

# RESEARCH ON THE SYSTEMATIZATION OF SPORTS STUDENTS IN SCIENTIFIC EXERCISE TRAINING

PESQUISA SOBRE A SISTEMATIZAÇÃO DO TREINAMENTO CIENTÍFICO ESPORTIVO DE ALUNOS DE EDUCAÇÃO FÍSICA

INVESTIGACIÓN SOBRE LA SISTEMATIZACIÓN DE LA FORMACIÓN DEPORTIVA CIENTÍFICA DE LOS ESTUDIANTES DE EDUCACIÓN FÍSICA



ORIGINAL ARTICLE  
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## ABSTRACT

**Introduction:** It is not unusual that students do not like physical education. It has become a common educational phenomenon in current school physical education. Students have become less participative in physical education, serious and cold, less enjoyable, and stressed. The emergence of this series of changes is not entirely a matter of student attitudes. **Objective:** Aiming at school students who like sports but do not fall in love with physical education, participation quality continues to decline, students do not exercise themselves, and have no concept of exercise load. This research aims to learn and master the knowledge and skills of physical exercise through a digital fitness teaching system, effectively improve students' scientific exercise ability, mobilize students' hobbies to actively participate in physical exercise, improve the unscientific physical exercise habits of students in the past, promote students' physical and mental health, and lay the foundation for lifelong physical education. **Methods:** The methods studied in this article mainly include an experimental method, document method, expert interview method, questionnaire survey method, mathematical analysis method and other methods. **Results:** After two weeks of experimental preparation and ten weeks of teaching experiments to develop students' physical exercise ability, the students' aerobic exercise ability has been steadily improved. Through the digital fitness teaching system, students' interest in participating in physical exercise is strengthened and the cultivation of sports emotions and physical habits, improving the school's physical exercise environment and meeting students' physical exercise needs. **Conclusions:** The digital fitness teaching system is in the development and test stage. The first generation of digital fitness bikes has many problems with hardware and software. As an important supplementary form of school physical education under the new situation, this system greatly promotes students' lifelong physical education and learning scientific physical exercise. **Level of evidence II; Therapeutic studies - investigation of treatment results.**

**Keywords:** Students; Physical exercise; Physical education and training.

## RESUMO

**Introdução:** Não é incomum que os alunos não gostem de educação física. Tornou-se um fenômeno educacional comum na educação física escolar atual. Os alunos tornaram-se menos engajados na educação física, sérios e descolados, menos agradáveis e estressados. O surgimento dessa série de mudanças não é exclusivamente uma questão de atitudes dos alunos. **Objetivo:** Visando alunos que gostam de esportes, mas não se apaixonam por educação física, a qualidade da participação continua em declínio, os alunos não praticam exercícios e não têm noção de carga de exercícios. Esta pesquisa tem como objetivo aprender e dominar os conhecimentos e habilidades de exercício físico através de um sistema de ensino de fitness digital, efetivamente melhorar a capacidade de exercício científico dos alunos, mobilizar os hobbies dos alunos para participarem ativamente do exercício. Aptidão física, melhorar os hábitos de exercícios físicos não científicos dos alunos em passado, promover a saúde física e mental dos alunos e estabelecer as bases para a educação física ao longo da vida. **Métodos:** Os métodos estudados neste artigo incluem principalmente um método experimental, método de documento, método de entrevista com especialista, método de pesquisa por questionário, método de análise matemática e outros métodos. **Resultados:** Após duas semanas de preparação experimental e dez semanas de experimentos de ensino para desenvolver a capacidade de exercício físico dos alunos, a capacidade de exercício aeróbico dos alunos tem melhorado continuamente. Através do sistema de ensino de fitness digital, o interesse dos alunos em praticar exercícios físicos e o cultivo de emoções e hábitos de esportes físicos é potencializado, melhorando o ambiente de exercícios físicos da escola e satisfazendo as necessidades de exercícios físicos dos alunos. **Conclusões:** O sistema digital de ensino de fitness está em desenvolvimento e testes. A primeira geração de bicicletas de fitness digitais tem muitos problemas com hardware e software. Como uma importante forma complementar de educação física escolar na nova situação, esse sistema promove enormemente a educação física ao longo da vida dos alunos e o aprendizado de exercícios físicos científicos. **Nível de evidência II; Estudos terapêuticos: investigação dos resultados do tratamento.**

**Descritores:** Estudantes; Exercício físico; Educação física e treinamento.



## RESUMEN

*Introducción: No es raro que a los estudiantes no les guste la educación física. Se ha convertido en un fenómeno educativo común en la educación física escolar actual. Los estudiantes se han vuelto menos participativos en educación física, serios y fríos, menos agradables y estresados. El surgimiento de esta serie de cambios no es exclusivamente una cuestión de actitudes de los estudiantes. Objetivo: Apuntando a escolares a los que les guste el deporte pero no se enamoren de la educación física, la calidad de la participación sigue decayendo, los alumnos no se ejercitan y no tienen concepto de carga de ejercicio. Esta investigación tiene como objetivo aprender y dominar el conocimiento y las habilidades del ejercicio físico a través de un sistema de enseñanza de fitness digital, mejorar eficazmente la capacidad de ejercicio científico de los estudiantes, movilizar los pasatiempos de los estudiantes para participar activamente en el ejercicio físico, mejorar los hábitos de ejercicio físico no científicos de los estudiantes en el pasado, promover la salud física y mental de los estudiantes y sentar las bases para la educación física de por vida. Métodos: Los métodos estudiados en este artículo incluyen principalmente un método experimental, método de documento, método de entrevista a expertos, método de encuesta por cuestionario, método de análisis matemático y otros métodos. Resultados: Después de dos semanas de preparación experimental y diez semanas de experimentos de enseñanza para desarrollar la capacidad de ejercicio físico de los estudiantes, la capacidad de ejercicio aeróbico de los estudiantes ha mejorado de manera constante. A través del sistema de enseñanza digital de fitness se potencia el interés de los estudiantes por participar en el ejercicio físico y el cultivo de las emociones y hábitos físicos deportivos, mejorando el entorno de ejercicio físico del colegio y satisfaciendo las necesidades de ejercicio físico de los estudiantes. Conclusiones: El sistema de enseñanza de fitness digital se encuentra en etapa de desarrollo y prueba. La primera generación de bicicletas fitness digitales tiene muchos problemas con el hardware y el software. Como una forma complementaria importante de educación física escolar en la nueva situación, este sistema promueve en gran medida la educación física a lo largo de la vida de los estudiantes y el aprendizaje del ejercicio físico científico. Nivel de evidencia II; Estudios terapéuticos: investigación de los resultados del tratamiento.*

**Descriptor:** Estudiantes; Ejercicio físico; Educación y entrenamiento físico.

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## INTRODUCTION

Our physical education lacks charm, and physical education classes cannot bring happiness to students, resulting in unsatisfactory results of physical education teaching. Affected by many problems such as one-sided pursuit of admission rate, poor students' physical exercise ability, and parents' lack of attention, school physical education is facing long-term challenges.<sup>1</sup> As the final stage of basic education, high school is the final stage of basic education, and it seems to cultivate physical exercise ability and good habits especially important. However, the research on the development of students' physical exercise ability is very scarce at this stage.

## METHOD

### Research objects

The research object of this thesis is to use digital fitness teaching system to develop students' physical exercise ability.

### Research methods

#### Subject

The subjects of the experiment are students who can participate in physical fitness measurement in the first and second grades of high school. The teacher randomly selects from the registered students, and their measurement results can be compared horizontally and vertically for the results of the experiment.

#### The applied factors of the experiment

Before the experiment, conduct physical tests on the students' form, function, quality and other indicators to understand the students' physical condition, ensure the smooth progress of the experiment, and provide a basis for the final evaluation of the experiment. By issuing questionnaires, we understand the students' knowledge of physical exercise and their motivation and interest in sports.<sup>2</sup> Ride

in 2-3 minutes, gradually enter a medium load, and then sprint for tens of seconds to record the highest pulse. The student pre-rides for 2 minutes, then keeps a pulse rate of 150 beats/min and rides for 5 minutes, determines and maintains a fixed resistance, and records the riding distance. The students will carry out effective continuous riding for 3-5 minutes (140 times/min), and after basic recovery, they will ride again, riding 3 times per session;

### Experimental indicators

1. Morphological index: BMI (height and weight). 2. Functional indicators: step test, vital capacity (ml), vital capacity and body mass index. 3. Quality indicators: effective riding distance for a fixed time, heart rate and resistance. 4. Biochemical indicators: heart rate, calorie consumption.

### Experimental equipment and test methods

With the development of current digital fitness equipment and fitness technology, the digital fitness teaching system integrates advanced multimedia technology, communication technology, and Internet technology into physical education. Students learn scientific fitness knowledge and skills, and continuously improve student sports science literacy and ability. (Figure 1)

## VIRTUAL FITNESS RUNNING EXERCISE SYSTEM

### Low-dimensional motion feature extraction

In order to scientifically guide users to exercise, the system designed three running actions: stepping, jogging, and high-leg run according to the intensity of the exercise. In the experiment, Kinect has a high dimension of depth information, which has a large amount of calculation and poor generalization effect. It is difficult to guarantee the real-time performance of the system.<sup>3</sup> The angle is low-dimensional, which can well represent the overall characteristics of joint movement. Since the

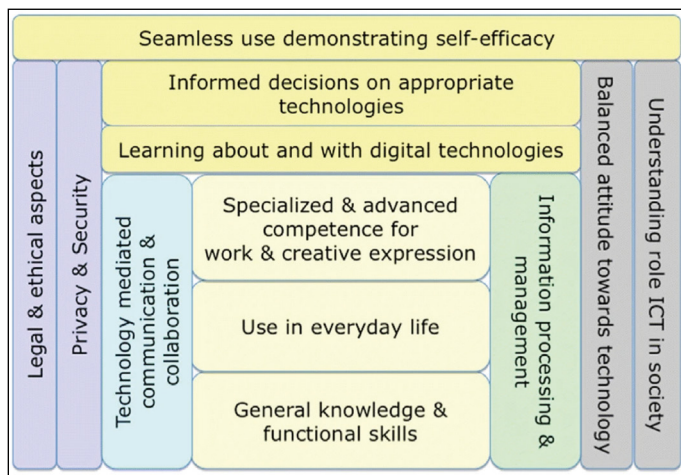


Figure 1. Digital fitness teaching system structure.

motion characteristics of the human body are mainly reflected in the relative position changes of the joint points, we select the angle feature  $\theta$  of the knee joint and the relative position coefficient  $K$  of the joint point to establish the feature set  $(\theta, K)$  of the lower limb running action. The knee joint angle  $\theta$  is calculated as

$$\theta = \cos^{-1} \frac{D^2(B,C)+D^2(A,B)-D^2(C,A)}{2 \cdot D(B,C) \cdot D(A,B)} \quad (1)$$

Among them, A, B, C represent the coordinates of the left hip joint point, left knee joint point, and left ankle joint point respectively; D (A, B) represents the distance between left hip joint point A and left knee joint point B, D (B, C) is similar to D (C, A). The calculation of the relative position coefficient  $K$  of the nodes is

$$K = \frac{h}{D(A,B)+D(B,C)} + \frac{w}{D(B,C)} = \frac{(Y_1-Y_3)}{D(A,B)+D(B,C)} + \frac{(Z_2-Z_3)}{D(B,C)} \quad (2)$$

### Running sports model

The system mainly uses heart rate as the measurement standard for running to control exercise intensity, and adjust the exercise plan in time to achieve scientific guidance for running exercise and achieve the best results. During running, the user's heart rate changes in proportion to the changes in running speed.<sup>4</sup> Target heart rate refers to the effective and safe exercise heart rate when aerobic exercise improves the function of the cardiovascular system, and is usually used to define the most effective exercise intensity. For most users, the most effective range of exercise intensity is to control the heart rate within the target heart rate zone for at least 5 minutes. The calculation formula is

$$\begin{cases} HRT_{\min} = HR_{\max} \times 60\% \\ HRT_{\min} = HR_{\max} \times 80\% \end{cases} \quad (3)$$

Among them,  $HR_{\max}$  is the maximum heart rate. The system is used to scientifically calculate the user's maximum heart rate. For ordinary users, the formula for their maximum heart rate is

$$HR_{\max} = 208 - 0.7 \times age \quad (4)$$

Among them, age is the age of the user. For obese people in special populations, the maximum heart rate formula is

$$HR_{\max} = 200 - 0.7 \times age \quad (5)$$

### Mathematical Statistics

The data obtained in each lesson during the experiment and the questionnaire survey data of the experimental group, using statistical principles and methods, using SPSS statistical software and EXCEL to enter and analyze the surveyed data. Perform statistical processing on the data results to obtain the basis for quantitative analysis.

### RESULTS

#### Comparison and analysis of students' knowledge and interest in physical exercise before and after the experiment in the experimental group

Before the experiment, the goals of middle school students' physical exercise were generally clear. Almost all students realized that active participation in physical exercise can enhance physical fitness and improve health. As shown in Table 1 and Table 2. However, some students have a rather vague definition of sports skills and fitness skills, and the first-grade girls think that both can be used as the goal of physical exercise.

After the experiment, the middle school students' goal of physical exercise, the first-grade boys understand the concept of fitness skills, but the difference between sports skills and fitness skills is still unclear. Before and after the experiment, the students' mastery of the goals of physical exercise is not ideal, and they do not understand the difference between sports skills and fitness skills. Motor skills are specialized movement skills and sports abilities formed under specific rules. Mastering sports skills does not mean mastering Improve the fitness skills. The fitness skills are based on the principles of fitness, aiming at one's own needs and physical conditions, to grasp the way of physical activity, activity amount and activity intensity as a whole. And use various physiological indicators to adjust and control, and perform physical activities to promote the methods, means and abilities of a person's healthy development to obtain a good fitness effect.<sup>5</sup> (Table 3)

Table 1. The goals of middle school students' physical exercise before the experiment (%).

	Enhance physical fitness	Learn motor skills	Win the gold medal	Learn fitness skills
Gao Yinan	90	60	10	50
High school girl	100	100	0	100
High school boy	100	70	0	100
High school girl	90	70	0	50

Table 2. After the experiment, middle school students' physical exercise goals (%).

	Enhance physical fitness	Motor skills	Win the gold medal	Fitness skills
Gao Yinan	90	100	0	100
High school girl	90	90	0	80
High school boy	80	50	0	70
High school girl	100	60	0	70

Table 3. Suitable exercise load before the experiment refers to (%).

	Exercise load	Body load	Fitness load	Ultimate load
Gao Yinan	30	20	40	10
High school girl	50	40	10	0
High school boy	50	20	10	20
High school girl	50	30	20	0

Before the experiment, 40% of high school boys thought that suitable exercise load refers to fitness load, and 50% of high school girls and second grades thought that suitable exercise load refers to exercise load. There are also 10% of high school boys and 20% of high school girls that the appropriate exercise load refers to the ultimate load. Table 4 After the experiment, the survey found that 40% of high school students and 30% of high school girls thought that the appropriate exercise load refers to the fitness load, and no students agreed to refer to the ultimate load.<sup>6</sup>

The comparison before and after the experiment found that most students have an understanding of ultimate load, but do not understand the difference between exercise load, body load and fitness load, and have no clear understanding. The appropriate exercise load should be the load intensity for fitness purposes. Body load refers to the amount of load and intensity that the body bears during exercise. Exercise load is also called physiological load, which refers to the physiological load a person bears when doing exercises.

**Table 4.** Suitable exercise load after the experiment refers to (%).

	Exercise load	Body load	Fitness load	Ultimate load
Gao Yinan	40	20	40	0
High school girl	40	30	30	0
High school boy	30	30	40	0
High school girl	30	30	40	0

## DISCUSSION

### Problems encountered by teachers in the experiment and countermeasures

In the digital fitness teaching classroom, the teaching methods are different from the traditional teaching mode. Teachers are required

to have higher requirements for equipment and Internet technology. Teachers are required to correctly and proficiently master and use the digital fitness teaching system in teaching, and can solve the problems encountered in actual teaching. All kinds of unexpected problems, including equipment failure. In the lesson plan, the arrangement of teaching content, the control of students' exercise load, the setting of teaching goals, teaching methods and organization are all new areas. Teachers need to consult relevant materials, explore in learning, and innovate through exploration.

## CONCLUSION

After two weeks of experimental preparation and 10 weeks of teaching experiments to develop students' physical exercise ability, the improvement of students' step test and vital capacity and body mass index showed that students' aerobic exercise ability was steadily improving. Through the "blind movement" exercise of self-controlling the exercise intensity in the "black screen" state, the students' ability to control the intensity of aerobic load is obviously improved. This system strengthens the interest of students participating in physical exercise, cultivates the ability of students' lifelong physical habits, improves the school's physical exercise environment, meets the students' physical exercise needs, and creates a good exercise environment for students. This system, as an important supplementary form of school physical education under the new situation, is of great significance for promoting students' lifelong physical education and learning scientific physical exercise.

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The author declare no potential conflict of interest related to this article

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## REFERENCES

- McLaren SJ, Macpherson TW, Coutts AJ, Hurst C, Spears IR, Weston M. The relationships between internal and external measures of training load and intensity in team sports: a meta-analysis. *Sports Med.* 2018;48(3):641-658.
- Ziyu LI. Application of college basketball training teaching based on sports video analysis under network multimedia. *Solid State Technology.* 2021 [cited 2021 21 Jun];64(01):170-81. Available from: <https://solidstatetechnology.us/index.php/JSST/article/view/6971>
- He H, He T, Peng G. Research on network service management platform for long term mechanism of sports in colleges. *Wireless Personal Communications.* 2018 [cited 2021 21 Jun];102(2):1117-27. Available from: <https://www.x-mol.com/paper/1335538758124531771?recommendPaper=1335538820292505751>
- Buckthorpe M. Optimising the late-stage rehabilitation and return-to-sport training and testing process after ACL reconstruction. *Sports Med.* 2019;49(7):1043-58.
- Hadlow SM, Panchuk D, Mann DL, Portus MR, Abernethy B. Modified perceptual training in sport: a new classification framework. *Journal of Science and Medicine in Sport.* 2018 [cited 2021 21 Jun];21(9):950-8. Available from: [https://research.vu.nl/ws/portalfiles/portal/108363908/Modified\\_perceptual\\_training\\_in\\_sport.pdf](https://research.vu.nl/ws/portalfiles/portal/108363908/Modified_perceptual_training_in_sport.pdf)
- Franchini E, Cormack S, Takito MY. Effects of high-intensity interval training on olympic combat sports athletes' performance and physiological adaptation: a systematic Review. *J Strength Cond Res.* 2019;33(1):242-52.

## ERRATUM

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