2 - F\delta L},\\
\text{system depth of field}: \Delta L &= \frac{F\delta L^2}{f^2 + F\delta L} + \frac{F\delta L^2}{f^2 - F\delta L},
\end{aligned} \tag{1}$$

where δ is the diameter of the allowable circle of dispersion, f is the focal length of the lens, F is the shooting aperture, and L is the shooting distance.

During image acquisition, the obtained image is a three-dimensional coordinate, so it is necessary to change the dimension of the acquired image and turn it into a familiar image plane coordinate [15]. Its calculation formula is as follows:

$$\begin{aligned}
&\begin{bmatrix} x \\ y \\ z \end{bmatrix} = R \cdot \begin{bmatrix} x_1 \\ y_1 \\ z_1 \end{bmatrix} + T,\\
&\begin{cases} x_i = f \cdot \dfrac{x}{z} \\ y_i = f \cdot \dfrac{y}{z} \end{cases},\\
&\begin{cases} X = x_i\left(1 + kr^2\right)^{-1} \\ Y = y_i\left(1 + kr^2\right)^{-1} \end{cases},\\
&\begin{cases} X_j = N_x X + X_m \\ Y_j = N_y X + Y_m \end{cases}.
\end{aligned} \tag{2}$$

Here, R is the 3×3 orthogonal transformation matrix, T is the translation vector of 3×1, f is the distance between the image plane and the optical center, (x_i, y_i) is the image coordinate of P in the ideal state, and (X, Y) is the actual image coordinate caused by lens distortion. (X_j, Y_j) is the center coordinate of the computer image, and (N_x, N_y) is the number of pixels per unit distance on the image plane.

2.2. Image Sensor and Invalid Action Rejection Subsystems. In system inspection, image acquisition, analysis, and image result comparison are the core parts of the entire system. Among them, the image intelligent sensor integrates the functions of image acquisition, image processing, and information transmission. All the modules that need to be processed are concentrated on one sensor, which greatly reduces the complexity and reliability of the system. All the modules that need to be processed are concentrated on one sensor, which greatly reduces the complexity and reliability of the system. Then, the information data goes through the acquisition system, and the processing system in turn processes the image data. During this process, the relevant data needs to be transmitted to the computer for detection, and finally, the detection result is output [16]. In the process of image acquisition and analysis, due to other irresistible factors, the information analysis of some images has no practical significance, and the image should be automatically eliminated to ensure that the output image results are valid.

3. Design of Smart Sensors and Digital Teaching

3.1. Overall Design of the System. When designing the operation scheme of the intelligent sensor, it is necessary to consider that the system based on intelligent sensor design can capture human body motion from multiple angles and understand the nuances of each action. It is necessary to avoid the interference of external factors such as light or electromagnetic waves in the process of image acquisition, which will cause the acquired images to suffer from poor resolution and low pixels [17]. For this reason, on this basis,

the whole system is divided into three main sections, which are image information acquisition section, algorithm processing section, and result display section in turn. The information collection block mainly collects the basic information of human body movements and transmits the signal to the algorithm block after simple processing. The algorithm processing section mainly performs operations such as segmentation and feature extraction on the collected image information. The result display section mainly transmits the processed information to the user in an intuitive way so that the user can know the required information in time. The main operation process is shown in Figure 1.

3.2. Sports Action Recognition. In the field of action image recognition, it is mainly divided into static recognition and dynamic recognition [18]. In terms of static recognition, it is mainly the process of classifying the points in the image space model into a certain subset in the space. Dynamic recognition is the process of composing these points into a motion trajectory and then classifying them into a certain subset. Among them, dynamic recognition covers the knowledge of time and space, and it is necessary to outline the motion trajectory when performing image analysis [19]. This paper mainly captures the skeletal points of human movements through intelligent sensors and identifies the real motion state of body movements. In addition, noise reduction processing can also be performed on the live voice, so that the image information changes not only visually but also audibly during the acquisition process; the noise is weakened; and the combination of image and audio explanation can better analyze the action and voice commands synchronously. The combination of the two makes the analysis results more accurate.

When performing dynamic action recognition, it is necessary to divide complex and multivariable problems, divide these problems into simple and univariate problems, and then solve the divided problems one by one. In this paper, the DTW algorithm is mainly used to analyze the dynamic problem of motion, and the time regularization and distance measurement calculations are combined [20]. Its main operation process is as follows:

Assuming that there are two given time series A and B; their lengths are a and b, respectively; and the distance matrix is C; the expression is as follows:

$$\begin{cases} A = a_1, a_2, ..., a_n \\ B = b_1, b_2, ..., b_n \end{cases}, \tag{3}$$

$$C = \begin{bmatrix} c(a_1, b_1) & ... & c(a_1, b_n) \\ ... & ... & ... \\ c(a_n, b_2) & ... & c(a_n, b_n) \end{bmatrix}. \tag{4}$$

In the distance matrix C, a bending matrix D also needs to be defined, and the conditions that the matrix needs to meet are as follows:

$$\max(m, n) \le k \le m + n - 1, \tag{5}$$

$$d_1 = C(1, 1), d_n = C(n, m), \tag{6}$$

$$d_1 = C(i, j), d_{k-1} = C(i', j'), \tag{7}$$

$$\begin{cases} i - i' \le 1, j - j' \le 1 \\ i - i' = 1 \text{or} j - j' = 1 \end{cases}. \tag{8}$$

Combining formulas (3)–(8), the optimal path formula can be obtained, and its expression is as follows:

$$r(i, j) = c(a_i, b_j) + \min\{r(i-1, j-1), r(i, j-1), r(i-1, j)\}. \tag{9}$$

During image acquisition, it is affected not only by light but also by electromagnetic interference, which causes certain errors in the analysis results. Therefore, it is necessary to eliminate the errors. Assuming that the output signals of the sensors are A_x, A_y, A_z and the Z axis coincides with the Z_1 axis, the angle between the OY axis and the OY_1 axis is β; the angle between the OX axis and the X_1OY_1 axis is α; and the angle between the OX axis and the Z_1OX_1 axis is γ. When the angle between A and its projected coordinate of A_x, A_z are φ, θ in an ideal state, the output expression of the sensor is as follows:

$$\begin{cases} A_x = A_{x1} \cos\gamma \cos\alpha + A_{y1} \sin\gamma + A_{z1} \cos\gamma \cos\gamma, \\ A_y = A_{y1} \cos\beta + A_{z1} \sin\beta, \\ A_z = A_{z1}. \end{cases} \tag{10}$$

Formula (10) is numerically modulo calculated, and the calculated result is subjected to a difference operation. The modulo and error expressions are as follows:

$$A' = A + 0.5A(\beta \sin 2\theta \sin\varphi + \gamma (\sin\theta)^2 \sin 2\varphi + \alpha \sin 2\theta \cos\varphi), \tag{11}$$

$$\begin{aligned} \Delta A &= A' - A, \\ &= 0.5A(\beta \sin 2\theta \sin\varphi + \gamma (\sin\theta)^2 \sin 2\varphi + \alpha \sin 2\theta \cos\varphi). \end{aligned} \tag{12}$$

3.3. Digital Physical Education Teaching. This paper mainly studies digital physical education teaching integrating intelligent sensor technology. In the daily physical education process, taking basketball as an example, in the process of basketball, athletes mainly move, pass, dribble, and shoot to complete a set of actions and then achieve the goal of hitting the basket with the basketball. In this process, the athletes are in a posture of always maintaining movement. Even if the teacher's movements are broken down in detail, it is difficult for the students to grasp the essentials of the movements. Not only that, when students practice independently, it is difficult for teachers to say whether there is a difference

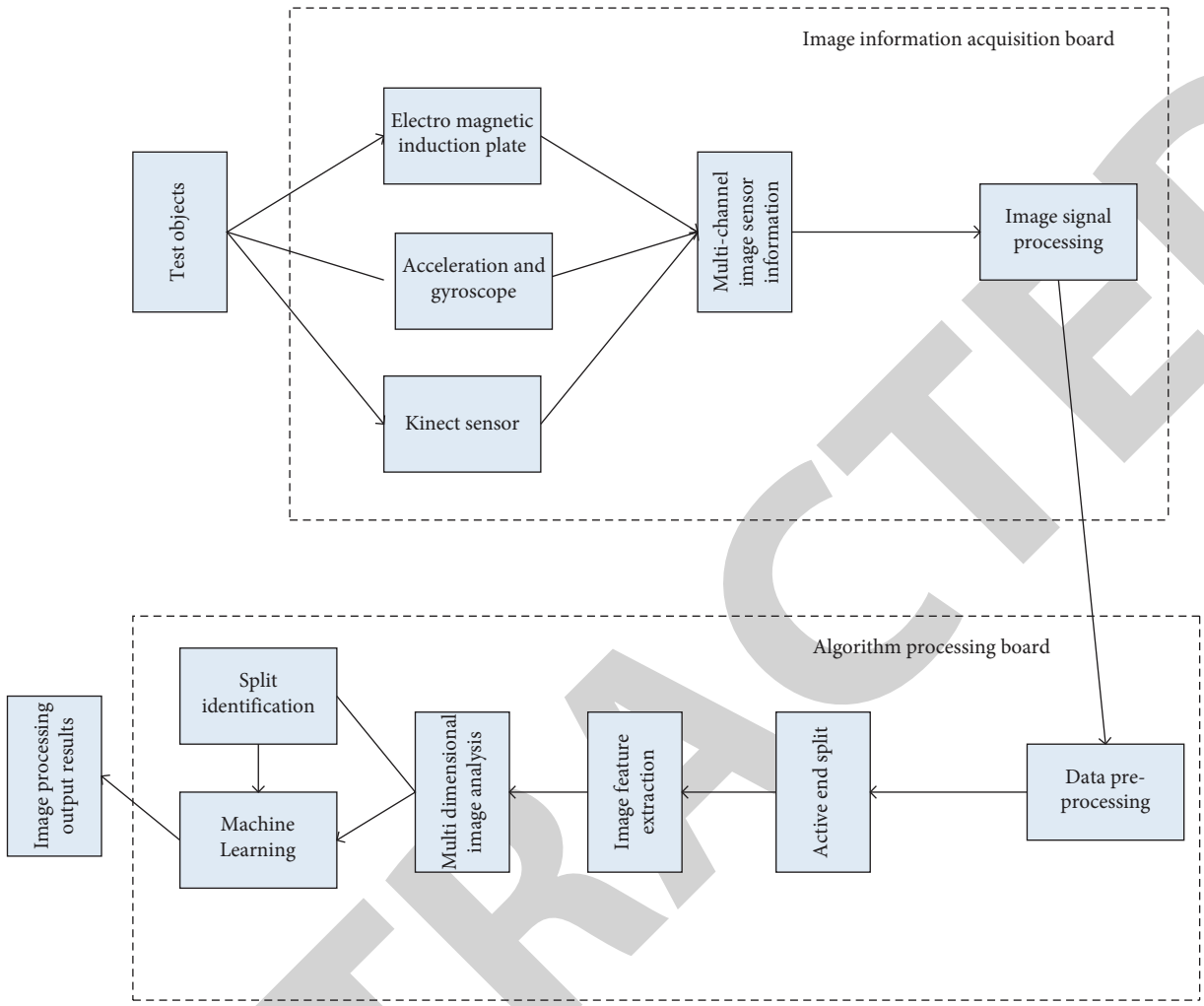

Figure 1: System image processing analysis figure.

between the results of the previous time and the next time. Therefore, with the advantages of intelligent sensors, the teacher's actions are decomposed and analyzed, and the students' changes before and after the same action are compared. People can find the subtle differences between the students before and after the same movement, compare them with the standard movements, and gradually improve the students' ability to master the essentials of movements.

The high precision of the smart sensor can eliminate accidental errors. The students' demonstration actions are automatically compared with the standard actions, and the massive data is analyzed and processed in real time. In the process of image information collection, the image can be denoised and self-checked, which improves the validity of the image and eliminates abnormal images. Not only that, but smart sensors have microcomputers that can process data themselves, further improving sensor performance. The teacher's action essentials are decomposed through intelligent sensors, and then students can understand and master the key points of actions with the help of digital teaching. In the process of implementing digital teaching, teachers can play animation-style action decomposition figures or videos so that the original boring physical education teaching becomes vivid, allowing students to truly understand the actions. Secondly, students can deeply understand the changes before and after their actions through digital teaching. Then compare the standard movements and carefully observe the difference between the standard movements and the standard movements. At the same time, teachers can also understand the deficiencies of the students' movements through digital teaching, and then give teaching guidance to improve the students' physical performance and learning efficiency.

4. Experimental Deconstruction of Digital Physical Education Teaching Integrating Intelligent Sensor Technology

In order to verify the effect of digital teaching integrating intelligent sensor technology in the process of physical education, the second-year physical education students of school A were selected as the research objects, and they were tested in table tennis, gymnastics, martial arts, football, and 100 meters, respectively. In order to ensure the authenticity of the experiment, the above five sports items were tested separately, and the total number of boys and girls in each

group was the same, and the professionals were allowed to rate them. Among them, in the course of the experiment, the experimental teaching content of the two groups remained the same, and the control group adopted the traditional teaching mode. Teachers expressed the essentials of action through language description and body demonstration. The experimental group adopted the improved digital physical education teaching, and the action images were collected by intelligent sensors. After a series of image processing and analysis, the results are fed back to the students and teachers in a timely manner so that students can recognize the deficiencies of actions and teachers can give corresponding guidance to the deficiencies of students' actions. The digital physical education research is carried out by studying the movement data of the students, and the data collection is based on the sensors on the students' arms. The students participating in the test wear a small sensor like a metal box on the upper arm. The sensor can record the individual students' heart rate, oxygen uptake, exercise load, running distance, and running speed. Then, there are sports equipment with built-in sensor chips. After the smart chip is installed, the sports equipment can interact with the sensors on the players to form human sports relationship data.

4.1. Difference Test of Experimental Objects. In order to ensure that there is no physical fitness and other reasons affecting the final evaluation results among the experimental subjects, a *T*-test was performed on the selected experimental subjects. The content of the test is height, weight, vital capacity, and pull-up for men and height, weight, sit-up, and 50 meter sprint for women. The test results are shown in Tables 1 and 2.

From Table 1, there is no significant difference between the two groups in terms of height, weight, vital capacity, physical fitness, and body shape of the pull-up for the boys in the experimental group and the control group. From Table 2, there is no significant difference between the two groups in terms of height, weight, physical fitness, and body shape of 50 meters and sit-ups in the experimental group and the control group through independent samples *T*-test. This shows that the selected experimental objects meet the experimental requirements, and then the experimental teaching activities can be carried out.

4.2. Comparison and Deconstruction of Course Performance before and after the Test. In the course of this experiment, the selected subjects of sports majors were taught the courses of table tennis, gymnastics, martial arts, football, and 100 meters test, respectively. In order to test the effect of digital physical education based on the fusion of intelligent sensor technology, the corresponding physical education behaviors are carried out for the two groups, and then the curriculum test is carried out. In order to ensure the authenticity and reliability of the experiment, the scores of each item are evaluated and scored by three professional teachers, and the final average is taken as the students' grades (the full score is 100 points) in this course. During the test, the students in the experimental group and the control group who participated in the course test were randomly played. The teacher did not know in advance what kind of teaching the students had done. The results of the three professionals' evaluations were analyzed as follows.

4.2.1. Comparison of 100 Meter Technical Achievements of Students Majoring in Physical Education. During the 100 meter training, people are mainly familiar with the starting technique, the mid-run technique, and the finish technique. At the start, when you hear the "prepare" command, lower your body's center of gravity, lean forward slightly, and drop your arms. After hearing the gunshot, the legs quickly leave the starting block, the arms quickly leave the ground and swing quickly, and the feet perform strong sidekicks. When running on the way, swing your arms back and forth vigorously, raise your front leg to a horizontal position, and then press down quickly. When the back kick is completed, fold the calf tightly, and then move the thigh to the next step. Throughout the process, keep your stride long and fast and rush forward. When running at the end, try to maintain the running posture on the way, speed up the speed and rhythm of the arm swing, increase strength, and speed of the back kick. When only 3 meters away from the finish line, the upper part of the body should lean forward and hit the finish line with your chest or elbow. Only by understanding the main points of these three techniques can people know how to exert strength and surpass the opponent when people reach the process. Therefore, the assessment items are mainly to test the students' starting, midway, and finish runs. The results of the assessment areshown in Tables 3 and 4.

From Tables 3 and 4, regardless of whether boys or girls, in the 100 meter course test, the three technical scores of the experimental group are higher than those of the control group, indicating that the improved digital teaching is effective. In terms of starting technique scores, boys in the experimental group and the control group scored $p < 0.05$, while girls in the experimental group and control group scored $p < 0.05$; on the score of running skills on the way, boys in the experimental group and control group scored $p < 0.01$, and girls in the experimental group and control group scored $p < 0.05$. In terms of finishing technique scores, boys in the experimental group and the control group were $p < 0.05$, and girls in the experimental group and control group were $p < 0.01$, indicating that the 100 meter test scores of the control group and the experimental group were significantly different, and some of the technical scores were extremely significant. In order to further compare the differences between the experimental group and the control group, we conducted a comparative analysis of their performance, as shown in Figures 2 and 3.

From Figure 2, during the 100 meter test, the boys in the experimental group scored higher on the three main technical indicators of the 100 meter than in the control group. Among them, the starting technique experimental group was 7.13 points higher than the control group; the midway running technique experimental group was 6.94 points higher than the control group; and the finish running technique experimental group was 6.93 points higher

Table 1: Comparison of physical form and physical fitness between the experimental and control classes of sophomore male physical education majors.

Groups	N	Height (cm)	Weight (Kg)	Spirometry (ml)	Pull-ups (pcs)
Control group	15	178 ± 1.12	70 ± 1.02	3980 ± 210.39	8.4 ± 1.40
Experimental group	15	177 ± 1.32	72 ± 1.12	4166 ± 218.07	11.7 ± 1.39
P		> 0.05	> 0.05	> 0.05	> 0.05

Table 2: Comparison of physical form and physical fitness between the experimental and control classes of sophomore female physical education majors.

Groups	N	Height (cm)	Weight (Kg)	50 m (s)	Sit-ups (pcs)
Control group	12	167 ± 0.23	58 ± 0.91	6.7 ± 0.02	23.1 ± 5.02
Experimental group	12	166 ± 0.31	59 ± 0.92	6.7 ± 0.03	23.6 ± 5.20
P		> 0.05	> 0.05	> 0.05	> 0.05

Table 3: Assessment of the 100 meter technical performance of male PE majors by three professionals.

Groups	N	Starting technique	En route running technique	Finisher's run technique
Control group	15	73.27 ± 1.77	73.53 ± 1.86	73.87 ± 1.62
Experimental group	15	80.4 ± 1.74	80.47 ± 1.78	80.8 ± 1.76
P		< 0.05	< 0.01	< 0.05

Table 4: Assessment of the 100 meter technical performance of girls in physical education by three professionals.

Groups	N	Starting technique	En route running technique	Finisher's run technique
Control group	12	72.67 ± 1.55	72.42 ± 1.38	72.33 ± 1.49
Experimental group	12	74.67 ± 1.03	75.42 ± 1.04	75.33 ± 1.18
P		< 0.05	< 0.05	< 0.01

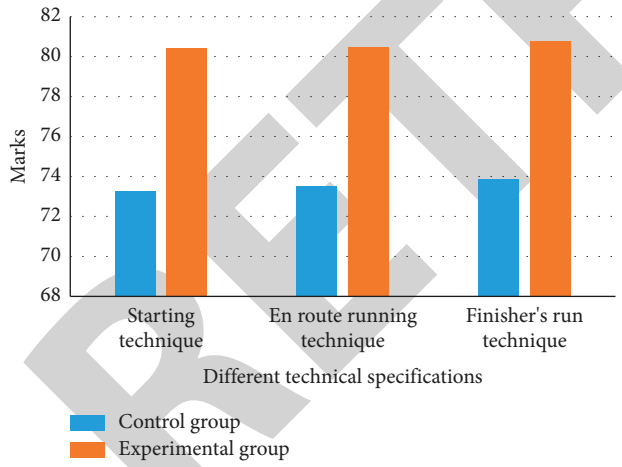

Figure 2: Comparison of the boys' 100 meter scores by technique.

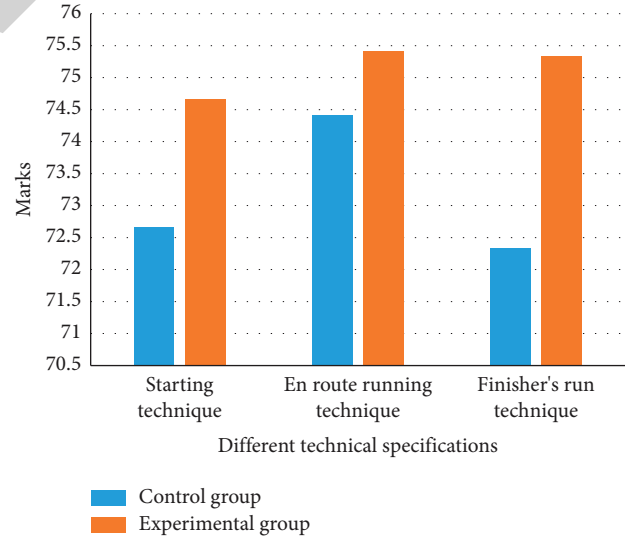

Figure 3: Comparative figure of girls' 100 meter performance by technical score.

than the control group. It shows that after the improved digital teaching, the effect of boys on the 100 meters is significant.

From Figure 3, the girls in the experimental group scored higher in the three main technical indicators of the 100 meter test than the control group during the 100 meter test. Among them, the starting technique experimental group was 2 points higher than the control group; the midway running technique experimental group was 1 point higher than the control group; and the finish running technique experimental group was 2 points higher than the control group. It shows that after the improved digital teaching, the effect of girls on the 100 meters is also significant. Combining Figures 2 and 3, the item with the lowest score for boys and girls is starting technique, which may be caused by psychological stress and other factors at the start. On the whole, the effect of digital physical education integrating intelligent sensor technology is remarkable.

4.2.2. Comparison of Physical Education Students' Performance in Football Skills. In the daily learning process of physical education, football is a project that many people participate in and cooperate with. It not only tests the endurance of students but also tests their shooting skills of students. There are many ways to shoot. In this paper, the experimental group and the control group are subjected to several common shooting techniques for corresponding physical education, and then the course performance test is carried out. The test results are shown in Tables 5 and 6.

From Tables 4 and 5, it can be seen that the boys and girls majoring in physical education, after the improved digital physical education teaching, the scores of four common shooting techniques, namely, the instep shot, the curved shot from the outside of the foot, the curved shot from the inside of the foot, and the collision shot from the inside of the foot, have been improved. The p-values of the different shooting techniques in the experimental group and the control group were both less than 0.05, indicating that improved digital physical education has a significant effect on improving the shooting techniques of students. In order to further compare the differences between the experimental group and the control group, the results of the four shooting techniques were compared and analyzed. The analysis is shown in Figures 4 and 5.

As can be seen from Figure 4, the scores of the four football shooting techniques of the boys in the experimental group were higher than those in the control group. Its four shooting techniques of instep, curved outside of the foot, curved inside of the foot, and inside of foot were 5.53, 5.4, 5.4, and 5.2 points higher than those of the control group, respectively. It shows that after the improved digital teaching, the effect of boys' shooting technique in football is significant.

It can be seen in Figure 5 that the scores of the four football shooting techniques of the girls in the experimental group were higher than those in the control group. Its four shooting techniques of instep shooting, lateral curved shot, medial curved shot, and inner foot collision shot were 2.23, 2.42, 2.91, and 3.5 points higher than those of the control group, respectively. It shows that after the improved digital teaching, the effect of girls' shooting skills in football is significant.

4.2.3. Comparison of Physical Education Students' Performance in Learning Martial Arts Techniques. Martial arts is a tradition of Chinese culture. There are many martial arts movements, including boxing techniques and leg techniques. The changes between different boxing techniques are unpredictable. A slight change may be another type of boxing. In order to verify the effect of digital teaching integrating intelligent sensor technology in martial arts movements, several common boxing and leg methods are selected in martial arts movements, such as swinging fists, lifting fists, piercing palms, framing fists, and stepping and pressing legs for inspection and analysis. The analysis results are shown in Tables 7 and 8.

It can be seen in Table 6 that after the improved digital teaching, the scores of four boxing methods and one leg method of martial arts movements in the experimental group were higher than those in the control group. And the p-values of the scores of different martial arts movements in the two groups are all less than 0.05, indicating that the improved digital physical education has a significant effect on improving the martial arts movement skills of boys. It can be seen in Table 8 that after the improved digital teaching, the scores of four boxing methods and one leg method of martial arts movements in the experimental group were higher than those in the control group. And the p-value of the scores of the first four punches is less than 0.05. While the p-value of the leg technique score is less than 0.01, indicating that the improved digital physical education has a significant effect on improving girls' martial arts skills, especially the leg technique. In order to further compare the differences between the experimental group and the control group, we conducted a comparative analysis of their martial arts movement skills, and the analysis is shown in Figures 6 and 7.

As can be seen from Figure 6, the scores in martial arts, boxing, and leg skills of the boys in the experimental group were higher than those in the control group. Its five martial arts action techniques of swinging fist, pulling fist, piercing palm, framing fist, and foot pressing leg were 4.47, 4.47, 4.53, 4.66, and 4.73 points higher than those of the control group, respectively. It shows that after the improved digital teaching, the effect of boys in martial arts movement techniques is significant.

As can be seen from Figure 7, the scores of martial arts movements, boxing, and leg skills of the girls in the experimental group were higher than those in the control group. Its five martial arts action techniques of swinging fist, raising fist, piercing palm, framing fist, and stepping and pressing leg were 4.58, 4.47, 4.42, 4.42, and 4.5 points higher than those of the control group, respectively. It shows that after improved digital teaching, the effect of girls in martial arts movement techniques is significant.

4.2.4. Comparison of the Performance of Physical Education Students in Learning Gymnastics Skills. Gymnastics performance shows a sense of balance and beauty. During the performance, the movement is constantly changed, and the range of movement is large and small. In the daily training process, it is difficult for teachers to carry out decomposed teaching. They can only make students understand and learn through complete movement changes, and the results are not good. Now, with the help of intelligent sensors, the movements in the teaching process are processed in detail so that students can clearly understand the entire transformation process of the movements. In this paper, the experimental group and the control group are subjected to physical education corresponding to several common gymnastics performance techniques, and then the course performance test is carried out. The test results are shown in Tables 9 and 10.

Table 5: Assessment of the technical performance of men's football in physical education by three professionals.

Groups	*N*	Shot from the front foot	Outside foot curved shot	Inside foot curved shot	Inside leg bump shot
Control group	15	81.47 ± 1.71	81.67 ± 1.58	81.6 ± 1.70	81.93 ± 1.84
Experimental group	15	87 ± 1.41	87.07 ± 1.34	87 ± 1.26	87.13 ± 1.36
P		< 0.05	< 0.05	< 0.05	< 0.05

Table 6: Assessment of girls' technical performance in football in physical education by three professionals.

Groups	*N*	Shot from the front foot	Outside foot curved shot	Inside foot curved shot	Inside leg bump shot
Control group	12	81.47 ± 1.47	80.83 ± 1.86	80.5 ± 1.98	80 ± 2.48
Experimental group	12	83.33 ± 1.18	83.25 ± 1.09	83.41 ± 1.04	83.5 ± 1.19
P		< 0.05	< 0.05	< 0.05	< 0.05

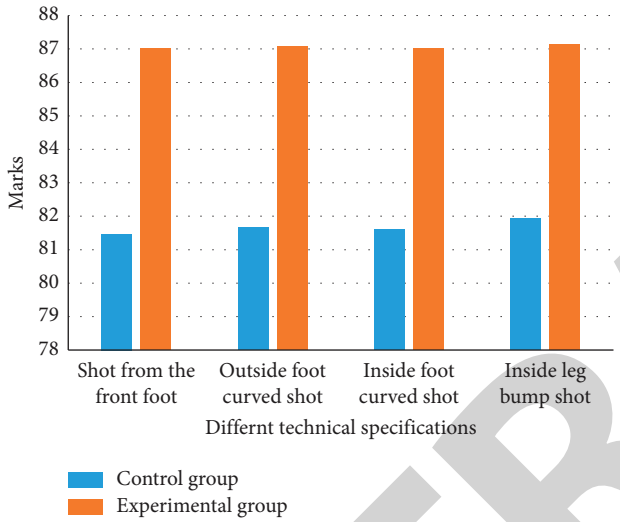

Figure 4: Comparative figure of technical scores for men's football results.

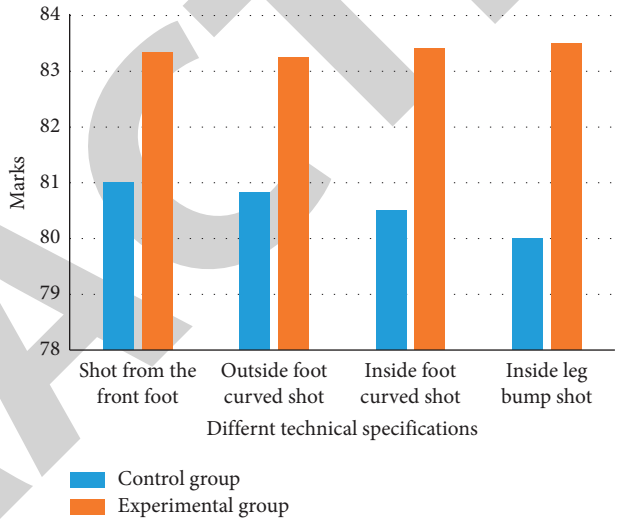

Figure 5: Comparative figure of technical scores for women's football results.

It can be seen in Table 9 that after the improved digital teaching of physical education boys, the scores of gymnastics movement skills in the experimental group are higher than those in the control group. And the *p*-values of the scores of different gymnastics movement techniques in the two groups are all less than 0.05, indicating that improved digital physical education has a significant effect on improving the gymnastics movement techniques of boys. It can be seen in Table 10 that after the improved digital teaching of physical education girls, the scores of gymnastics movements in the experimental group are higher than those in the control group, and the *p*-values of the scores of different gymnastic movements in the two groups are both less than 0.01. It shows that improved digital physical education can significantly improve the gymnastics movement skills of girls, and the significance is obviously better than that of boys. In order to further compare the differences between the experimental group and the control group, a comparative analysis of their gymnastics skills was conducted. The analysis is shown in Figures 8 and 9.

As can be seen from Figure 8, the scores of gymnastics movement skills of the boys in the experimental group were higher than those in the control group. The five gymnastics skills of fish jumping forward roll, head-handstand, cartwheel, prone balance, kneeling, and jumping were 1.67, 1.6, 1.67, 1.73, and 1.67 points higher than those of the control group, respectively. It shows that after the improved digital teaching, the effect of boys' gymnastics movement technique is significant.

As can be seen from Figure 9, the girls in the experimental group scored higher in gymnastics skills than the control group. Its five gymnastics skills of jumping forward roll, headstand, cartwheel, prone balance and kneeling jump were 4.59, 4.58, 4.58, 4, and 3.92 points higher than those of the control group, respectively. It shows that after the improved digital teaching, the effect of girls' gymnastics movement technique is significant. Combining Tables 8 and 9, the reason why girls score higher in gymnastics than boys' is mainly because girls' physical fitness is more dominant than boys in gymnastics. Especially after the improved physical education, its effect is particularly obvious.

4.2.5. Comparison of the Performance of Physical Education Students in Table Tennis Skills. Table tennis can be seen everywhere in China. Many people are keen to play table tennis. When playing table tennis, not only should they consider the action of serving but also how to attack the ball

Table 7: Three professionals' assessment of the technical performance of men's martial arts in physical education.

Groups	N	Pendulum boxing	Teasing punch	Wearing the palm	Racking boxing	Maiden step leg press
Control group	15	87 ± 1.21	87.13 ± 1.31	87.2 ± 1.32	87.27 ± 1.29	87.4 ± 1.14
Experimental group	15	91.47 ± 1.09	91.6 ± 1.02	91.73 ± 0.93	91.93 ± 1.06	92.13 ± 0.97
P		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Table 8: Three professionals' assessment of the technical performance of girls' martial arts in physical education.

Groups	N	Pendulum boxing	Teasing punch	Wearing the palm	Racking boxing	Maiden step leg press
Control group	12	84.5 ± 1.97	84.7 ± 1.93	84.83 ± 1.86	85 ± 1.87	85.08 ± 1.80
Experimental group	12	89.08 ± 1.19	89.17 ± 1.28	89.25 ± 1.42	89.42 ± 1.71	89.58 ± 1.66
P		< 0.05	< 0.05	< 0.05	< 0.05	< 0.01

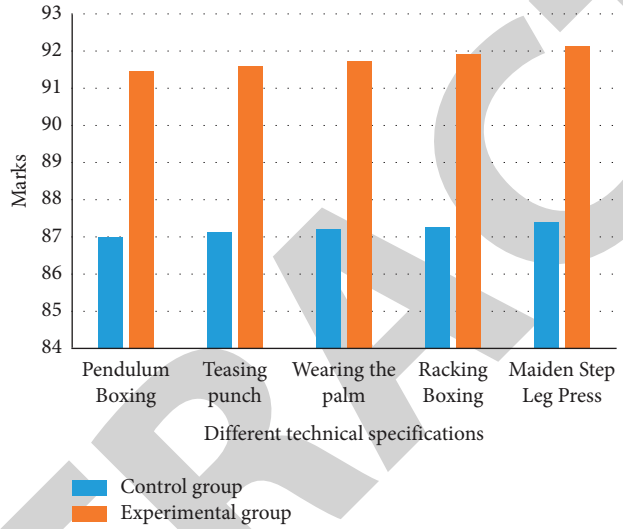

Figure 6: Comparison figure of boys' martial arts movement technique results.

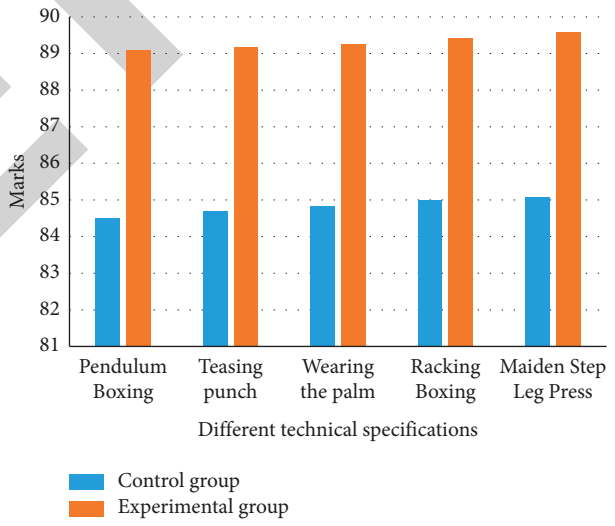

Figure 7: Comparison figure of technical performance of girls' martial arts movements.

so that the opponent cannot catch the ball. In this process, the change of the hand is extremely fast and agile, and it is difficult for the ordinary naked eye to judge this process. The intelligent sensor can capture the image of the movement of the hand in this process. Then through digital teaching, students can discover the specific changes of the hand. In order to test its teaching effect, this paper selects the forehand attack, the forehand plus turn circle ball, the forehand

Table 9: Assessment of men's gymnastics technical performance in physical education by three professionals.

Groups	*N*	Fish leap forward roll	Head & handstand	Side handspring	Prone balance	Kneel and jump up
Control group	15	82.4 ± 1.25	82.53 ± 1.09	82.73 ± 1.06	82.8 ± 0.98	82.93 ± 0.93
Experimental group	15	84.07 ± 1.24	84.13 ± 1.15	84.4 ± 1.02	84.53 ± 0.81	84.6 ± 0.80
P		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Table 10: Assessment of girls' gymnastics technical performance in physical education by three professionals.

Groups	N	Fish leap forward roll	Head & handstand	Side handspring	Prone balance	Kneel and jump up
Control group	12	84.58 ± 1.26	84.67 ± 1.18	84.75 ± 1.08	85.58 ± 1.44	85.75 ± 1.36
Experimental group	12	89.17 ± 1.07	89.25 ± 1.01	89.33 ± 0.94	89.58 ± 1.19	89.67 ± 1.18
P		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

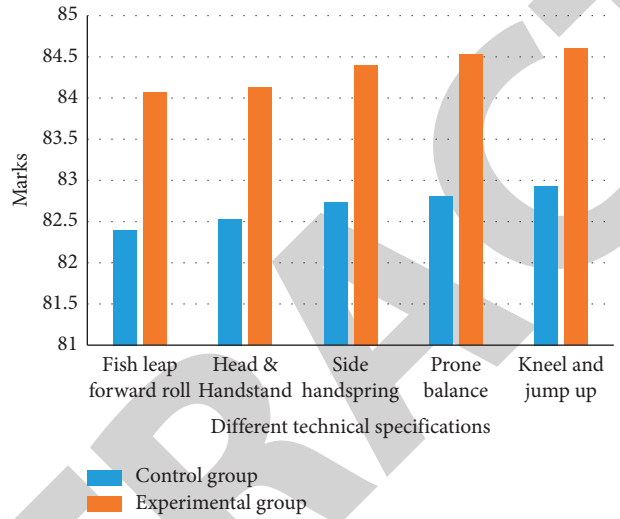

Figure 8: Comparison figure of technical performance of boys' gymnastic movements.

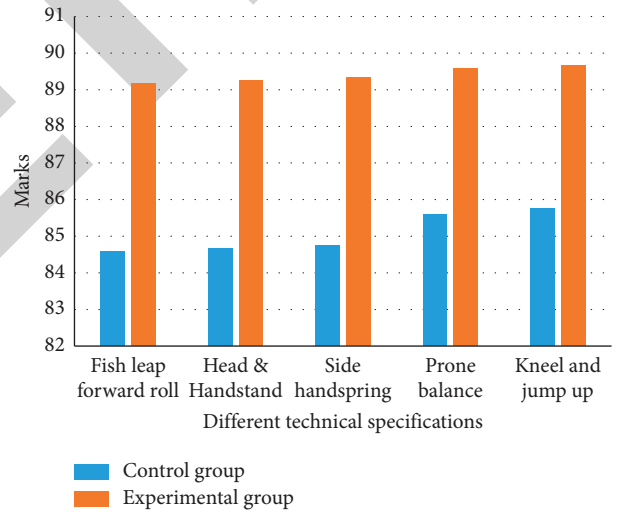

Figure 9: Comparison figure of technical performance of girls' gymnastic movements.

forward circle ball, and the straight rubber forehand circle ball in table tennis to verify the results. The experimental results are shown in Tables 11 and 12.

It can be seen in Table 10 that after the improved digital teaching of physical education boys, the scores of table tennis attacking skills in the experimental group are higher than those in the control group, and the *p*-values of their scores are all less than 0.01. It shows that the improved digital physical education has a significant effect on the improvement of boys' table tennis attacking skills. It can be

Table 11: Assessment of men's table tennis technical performance in physical education by three professionals.

Groups	N	Forehand attack	Curveball with forehand spin	Forehand curve	Straight forehand curve ball
Control group	15	87.8 ± 1.42	87.93 ± 1.23	88 ± 1.21	88.13 ± 1.31
Experimental group	15	92.13 ± 1.26	92.27 ± 1.12	92.33 ± 1.01	92.47 ± 0.96
P		< 0.01	< 0.01	< 0.01	< 0.01

Table 12: Assessment of girls' table tennis technical performance in physical education by three professionals.

Groups	N	Forehand attack	Curveball with forehand spin	Forehand curve	Straight forehand curve ball
Control group	12	86.67 ± 1.60	86.75 ± 1.42	86.83 ± 1.40	86.92 ± 1.38
Experimental group	12	92.33 ± 1.18	92.41 ± 1.11	92.5 ± 1.11	92.58 ± 1.11
P		< 0.01	< 0.01	< 0.01	< 0.01

seen in Table 11 that after improved digital teaching, the scores of the table tennis attacking skills of the experimental group were higher than those of the control group, and the p-values of the scores were all less than 0.01. It shows that the improved digital physical education has significantly improved the girls' table tennis attacking skills. In order to further compare the differences between the experimental group and the control group, a comparative analysis of their table tennis attacking skills was conducted. The analysis is shown in Figures 10 and 11.

As can be seen from Figure 10, the scores of the table tennis attacking skills of the boys in the experimental group were higher than those in the control group. Its four attacking skills of forehand attack, forehand plus turning circle ball, forehand forward rushing circle ball, straight forward glue forehand circle ball are 4.33, 4.34, 4.33, and 4.34 points higher than those of the control group, respectively. It shows that after the improved digital teaching, the effect of boys' table tennis attacking skills is significant.

As can be seen from Figure 11, the scores of table tennis attacking skills of the girls in the experimental group were higher than those in the control group. Its four attacking techniques of forehand attack, forehand plus turning circle ball, forehand forward rushing circle ball, straight forward glue forehand circle ball are 5.66, 5.66, 5.67, and 5.66 points higher than those of the control group, respectively.

4.3. Development Trend of Digital Physical Education under the Technology of Intelligent Sensor. So far, the intelligent sensor technology in digital teaching mainly captures the action images in the teaching process and then decomposes and analyzes the action changes in the images. The dynamic analysis of actions is very clear. In the application of intelligent sensors, this paper also focuses on analyzing the movement decomposition images of teachers in physical education and the subtle differences between the changes in students' movements before and after training and the standard movements. Overall, compared with the traditional language teaching and action demonstration in the past, with the assistance of smart sensor technology, digital teaching has achieved significant results in 100 meters, football, martial arts, gymnastics, and table tennis courses. It can be said that in future physical education, smart sensors not only can analyze the action images but also can analyze

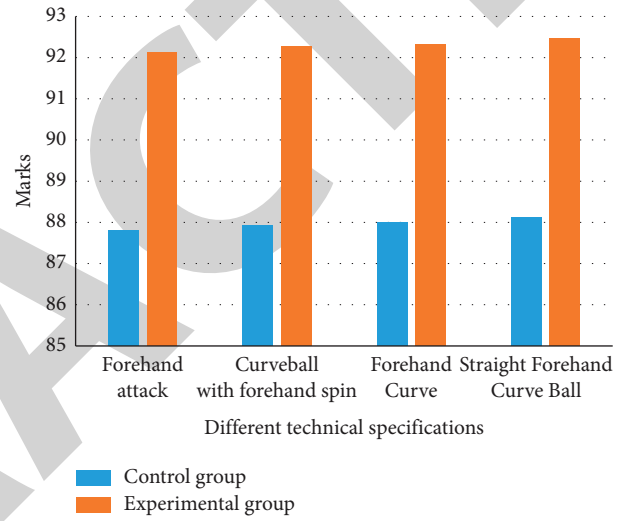

Figure 10: Comparison chart of boys' table tennis attacking technique results.

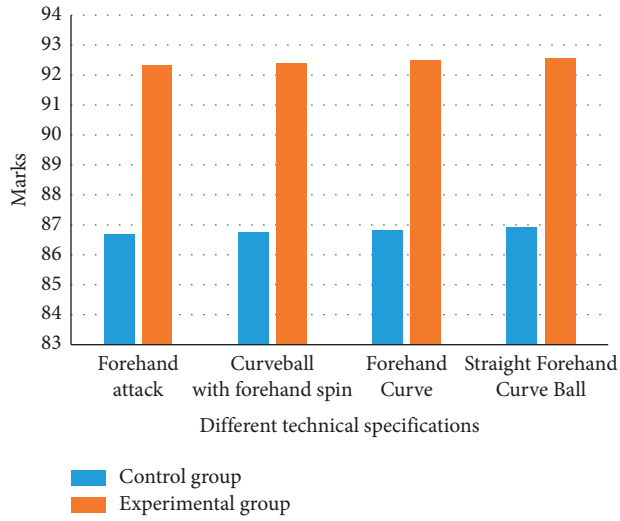

Figure 11: Comparison figure of girls' table tennis attacking technique results.

the physical pressure and speed changes of the students during the training process, thereby greatly improving the students' physical training effect. In general, the development of digital physical education integrating intelligent

sensor technology shows an upward trend. The digital physical education in the future will not only rely on the image analysis of intelligent sensors but also analyze the overall and local movement changes of the human body in a multi-dimensional process.

Aiming at the current situation that it is difficult to use modern teaching technology in sports technology class, this research proposes a practical and effective multimedia teaching feedback system. And through the teaching experiment of this system, it is proved that a large number of applications of modern teaching technology in the teaching of sports technology can help students quickly master the essentials of technical movements, and cultivate students' ability to observe, analyze, and solve problems, thereby improving students' learning skills, better mastering sports technology, and improving teaching effect. At the same time, it helps teachers improve their teaching ability and enrich their teaching methods. The ultimate purpose is to promote the national higher physical education colleges to make full use of modern teaching technology to improve the teaching quality in the process of technical course teaching.

4.4. Discussion on Sports Technology Teaching. Conventional sports technology teaching presents a teaching mode of "lecture" or "exercise," and its manifestation is the teaching of memory level and the practice of imitation level. It puts students in a passive position. The improvement of students' thinking ability, intellectual quality, and skill level is affected to a certain extent. Using modern teaching technology to teach can break through the traditional teaching mode of physical technology courses and realize the optimal combination of various teaching methods. Make full use of the advantages of modern teaching technology network electronic education method so that theoretical explanation and action practice can be organically combined. The concept and essential application of each technical action are transmitted to the students in the form of sound and image. It improves the utilization rate of effective time in the classroom, increases the amount of information disseminated in teaching, broadens the scope of knowledge, broadens students' horizons, and broadens their thinking.

In the process of learning, students have clear learning tasks and intuitive and vivid simulation steps. When students receive this information, they understand and master the relevant knowledge of the basic techniques they have learned, and immediately transfer to practical exercises to put these knowledge into practice guide your actions. This way of teachers and students participating in teaching together communicates the emotional exchanges between teachers and students, and feeds back the information of teaching and learning, giving full play to the leading role of teachers and the main role of students. The use of modern teaching techniques for teaching makes students' learning initiative consistent with the rationality of teachers' teaching methods, and its teaching effect is bound to be better than conventional teaching.

5. Conclusions

In recent years, with the rise of digitization, more and more colleges and universities have gradually applied digitization to their daily teaching activities and achieved good results. Digital teaching is not omnipotent. Digital teaching does bring great convenience to daily course teaching. Digital teaching is difficult to carry out corresponding teaching behaviors for complex problems. In this environment, research on digital transformation is imperative. In the context of digital teaching, this paper studies and analyzes the problems existing in current digital teaching in physical education combined with relevant literature. It is proposed to use intelligent sensor technology to accurately grasp and analyze the changes of movements in the process of physical education and then feed the results back to the students. Let the students recognize the real sports action, carry out the experimental demonstration of the research content, and obtain a feasible conclusion. The main research work of this paper is divided into the following three points:

(1) System research of intelligent sensor

This part is mainly aimed at the recognition and analysis of human actions by smart sensors, and a system that can analyze the action images of physical education teaching is designed. The system is mainly composed of a light source illumination part, optical imaging part, image acquisition part, image analysis part, result comparison part, and invalid action elimination part. The working principle of some systems is briefly introduced, which provides a theoretical basis for the follow-up research.

(2) Research on the intelligent sensor and digital teaching design

This part mainly introduces the system design based on the intelligent sensor, introduces its work flow, and gives a detailed explanation and solution to the principle of action recognition and the problems that may be encountered in the process of image acquisition. Finally, the improved digital physical education teaching is explained.

(3) Experiment analysis of digital physical education teaching integrating intelligent sensor technology

This part mainly analyzes the effect of digital physical education teaching integrating intelligent sensor technology, taking physical education students of school A as the research object, divided into experimental group and control group. Before the experimental teaching, the differences between the experimental group and the control group were tested, and it was found that there was no significant difference between the experimental group and the control group. Different teaching experiments were conducted for 100 meters, football, martial arts, gymnastics, and table tennis courses, and the changes in course performance between the two

groups were compared to reflect the degree of effect. The conclusion shows that the scores of the experimental group are higher than those of the control group, indicating that the teaching has achieved the expected effect.

Due to the influence of the experimental environment, the experimental objects and physical education indicators selected in this paper are not perfect, which may affect the final experimental results. The above shortcomings is also the focus of future work improvement. The use of digital sports teaching training rapid diagnosis feedback system for sports technology teaching can improve students' technical level and achievement, give full play to the role of students as the main body of learning, improve students' learning interest and enthusiasm, improve students' learning methods, and enhance their observation, analysis, and problem-solving skills. Using the digital physical education training rapid diagnosis and feedback system to conduct track and field technology teaching can give full play to the leading role of teachers, improve teachers' ability to differentiate and teach students according to their aptitude, and improve teachers' ability to explain, demonstrate, and organize teaching.

Data Availability

The data that support the research findings are available on request.

Conflicts of Interest

The authors declare that they have no conflicts of interest to report regarding the present research.

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