

Applied Mathematics and Nonlinear Sciences

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Research on the impact of physical education teaching reform on students' physical fitness improvement in colleges and universities based on numerical analysis

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Submission Info

Communicated by Z. Sabir
Received September 27, 2024
Accepted January 4, 2025
Available online February 5, 2025

Abstract

This paper collects and collates relevant information about school physical education teaching and physical education integration and proposes a reform path plan for physical education integration teaching of physical education majors from the individual level and the organizational level. It also uses multiple regression analysis to explore the influence of individual and organizational levels on the improvement of students' physical fitness and health. The comparative experimental method was used to analyze the effect of teaching methods on physical fitness under the concept of integration of physical education on the improvement of physical fitness by taking a university student as the research object and setting up an intervention group and a control group. After analysis, it can be seen that factors at the individual level (sports motivation, health behavior $P < 0.01$) and organizational level (environmental support, physical education faculty $P < 0.05$, $P < 0.01$) will have a significant positive impact on college students' physical fitness and health. The intervention group's performance on lung capacity index, test item of 50m, and minute sit-ups before and after the experiment was significantly improved ($P < 0.05$).

Keywords: Positive influence relationship; Multiple regression analysis; Comparative experiment; Physical education.

AMS 2010 codes: 68T05

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1 Introduction

The social development of the new era has put forward new requirements for physical education teaching, and under the concept of quality education, physical education classes in colleges and universities should set up the concept of health first so that students can feel the fun in physical exercise and help students enhance their physical fitness [1-2]. These provide directions and goals for the reform of college physical education teaching. College students are an important force for the development and growth of the country, and their physical condition is directly related to whether they can be successfully employed and developed. Colleges and universities need to have a deep understanding of the current physical fitness and health status of college students and clarify the specific influencing factors in order to better explore countermeasures [3-4]. At present, the issue of college students' physical fitness and health has been widely concerned by all walks of life, and the reform of physical education teaching in colleges and universities has become an inevitable trend of development. Therefore, it is very necessary to explore the reform strategy of college physical education teaching from the perspective of college students' physical fitness improvement [5-7].

Numerical calculation analysis is also the basis of computer software simulation sports teaching experiments. With the continuous development and innovation of information technology, the phenomenon of computer software assisting sports teaching in colleges and universities has become more and more common [8-9]. Through the numerical analysis of sports problems, MATLAB is the presentation software simulation of college sports training experiments to assist the college sports experimental teaching. It should be able to stimulate students' enthusiasm, exercise students' independent learning ability, change the teacher's teaching method, improve students' physical health, and, to a certain extent, also help to cultivate students' observation and exercise ability, and improve students' interest in learning sports [10- 13].

In the context of educational reform, physical education in colleges and universities has also been adjusted and reformed, and colleges and universities have improved the physical quality of college students by adjusting physical education teaching so that students can establish a healthy and scientific concept of exercise. Literature [14] mainly examines the influence of high school physical education experience on college students' physical fitness and physical activity behavior and designs relevant survey experiments. The final experimental results show that effective physical education programs can establish students' lifelong healthy and active habits and improve students' physical fitness and health. Literature [15] believes that teaching reform and physical fitness improvement are crucial for college students, and after analyzing the reasons for the decline in physical fitness of contemporary college students from the physiological and psychological aspects, it puts forward the reform proposal of physical education teaching, which focuses on the teaching of sports skills as well as health education of college students, and aims to optimize the quality of physical education teaching and promote the healthy development of students' body and mind. The purpose is to optimize the quality of physical education teaching and to promote the physical and mental health development of students. Literature [16] suggests that the effectiveness of physical education reform methods in higher education can be measured by indicators such as knowledge, skills, physical fitness, general and specific physical fitness, motivational and value-based attitudes towards healthy lifestyles and their health, and the ability of students to acquire physical culture and health. Literature [17] reviewed and meta-analyzed existing studies in order to investigate the effects of quality- or quantity-based physical education on adolescents' health-related physical fitness outcomes and basic motor skills and found that quality- or quantity-based physical education improves adolescents' health-related physical fitness and improves adolescents' basic motor skills.

In addition, literature [18] emphasized that physical education in colleges and universities can enhance students' physical fitness and health and that the implementation of physical education

reforms based on college students' physical education lifestyle goals can help alleviate students' physical fitness and health problems. Literature [19] pointed out that today's college students generally have anxiety and depression symptoms and stress symptoms, and to explore whether physical activity and sports interventions can help to promote the mental health of college students and other emerging adults, the experimental results show that there is a positive correlation between physical activity, mental health and well-being and that sports interventions can effectively reduce college students' depressive symptoms and perceived stress. Literature [20] focuses on the fact that physical culture and sports in colleges and universities can promote the harmonization of students' body and mind. For example, strengthening physical education for students with fatigued physiques can provide the biological potential of students' organism's life activities. Literature [21] used Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the effect of health education on students' mental health, and the results showed that there is a significant relationship between the two, and the relationship was positively influenced by continuous healthy exercise and sports participation, and the study helped to improve the physical health of students.

In this paper, two reform paths, at the individual level and at the organizational level, are proposed in the context of integrating physical education. It also uses the numerical analysis method - multiple regression analysis to explore the influence of individual-level and organizational-level factors in the reform path of physical-educational integration on the improvement of college students' physical fitness and health. Using data method, experimental method, survey method, mathematical and statistical methods to carry out experimental research on 60 college students in a university, the experimental group with the concept of physical education fusion sports teaching design intervention for school physical education teaching, the control group using the traditional physical education teaching design for teaching. Explore the impact of the concept of physical education integration in teaching on the improvement of physical fitness and health.

2 Multiple linear regression modeling of factors affecting physical health

The physical fitness of Chinese college students is influenced by a variety of factors, including students' perceptions and participation, the adequacy of the physical activity environment at school, the constructive guidance provided by families, and the culture of the nurturing community. These factors have been the subject of focused analyses to determine their impact on the physical fitness of college students. This study intends to explore the factors that influence college students' physical fitness and health in order to provide a theoretical reference.

Numerical analysis is the practice of using numerical analysis effectively to find approximate solutions to mathematical problems, as well as the science that encompasses related theories. It mainly studies how to use mathematical theory and mathematical methods to better solve a variety of problems involving mathematical analysis, such as nonlinear equations (groups), systems of linear equations, interpolation and fitting, numerical integration and ordinary differential equations, etc., and based on the mathematical software can be used to realize the solution of these common methods. With the wide application of computers and the continuous optimization of computer software, many problems involving mathematical analysis can be processed and visualized by computer software.

2.1 Linear regression models

Regression models are categorized into linear regression models and non-linear regression models, and linear regression is further divided into univariate linear regression and multiple linear regression. When the relationship between the variables is a linear relationship between the model are called a

linear regression model. Otherwise, it is called non-linear regression model. When the regression function in the probabilistic model (1) equation is linear, i.e., there is:

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p + \varepsilon \quad (1)$$

Where $\beta_0, \beta_1, \beta_2, \cdots, \beta_p$ is the $p+1$ unknown parameter, β_0 is called the regression constant, $\beta_1, \beta_2, \cdots, \beta_p$ is called the regression coefficient, y is called the explanatory variable (dependent variable), and $x_1, x_2, \cdots, x_p$ is the p general variable that can be precisely measured and controlled, and is called the explanatory variable (independent variable). At HH, (1) is the univariate linear regression model, at $p \geq 2$, we will call (1) the multiple linear regression model, and ε is the random error.

Linearity in a linear regression model is for the unknown parameter $\beta_i (i = 0, 1, 2, \cdots, p)$. Linearity of the explanatory variables of a regression is non-essential because the explanatory variables are non-linear and can often be made linear by substituting variables.

If $(x_{i1}, x_{i2}, \cdots, x_{ip}; y_i)$, BB is a set of observations for the variable $(x_1, x_2, \cdots, x_p; y)$ in equation (1), the linear regression model can be expressed as:

$$y_i = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_p x_{ip} + \varepsilon_i \quad (2)$$

In the whole regression analysis, the linear regression model is the most important. On the one hand, it is because of the wide application of linear regression; on the other hand, it is only under the assumption that the regression model is linear that more in-depth and general results can be obtained, and many nonlinear regression models can be changed into linear regression problems through appropriate transformations. Therefore, the theory and application of the linear regression model are the focus of regression research. Univariate linear regression is a special case in regression analysis, which is usually the result of our simplified consideration of many factors affecting a certain phenomenon. The multivariate linear regression model is described below.

2.2 Multiple linear regression models

Let the linear regression model of the random variable y with the general variable $x_1, x_2, \cdots, x_p$ be:

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p + \varepsilon \quad (3)$$

As with univariate linear regression, for the random error term we often assume that $E(\varepsilon) = 0$, $Var(\varepsilon) = \sigma^2$. Call:

$$E(y) = \beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p \quad (4)$$

is the theoretical regression equation.

For a practical problem, if one obtains n sets of observations $(x_{i1}, x_{i2}, \cdots, x_{ip}; y_i)$, $i = 1, 2, \cdots, n$, then the linear regression model (4) is:

$$\begin{cases} y_1 = \beta_0 + \beta_1 x_{11} + \beta_2 x_{12} \cdots + \beta_p x_{1p} + \varepsilon_1 \\ y_2 = \beta_0 + \beta_1 x_{21} + \beta_2 x_{22} \cdots + \beta_p x_{2p} + \varepsilon_2 \\ \dots\dots\dots \\ y_n = \beta_0 + \beta_1 x_{n1} + \beta_2 x_{n2} \cdots + \beta_p x_{np} + \varepsilon_n \end{cases} \quad (5)$$

is written in matrix form as:

$$y = X\beta + \varepsilon \quad (6)$$

Among them:

$$y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} \quad X = \begin{bmatrix} 1 & x_{11} & \cdots & x_{1p} \\ 1 & x_{21} & \cdots & x_{2p} \\ \vdots & \vdots & & \vdots \\ 1 & x & \cdots & x_{np} \end{bmatrix} \quad (7)$$

$$\beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_p \end{bmatrix} \quad \varepsilon = \begin{bmatrix} \varepsilon_0 \\ \varepsilon_1 \\ \vdots \\ \varepsilon_n \end{bmatrix}$$

X is the $n \times (p+1)$ matrix and call X the regression design matrix. In order to facilitate the parameter estimation of the model, some basic assumptions are made for equation (7) as follows:

- 1) The explanatory variables $x_1, x_2, \dots, x_p$ are deterministic and X is a full rank matrix.
- 2) The random error term has zero mean and equal variance, i.e., it satisfies the Gauss-Markov condition:

$$\begin{cases} E(\varepsilon_i) = 0, i = 1, 2, \dots, n \\ Cov(\varepsilon_i, \varepsilon_j) = \begin{cases} \sigma^2, i = j \\ 0, i \neq j \end{cases} (i, j = 1, 2, \dots, n) \end{cases} \quad (8)$$

- 3) The random error term follows a normal distribution:

$$\varepsilon_i \sim N(0, \sigma^2), i = 1, 2, \dots, n \quad (9)$$

For the matrix form of multiple linear regression, equation (9), this condition is:

$$\varepsilon \sim N(0, \sigma^2 I_n) \quad (10)$$

From the above assumptions and the properties of the multivariate normal distribution, the random vector obeys the dimensional normal distribution:

$$y \sim N(X\beta, \sigma^2 I_n) \quad (11)$$

3 Study on the reform path of integration of sports and education and its impact on physical fitness and health

3.1 Reform Paths for the Development of “Sports-Education Integration”

The integration of sports and education is not a new idea. Since the integration of sports and education in the 1980s, China has made great improvements in the problems it has faced in developing competitive sports, training reserves, improving the physical fitness of young people, and raising the level of mass sports, but many attempts have been futile or have fallen into difficulties. Therefore, to understand, consider and strengthen the combination of sports and education from a deeper and longer-term perspective to promote the healthy development of young people is not only a major political work but also a major historical task, a major event based on the present, focusing on the long term, the merits of the present generation, the benefits in the autumn and a thousand years, the growth of young people, and the future of the country and the nation. In the context of the integration of education and sports, school sports have received unprecedented attention. It is necessary to carry out the new concepts and objectives of reform in the field of education to the end, take the reform of teaching, competitions and the secondary and higher education examinations as an entry point, speed up the process of integrating physical education and sports, assure the integration of physical education and sports with a management model of common construction, common governance and common sharing, realize the common construction of high-quality resources, share and win-win situation, and promote the development of education and sports work. It is conceivable that physical education teaching must be carried out in the context of the “integration of sports and education” and must be creative and have the ability to integrate.

The sports and education integration development path shown in Figure 1, “sports and education integration” proposed not only the shortage of high-level competitive athletes reserve force but also the need to solve the problem of physical health of young people to summarize the “deepen the integration of sports and education to promote the healthy development of young people’s opinions” to promote the healthy development of young college students sports opinions are Strengthening school sports work to establish a “health first” education concept, to carry out colorful after-school training, competition activities, enriching school sports activities, extensive school competitions based on the construction of school teams, the establishment of university sports clubs, and vigorously cultivate the team of physical education teachers and coaches and to strengthen the sharing of the use of venues and facilities and so on. Several blocks of content. In the literature on the development path of university sports teaching studied by experts, sports teachers, sports equipment, teaching contents, sports competitions, and after-school sports training are studied and analyzed in several parts.

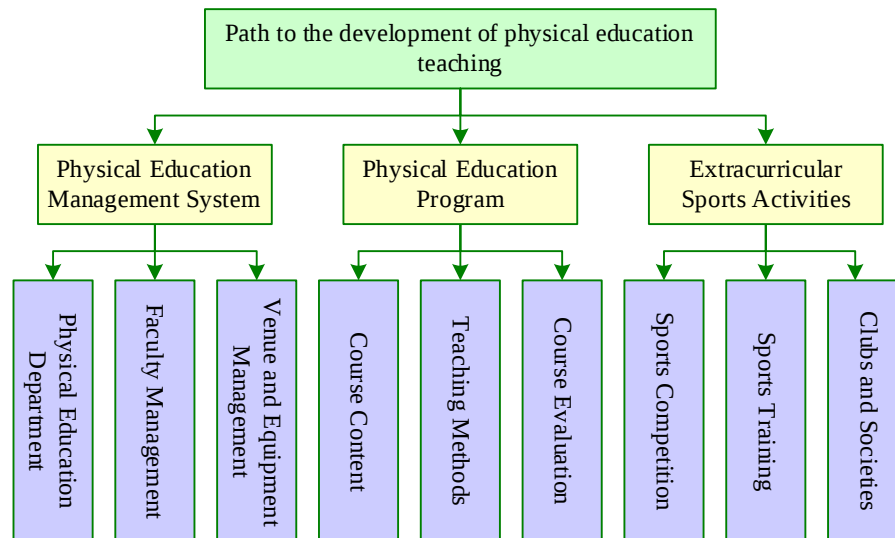


Figure 1. The university sports teaching development path map

Under the development concept of integration of sports and education, it is necessary to carry out specific reform measures planned by the sports management department within each campus, and then through the division of labor and cooperation of the sports management department to jointly complete. The university sports management system includes including leadership system, implementation system, and sports activities organization under the leadership of the school sports management department through departmental division of labor cooperation and then the organization and implementation of a school sports management model. Management mode is shown in Figure 2. In this mode, the school sports management department can give full play to the effectiveness of management and is responsible for the development of school sports work objectives, annual plans and arrangements, while the implementation and supervision of sports work is the university sports management system has an important significance to the overall level and reform and development of university sports.

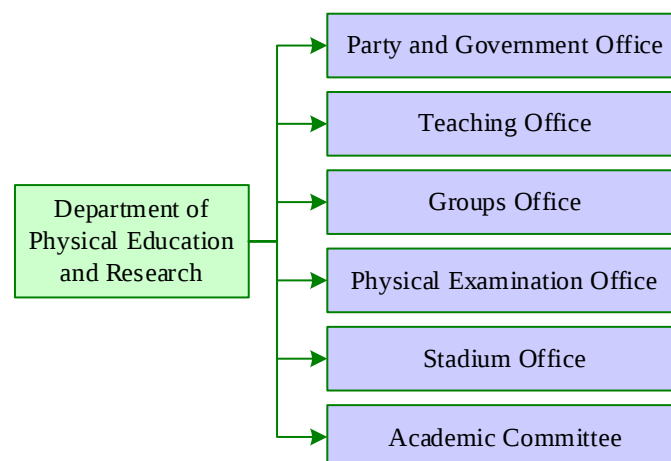


Figure 2. Composition of sports teaching research department

3.2 Paths of reform at the individual and organizational levels

To enhance the enthusiasm for physical exercise, set up sports association management associations in the school, departmental division of labor and cooperation, from the sports activity planning, sports activity publicity, sports activity organization and other departments, so as to facilitate the development of sports associations. In the formation of sports clubs, follow the law of students' physical and mental development, introduce some sports activities that most students are happy to participate in, encourage students to voluntarily join sports clubs to participate in sports activities, strengthen the awareness of sports, so that students can experience the fun of collective, cooperative sports in the process of sports, enhance the enthusiasm of physical exercise, and change their views on sports.

Introducing specialized teams of teachers and strengthening teacher training. In terms of teacher strength, it is crucial to improve the balanced development of teachers' age, and physical education teachers from different age groups play different roles in the development of physical education integration. In terms of the age structure of teachers, there are fewer young teachers. Compared to physical education teaching, in addition to the succession and inheritance of new and old teachers, it is more important to have an athletic ability of the teacher. Physical education teachers need to demonstrate sports actions and provide protection and assistance to students. The implementation of an excellent talent introduction mechanism to absorb outstanding retired athletes and coaches to teach clears the way for outstanding retired students, and coaches into the school as a physical education teacher. Organize vocational transition training for retired students and students, and formulate a method for entering the profession first and then training. It can also enhance the training of sports skills of physical education teachers in schools. Teacher training can not only consolidate their basic knowledge, but also expand their mastery of different sports, strengthen their learning of sports skills, strengthen the development of correct sports skills norms, and provide a real service for sports teaching. Subsequently, the selection of outstanding physical education teachers to participate in a variety of sports program skills training, cross-training, and physical education teachers to enhance the ability of physical education teaching and after-school training. At the same time, it organizes and executes training programs for top-notch physical education teachers.

Strengthening the construction of internal and external sports venues on campuses. In the process of teaching physical education to students, as well as sports events and activities carried out in the lack of activity sites, through the school land planning, rational planning of land, abandoned, old houses to be rebuilt or renovated. Secondly, the construction of the site should be implemented quickly. In the school, many planning documents have been issued, but they did not quickly implement the delay again and again, resulting in even after the implementation of the next, the impact on students can not be compensated. Not only to strengthen the management of outdoor sports venues repair but also the construction of indoor venues for reasonable space planning, the use of the top floor of the school building and basement can be converted to the construction of sports venues to create a number of functions into one multi-functional venue, to improve the degree of openness of the venues to improve the efficiency of the utilization of the venues. In addition to the internal construction of the campus, it is also possible to build venues outside the campus for students to carry out physical education courses or activities and to open them to the public on the premise of not affecting the physical education courses of students and sports competitions on rest days and holidays, or to contract them to clubs, so as to increase the rational use of sports venues. Secondly, it can cooperate with clubs and gyms near schools to provide further support and protection for students in physical education and physical exercise.

3.3 Multiple regressions of the impact of the reform of physical education integration

3.3.1 Individual level

A questionnaire study, individually tested, was used and collected through the offline distribution of questionnaires. The study variables included sports motivation, health behavior, environmental support, and physical education faculty subscales with a total of 30 items. In this study, pre-test questionnaires were distributed to randomly selected college students majoring in Physical Education at S University. Three hundred and seventy questionnaires were distributed, and 370 were returned with a return rate of 100%. Valid questionnaires were 370 with a validity rate of 100%. This questionnaire was designed in a reasonable way to test the degree of influence or effect through a 5-point Likert scale. Score from 1 to 5: Very unreasonable, Unreasonable, Fair, Reasonable, Very reasonable.

In the theoretical model of social ecology, the individual level is located at the most proximal end of the ecosystem, and the survey of its influencing factors, as shown in Table 1, with a mean value of 3.420, has a significant impact on college students' physical fitness, dominated by sports motivation and health behaviors. The mean value of sports motivation was higher than that of health behaviors, with a mean value of 3.552. The results suggest that lack of sports motivation may have a considerable impact on an individual's physical fitness level. It was found that students who lack physical activity habits are frequently associated with a lack of physical motivation. In addition, health behaviors play an important role in the physical fitness level of college students with a score of 3.312. Previous research has shown that individuals are highly motivated to participate in physical activity and that the frequency of participation correlates with increased levels of physical fitness. College students' motivation to play sports is also related to their interests and attitudes towards participation, with strong interests typically leading to higher levels of motivation and more positive attitudes towards participation. Each sport has its unique appeal, and the psychological tendency of college students to choose a sport based on their preferences and to experience the joy of participation may serve as a "catalyst" to solidify sports participation. This encourages participation in sports and ultimately improves physical health. The above analysis suggests that college students' perceptions of sports are closely related to their physical health. In order to improve the physical fitness of university students, interventions should aim to change their perceptions of sport at the individual level.

Table 1. Analysis of physical health factors affecting college students

Influencing factor	Sample size	Minimum value	Maximum value	Mean value	Standard deviation
Personal level	370	1	5	3.420	0.942
Sports initiative	370	1	5	3.552	0.903
Health behavior	370	1	5	3.312	1.022

3.3.2 Organizational community level

School sports are the main part of the organizational community level, and their influence factors investigation and analysis is shown in Table 2, which has a great influence on college students' physical health, and the mean score is 3.622 points. This study investigates the organizational level on college students' physical health has influence factors on two aspects of physical education teachers, environmental support, etc., and the average score is 3.55 points or more, indicating that the organizational community level has a great role in improving the level of college students' physical fitness and health.

Physical education teachers are the foundation of school sports and have the greatest impact on college students' physical health at the organizational community level, with a score mean of 3.654. Physical education teachers are at the forefront of sports, and excellent faculty plays a key role in enhancing students' physical fitness and health.

The mean value of the score of environmental support on the physical fitness level of college students was 3.590, which mainly included the provision of school grounds and equipment, financial support for sports activities, and existing policies. Adequate sports facilities are crucial to the smooth running of school sports. However, due to the marginalization of school sports and the prioritization of disciplines in domestic colleges and universities, less funding has been invested in teacher training and the construction of sports venues, resulting in inadequate facilities. Providing financial support for sports activities is crucial to promote students' participation in diversified sports activities. Adequate material conditions, participation in diversified sports activities, purchase of necessary sports equipment, and optimization of the physical exercise environment can directly affect the improvement of college students' physical fitness and health. The current sports policy is more of a school policy for students.

Table 2. Analysis of physical health factors affecting college students

Name	Sample size	Minimum value	Maximum value	Mean value	Standard deviation
Community level	370	1	5	3.622	0.924
Environmental support	370	1	5	3.590	0.912
Sports teacher	370	1	5	3.654	0.895

3.3.3 Regression analysis of impact factors

The results of regression analysis are shown in Table 3. The value of the regression coefficient of sports motivation is 0.099 ($t=3.271$, $p=0.001<0.01$), which means that sports motivation will have a significant positive influence relationship on physical fitness. The value of the regression coefficient of health behavior is 0.063 ($t=2.925$, $p=0.003<0.01$), which means that health behavior will have a significant positive influence relationship on physical health. The value of the regression coefficient of environmental support is 0.071 ($t=2.568$, $p=0.016<0.05$), which means that environmental support will have a significant positive influence relationship on physical fitness. The value of the regression coefficient of physical education faculty is 0.163 ($t=5.745$, $p=0.000<0.01$), which means that physical education faculty will have a significant positive impact relationship on physical fitness. To summarize the analysis, it can be seen that: sports motivation, health behaviors, environmental support, and physical education faculty all will have a significant positive impact relationship on physical fitness.

Table 3. Regression model table

Model	Unnormalized coefficient		Normalization factor	t	Sig.	Common linear statistics	
	B	Standard error	Beta			Tolerance	VIF
Constants	1.232	0.112		11.925	0.000		
Personal level	0.099	0.034	0.174	3.271	0.001	0.552	1.844
Sports initiative	0.063	0.024	0.142	2.925	0.003	0.741	1.378
Health behavior	0.102	0.030	0.194	3.463	0.002	0.544	1.886
Environmental support	0.071	0.028	0.120	2.568	0.016	0.672	1.524
Sports teacher	0.163	0.029	0.275	5.745	0.001	0.648	1.563

4 Effectiveness of sports reforms in improving physical health

4.1 Comparative analysis of students' physical health before the experiment

The selected experimental subjects are college students of S University, and the physical activity levels (including exercise frequency, time, and exercise intensity) of the 60 college students participating in the experiment were scientifically and effectively tested to better group the experimental subjects and to facilitate the analysis of their exercise levels, which lays the foundation for the quantification of the training activities in the subsequent experimental teaching. The physical fitness test of all participating students before submitting the integration concept teaching experiment was conducted on the school playground. The experiment was conducted at a uniform time when none of the participating students were unwell and in good condition, and the dress code was suitable for sports. The physical fitness test items were (height, weight, lung capacity) and (50m, one-minute sit-up, one-minute rope skipping, and seated bent-over) under the National Physical Fitness Standards (NPS). Multiple measurements were averaged to ensure that the data were true and accurate, and finally, the data results were statistically analyzed using statistical software. The results are shown in Table 4. Data analysis shows that the body mass index of students in the intervention group (teaching the concept of integration of physical education) is $17.3 \pm 4.05 \text{ kg/m}^2$, and the body mass index of students in the control group (traditional teaching methods) is $17.35 \pm 4.15 \text{ kg/m}^2$, and the comparison of the two groups before the experiment, the independent samples t-test results in a p-value of 0.822, $p > 0.05$, which shows that the concept of integration of physical education Teaching design intervention group and the control group before the experiment, there is no significant difference in body mass index, in a large limit to exclude the experimental subject body mass index factors on the experimental results. In summary, it can be seen that through the comparison of the results of the physical fitness test of the two groups before the experiment, it was found that there was no significant difference between the students of the experimental intervention group and the control group in the indicators of the physical fitness test items of the physical fitness concept of the integration concept of teaching design. Through the index test results can be seen in the endurance quality, the vast majority of students can achieve the national requirements of the index.

Table 4. The student's physical health is a separate table

Sharp philosophy teaching design	Intervention group	Control group	T	P
Body mass index(Kg/m^2)	17.3 ± 4.05	17.35 ± 4.15	0.232	0.822
Lung capacity(ml)	1725.54 ± 370.2	1718 ± 374.38	1.995	0.063
50m(s)	10.23 ± 1.12	10.38 ± 1.14	1.364	0.183
Jumping rope in a minute	90.11 ± 20.1	90.84 ± 20.92	0.462	0.664
One minute sit-ups	22.35 ± 7.56	22.42 ± 7.54	0.214	0.847
Preflexion(cm)	7.72 ± 2.53	7.8 ± 2.53	0.437	0.668

4.2 Comparative analysis of students' physical health in the intervention group before and after the experiment

Post-experimental statistics are shown in Figure 3. The body mass index of the students in the intervention group before the experiment was $17.3 \pm 4.05 \text{ kg/m}^2$, and the body mass index of the students after the experiment was $17.62 \pm 3.57 \text{ kg/m}^2$, and the comparison between before and after the experiment showed that the p-value obtained after the paired samples t-test was 0.93, and the $p > 0.05$, which indicates that before and after the experiment, there is no obvious Difference. It can be seen that the body mass index does not have a significant impact on the overall outcomes of the

intervention group. The concept of integration of physical education into physical education did not have a significant effect on reducing students' body weight.

The results of the spirometry test of the students in the intervention group before the experiment were 1725.54 ± 370.2 ml, while the results of the spirometry test of the students after the experiment were 1775.42 ± 325.24 ml, and the results of the students before and after the experiment showed that the students appeared to have a substantial increase in the indicators of spirometry data after the experiment. A paired-sample t-test yielded a p-value of 0.012, $p < 0.05$, indicating that there was a significant difference in the spirometry indexes of the intervention group before and after the experiment. Therefore, the concept of physical education integration in physical education teaching can effectively improve the level of students' lung capacity. The performance data of the intervention group in the test program of 50m was 10.23 ± 1.12 s before the intervention and 9.24 ± 1.72 s after the intervention, and the test results before and after the experiment yielded a p-value of 0.036, $P < 0.05$ after the paired t-test.

In the one-minute rope skipping program, which examines cardiorespiratory strength and muscular endurance, the test result of the intervention group was 90.11 ± 20.1 times before the experiment and 92.47 ± 16.32 times after the experiment. The paired t-test of the pre- and post-test results showed a p-value of 0.043, $p < 0.05$.

Similarly, in the one-minute sit-up program test that examines muscular endurance, the test score of the intervention group was 22.35 ± 7.56 times before the experiment and 23.35 ± 5.88 after the experiment, and the before-and-after test results were tested by the paired t-test p-value of 0.003, $p < 0.01$, which indicates that there is a highly significant difference between the data of the two groups before and after the experiment, as well.

As for the flexibility test of the seated forward bending program, the test score of the intervention group was 7.72 ± 2.53 cm before the experiment and 7.85 ± 2.27 cm after the experiment. The test scores of the two groups were subjected to paired T-tests, and the resultant P-value was 0.105, $P > 0.05$.

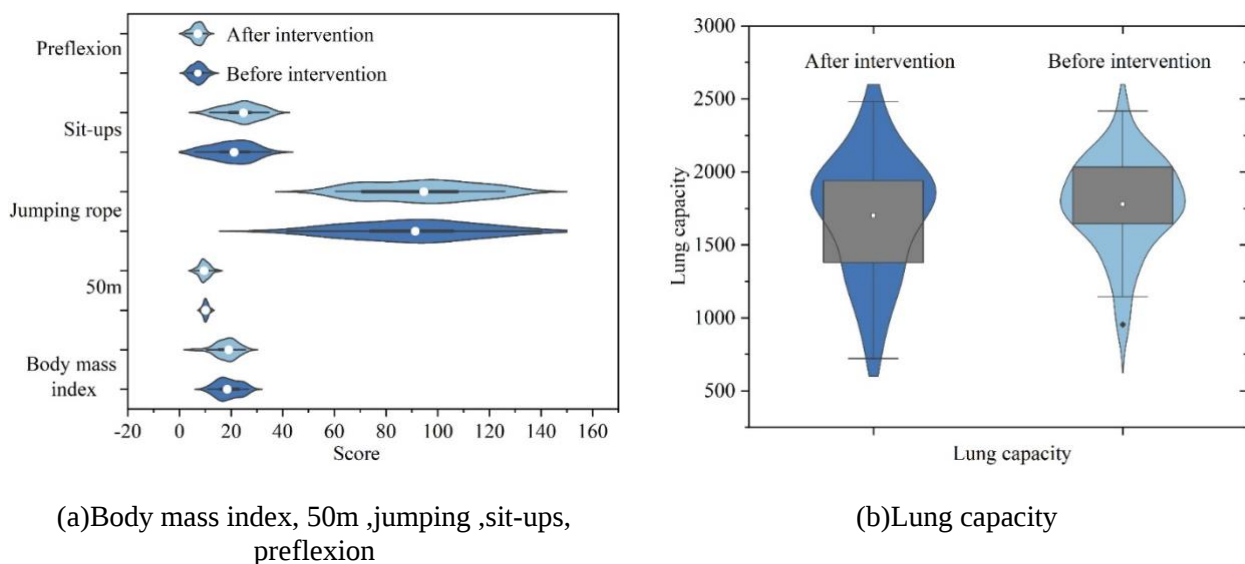


Figure 3. Physical health of students

5 Conclusion

This paper firstly elaborates on the teaching reform path of physical education integration, then utilizes the numerical analysis method to explore the impact of physical education integration teaching on physical health, and finally explores the advantages of physical education integration teaching based on the effect of physical health indicators before and after physical education integration teaching. The study shows that:

- 1) Sports motivation, health behaviors, environmental support, and physical education faculty are all five factors that significantly and positively influence the physical fitness of college students. At the individual level, sports motivation is the most influential factor. At the organizational level, the influence of physical education teachers is the most significant.
- 2) The effect of teaching the concept of physical education integration on health indicators such as lung capacity, the test item of 50m, and one-minute sit-ups was significantly improved ($P < 0.01$ or $P < 0.05$). Therefore, the teaching method of physical-educational integration can effectively improve students' physical health index.

Funding:

This research was supported by the Provincial educational reform project: Design and Application of PBL and PAD Blended Teaching Mode Based on OBE Concept in Core Courses of Physical Education Major (No.: J20231380).

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