

Research on the Application of wearable bracelet based on Internet in the Integration of physical training inside and outside physical Education Class

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Abstract: In order to promote the application research of wearable devices that was based on Internet platform in physical education teaching in school, this paper adopts questionnaire and experimental research, the bracelet is the carrier, Web is the platform of the physique health management and promotion system. Through the bracelet Data Capture-- Transit transmission--r-mobile phone application-Web background management mode, what manage students exercise in and out of physical education class. the results show that: 1. Experts and students were praised highly for smart wearable bracelets and systemsit amounts to roughly 96.5% and 89.4%, 2. Students' physical health scores were improved by 4.0 points as a whole. skinfold was cut down significantly lower than that before experiment ($p < 0.01$). The result of long distance running was increased significantly higher than that before experiment ($P < 0.01$).3.Bracelet exercise than the traditional card run, faster, forming the in--and-outside of class, the family-school-social place integration model. 4. Taking the best heart rate range of (110-180 beats / min) and time as exercise evaluation,It is more scientific and effective than punch evaluation, and highlights the intensity of students' exercise. Conclusion: the student physique health management system based on Internet with wearable bracelet as the carrier. It has effectively solved student exercise the availability and scientificity, expanded the space-time character of student exercise, and stimulated the enthusiasm of student exercise. That been formed A set of operable, replicable and popularized integrated management mode of physical exercise in and out of class, which is of great significance to improve the students' physical health level.

1 Introduction

The deterioration of students' physical health what has become a difficult point in Chinese education. Hot issues. the two sessions draw up "The Thirteenth Five-Year Plan: a hundred projects reflecting China's National Strategy "of the 98th item on March 6, 2016, Youth physique qualification improving more than 95%. On November 25, 2015, the seventh national National

investigation of students' physique,. The results of the physique showed: "the students of height、 body weight and chest circumference continued to increase in urban and rural of China,the growth range of body weight and skinfold thickness was greater than that of height, the physical quality of college students continued to show a downward trend, the prevalence rate of obesity continued to rising of all ages students. faced to the deterioration of students' physical health, the party and state leaders pay high attention to great importance to it. so, Central Committee and State Council, Ministry of Education and other departments issued a series of documents, such as document "No. 7", "Sunshine-long-Sports", " Methods for monitoring and evaluating students' physical health ", "Regulations on ensuring one hour of Campus Sports activities for Primary and Middle School students", etc, extracurricular sports activities bring into the school's daily teaching plan, used Information Technology of Internet that

Set up the constitution health research judgment system, scientific forecast change trend, carried out constitution health early warning and so on. On July 4, 2015, the State Council issued the guidance on actively promoting the Internet, which was signed and approved by Prime Minister Li Keqiang, which provides a new perspective for the study of students' physical health. How to use Internet information technology to upgrade and enhance the physical health of college students what has become a major issue of the country, society and family. Therefore, this paper makes use of Internet information technology, takes intelligent wearable bracelet is the means, the physique health management system is the platform what the physical education class teaching reform, in-and-out the class exercise integration management, that will provides reference basis the improvement of students' physical health level.

2 Research object and method

2.1 object of study

400 students were recruited randomly from XX University, including 200 males and 200 females, aged 20.5 ± 1.3 years.

2.2 Research indicators

Collect students' exercise heart rate, exercise time, exercise energy consumption, distance, time axis.

Body shape index: height, weight, body mass index (BMI), fat percentage、 waist to hip ratio (WHR) and grade score;

body function and physical quality index: vital capacity: 50m, body flexion in sitting position, Pull-up (male) / sit-up (female), standing long jump, 1000m (male) / 800m (female) .

2.3 Research equipment

The intelligent wearable bracelet and student physique health management system are both developed and sponsored by Hangzhou kengqiang Science and Technology Co., Ltd. The physique tester is manufactured by Tiankang instrument Factory by the State Sports Administration appointed; the body composition is measured by Inbody720 is made in Korea. During the physical health test, the clothing of the students was provided uniformly by the laboratory.

2.4 Research methods

2.4.1 Questionnaire

A total of 208 questionnaires were sent out, 208 questionnaires were collected, and the recovery rate was 100. Among them, 203 were valid questionnaires, and the effective rate was 97.6.

2.4.2 Experimental programme

Male and female students were randomly divided into the control group (100 (males and 100 females) and the experimental group (100 males and 100 females). The control group was the long distance running route of the school. the total length was 3 000 m from A-B-C-D In the specified time, Brush the campus card once by one point, it was confirmed as a long distance running exercise experimental group wore an intelligent wearable bracelet for 12 weeks. The daily movement w monitored intensity, duration, amount of exercise and energy consumption by time axis. The data were uploaded to the background management system through APP software. After a series of analysis and processing, the results of exercise performance, background in time to send to the students by SMS. The students who run each time wear the bracelet for 12 weeks, and give 0.25 points for each exercise, and the highest score for physical education is 5 points. It takes more than 16 exercises to give the fitness test qualification in order to carry out the integrated management inside and outside the physical education class.

2.4.3 Exercise monitoring

Exercise intensity and duration were used as the test criteria, the mean target heart rate of $120 < HR < 180$ was matched with the corresponding time. The exercise intensity was $120 < HR \leq 140$ / min, $141 < HR \leq 160$ / min, $161 < HR \leq 180$ times / min. The sports GPS path was used to authenticate, the intensity and time of exercise were standardized to confirm times of sports, in which the time was 0: 00-24: 00, the sports scores were counted into the final physical education class and physical health examination results.

2.5 Mathematical Statistics

All the data were expressed as mean \pm standard deviation (mean \pm ESD). The statistical analysis of the data obtained by SPSS17.0 software showed significant difference ($P < 0. 05$).

3. Results and analysis

3.1 experts and students evaluated the wearable bracelet in physical health management

Table 1 Evaluation of wearable bracelet in physical health management by experts and students

	quite agree	agree	don't know
expert	67.1%	29.4%	3.5%
student	54.1%	35.3%	10.6%

As can be seen from Table 1, experts agree with and approve of the evaluation of intelligent wearable bracelets in the promotion of physical health management. Similarly, students are quite agree and approve of the evaluation of the intellectual wearable bracelet. Therefore, wearable bracelets are accepted by experts and students for their physical health promotion.

3.2 student body shape changes in before and after the experiment

Table 2 changes in body shape of college students before and after the experiment ($\bar{X} \pm S$)

Sex		height (cm)	weight (kg)	WHR	BMI	fat%
female	before	161.1±5.5	52.2±7.0	0.74±0.2	20.1±2.5	26.4±4.8
	after	161.2±5.8	51.4±5.8	0.72±0.21	19.8±2.2	23.2±5.1 * *
male	before	172.8±5.7	65.2±11.3	0.83±0.1	21.8±3.6	23.1±4.0
	after	172.4±6.8	63.2±10.5	0.82±0.13	21.3±3.4	21.1±3.2 * *

Note: * indicates that there is significant difference before and after the experiment ($P < 0.05$). * it means that the comparison before and after the experiment is very significant ($P < 0.01$), and the following is the same.

From table 2, the students body shape the has been improved in varying degrees, after 8 weeks of exercise, especially the percentage of body fat. There is a significant difference between the male and female students after exercise.

3.3 changes of body function and physical quality before and after the experiment

Table 3 changes in physical function and physical quality before and after the experiment.

sex		vital capacity (ml)	50m (s)	Sitting position flexion (cm)	pull-up (male) / sit-up (女) (cm)
female	before	2864±352	8.13±1.86	14.2±4.7	32.5±11.6
	after	2912±317	8.12±1.65	15.9±6.9	36.1±15.2
male	before	4163±589	7.92±1.22	12.3±4.7	4.1±2.3
	after	4279±645	7.81±1.35	13.6±3.5	5.3±3.1 *

Table 4 comparison of physical quality and physical health scores before and after the experiment

sex		standing-long-jump、(cm)	1000m (male) /800m (female) (min)	physical health scores
female	before	177.0±18.3	4.07±0.23	76.6±12.5
	after	178.6±20.6	3.53±0.19 * *	80.2±13.1
Man	before	201.7±22.5	4.08±0.21	70.9±16.4
	after	210.3±21.7	3.49±0.27 * *	75.3±17.7

It be seen from Table 3 and Table 4, after 8 weeks of exercise, students' vital capacity, 50 m, sitting position forward flexion, standing-long-jump are greatly improved, pull-up / sit-up, long-distance running have increased a significant compared with before exercise, The total score of physical health was 4 points higher than that before exercise, which indicated that the wearable device monitoring and managing students' exercise had significant effect on students' physical health.

Table 5 comparison of exercise heart rate, exercise time, exercise times

sex	120<HR≤140	141<HR≤160	161<HR≤180	mean HR	times(min)	time
female	67.3%	25.6%	7.1%	136.1±10.5	63.1±3.2	22.1±3.2
male	45.1%	4.4%	45.1%	148.8±5.8 * *	57.8±6.5 * *	17.5±2.5 * *

It can be seen from figure 5 that there is a gender difference in exercise intensity between men and women. The exercise intensity of girls is 120-140 beats / min, while that of boys is 120-160 / min. The rate of exercise heart rate of boys is significantly higher than that of girls. The exercise

time of girls was significantly longer than that of boys, and the number of exercise was significantly higher than that of boys.

The 10 ministries of the State General Administration of Sports and the Ministry of Education have promulgated a series of documents on the management and promotion of students' physique [1]. The System document were carried establishment and implementation that have an active guiding role in the management and promotion of students' physical health. The results of the seventh national investigation of students' physical health show that the students' physical health has been declining, which indicates that the promotion of students' physical health still needs further reform and exploration.

students' physical health management model has experienced three stages In the United States,,: physical health model, health education model and health promotion model. Integrating the resources of health, education and social sectors, emphasizing collaboration, curriculum content and curriculum, process of model implementation, etc. [2]. Health research is closely integrated with the physical education curriculum of schools. Schools carry out fitness programs with their local characteristics in order to promote students' physical health. And adopted a non-restrictive means that was the whole process of health and fitness education of students [3]. Germany sponsors people's physical exercise and guides the corresponding organizations. Physical education is a compulsory subject for high school graduation. 70-80% of college students take part in extracurricular sports activities. Physical Education in Colleges and Universities can improve the physical health of students by participating in social sports clubs [4.5].

The development of information science and technology provides a new means for health management and promotion. [6] It collect a number of physiological parameters of the human body by the use of medical sensors, real-time date is transmitted to remote monitoring center and medical staff. Informatization and digitization have permeated every field of public sports service in the United States. [7] Nike has used sensing devices and computing technology on basketball and training shoes. The collected motion data is transmitted to the user's mobile device through wireless data transmission. After analysis and processing, the user is further guided to carry out health exercise [7]. With the development of technology, biosensor collects body physiological signals, human body activity or action signals and human environmental information to realize the overall perception of human body [8]. The management of students' physical health is the direction of national policy, integrates the resources of various departments, through the interaction among school, parents and government, it forms the internal and external cooperation between the school and the government. The ecological circle of student physique management, which is formulated and implemented by family factors and government policies, monitoring is developed a systematic and comprehensive monitoring mode with school, parents and government. systematic and comprehensive management model of the main body that realized by school, Parents and the government for the monitoring. Information technology is of great significance in students' physical health.

Domestic scholars have carried out a lot of research on the theory and practice of health management. Wu Zongxi [9] has carried on the research to our country university student physique health management present situation question, and has stated the university physical health management method with the hardware and software. Tan Hongyan [10] the university student physique health is deteriorating day by day present situation, This paper puts forward the management system flow ,college students' physical health and the environment of carrying out healthy behavior. Du Xiaolan, Zhu Bin(2010) [11] pointed out that college students' physique health test has emphasizing test rather than service management, he puts forward that the management of university health should provide scientific health information of service for individual or group of college students. Xue Haihong puts forward the theory of "effective physical health promotion

mode in colleges and universities" Based on the actual situation of colleges and universities, he research the practice programme of operation procedure and characteristic [12]. Sun Bing takes the special menu type physical fitness exercise in the public physical education curriculum, it was taken the guarantee that is the students' physical health report—forecast--- intervene in the three-level system. it establish a new physical education curriculum system that promote the physical health of college students [13].

Weng Hui-gen 's research shows that established "three-in-one" physical education comprehensive management system of students', this form extracurricular physical exercise attendance, the examination of integrated physical education teaching and the test of health standards. [14], which indicates that physical health management of college students of research on theoretical to practice. This is consistent with this study basically. where the expert approval rate reached 96.5%., and the student approval ratio reached an unexpected 89.4%. wearable bracelet runs performance is the student's final achievement of part. At the same time, the wearable bracelet can directly record the students' running intensity, time and amount of exercise, so as to avoid the embarrassing situation in which the students used to just punch out their cards, it expands the space and time distance of students' exercise, students exercise anywhere and anytime. wearable bracelet upload data, which provides great convenience for the students in grade 3 and grade 4, so they get strong support from students.

Chen Lei studied the feedback system of college students' physique information management[15]. Based on the campus IC card physical exercise record terminal system, it is recorded the beginning time and sports items of students' physical exercise. This programme marks IC card that is a physical health management and promotion monitoring equipment to monitor the exercise of college students. The study only recorded the exercise time, but it was not known about the students' sports style, intensity, duration and effect. In this study, wearable bracelet is used to monitor the heart rate and movement track of the exercisers in real time. The exercise intensity, time and quantity are quantified to evaluate the performance of the exercise, and the whole process of the students' exercise that is monitored through the cloud platform. Real time and accurate discrimination show students' exercise status and physical health condition, forecast and alarm for students' sports risk, effective relief and relief of sports accidents. [16]. Xu Shuxiang studied students' physical health management model and its implementation effect in Guangdong Province primary and middle school, he carried Physical fitness test and evaluation, feedback system, management of physical education classroom teaching, management of after-school sports activities, etc. [17] Ping Jie proposed to build a set based on the Internet of body building, data collection, guidance and monitoring, evaluation, feedback. That is a new model, include closed-loop scientific fitness guidance model for individualized fitness consultation. These models provide evidence for this study. Student exercise with wearable bracelet After 8 weeks of experiment, the students' were significantly improved that physical composition, cardiopulmonary endurance and muscle strength endurance than before ($P < 0.01$) $P < 0.01$ ($P < 0.01$) $P < 0.05$, and the total score of physical health was increased by 4 points on average. In addition, the study found that there are obvious gender differences in sports intensity between male and female students. The intensity of female students is smaller than that of male students, but the exercise time is longer.

4. Conclusion

4.1 Intelligent wearable bracelet and physical health management promotion system can monitor students' exercise in and out of class. it can guide the fitness exercise scientifically, improve the students' physical health level.

4.2 Intelligent wearable bracelet provide feedback to students' exercise status, effectively and

health level.

4.3 students' physical health promotion model of wearable bracelet that can improve students' physical health level by Internet, it is practical feasibility.

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