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Article

Impact of Civic Education in Physical Education Classrooms on Students' Psychological Development and Its Quantitative Analysis Model

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Abstract: The study started from the question of to what extent Civic Education in the physical education classroom can actually influence the development of students' psychological health, and explored the integration of theory and empirical evidence. With 478 physical education students as the research subjects and self-esteem scale, psychological elasticity scale and well-being scale as the measurement tools, the study quantifies the real changes that occur in students' psychology after the integration of Civic-Political education into the physical education classroom. The results found that sports civic education does effectively promote students' psychological health. Its effect is mainly reflected in four dimensions: teaching frequency, form richness, content identity, and effect perception. Students' identification with the content of Civics is closely related to their sense of self-affirmation, with a correlation coefficient of 0.694, while their perception of the teaching effect is closely related to their learning satisfaction, with a correlation coefficient of r=0.886. It was further found through the establishment of a multiple regression mathematical model that it is the students' internal identification with the content of the Civics and the actual feeling of the effectiveness of the teaching and learning that is the key driving force for the psychological growth, which explains 63.7% and 71.8% of the changes in mental health, respectively. In contrast, simply increasing the frequency of Civics elements or enriching the form of teaching has a limited effect. Teaching experiments showed that students who received sports Civics education improved significantly better than the traditional teaching group in psychological dimensions such as anxiety and paranoia, with effect sizes Cohen's d ranging from 0.293 to 0.482.

Keywords: physical education classroom; political education; psychological development; multiple linear regression

1. Introduction

In recent decades, the status and role of physical education has become more prominent in the ever-developing education system, and it plays a vital role in broadening students' ideological horizons, cultivating their physical and psychological qualities, and mobilizing their enthusiasm for learning [1-3]. Physical education is very different from other disciplines in the form of teaching, mainly in the openness of the classroom form, the practicality of the teaching content, the diversity of the organization, the expressive nature of the learning process, and the multilateral nature of interpersonal communication [4-5]. The unique nature of physical education has constructed an indispensable basic environment for the expression, cognition, realization and transformation of students' internal concepts, which constantly helps students grow, and at the same time, it also provides teachers with a platform for observing students' ideological dynamics, and an opportunity to intervene in the education of ideology and politics [6-8]. Under the teaching concept of integration of physical education, we can find a common point of

convergence with ideological and moral education in physical education, and carry out teaching practice with this as the focus, which can better fulfill the educational task of "cultivating morality and nurturing human beings", and at the same time, promote the synergistic development of students' physical fitness, knowledge cultivation, and moral qualities [9-10]. The integration of physical education and civic education is a complex teaching practice, in which physical education, subject teaching and civic education courses give full play to their respective strengths to synchronize the development of physical and moral qualities as the goal of teaching, so that students have both good moral qualities and physical qualities through learning [11-13].

With the growth of age, students experience a series of changes and development in psychology. From elementary school to high school, students' learning tasks are relatively heavy, and they have been maintaining a high intensity learning state, resulting in some students' prominent anorexia, and difficulties in communication and self-cognitive bias, and their psychological state is not good [14-17]. School physical education generally adopts the mode of open-air, which is a rare way for students to relax both physically and psychologically during school, relieving psychological pressure for students, promoting teamwork ability, and enhancing sociability, while Civic Education helps to improve students' self-cognition. For example, literature [18] points out that the mechanism of university sports interest and atmosphere on relieving students' academic stress is mediated through psychological toughness, and cultivating students' sports interest and creating a good sports atmosphere can improve students' psychological toughness, thus reducing students' academic stress. In addition, the literature [19] preaches that indicated that appropriate physical activity can enhance the level of intelligence of students, contribute to the formation of positive emotional and psychological states, and improve interpersonal interactions. Literature [20] used statistical software to analyze and found that active physical activity contributes to students' self-efficacy, subjective well-being, and emotional intelligence, all of which show a significant positive correlation, and that the promotion of subjective well-being by physical activity can be either direct or indirect to self-efficacy and emotional intelligence. Literature [21] analyzed the effect of physical education program on students' mental health using structural modeling, and physical education program indirectly promotes the development of students' mental health by improving social adaptability and physical activity level. And the literature [22] suggests that teachers should play a guiding role in physical education teaching, cultivate students' self-confidence and teamwork ability through the course, break down psychological barriers, and combine the theory of Civic and Political Education to promote students' mental health development, strengthen students' social adaptability and civic participation.

In the context of Civic and Political Education, literature [23] used *t*-test and one-way ANOVA to analyze the promotion effect of physical education on students' psychology, and the three physical education courses, basketball, tai chi and cheerleading, all helped to alleviate students' anxiety levels, with tai chi courses being the most effective. And the literature [24] pointed out that civic education is the main way to reduce students' anxiety level, but the boring character of civic education hinders this effectiveness, and different educational modes affect students' psychological changes and the formation of personality traits. It can be seen that the implementation of Civic and Political Education in physical education courses should avoid following the traditional Civic and Political Education model. In addition, literature [25] used multilayer linear modeling analysis to reveal the significance of psychological stress and physical activity in predicting the production of disease, while physical activity mediated the production of disease by psychological stress. Literature [26] assessed the impact of an integrated program of physical education and civic education on students' mental toughness, which showed a tendency to diminish with increasing age, and males' mental toughness was better than females'.

Under the development of educational informatization and digitalization, a variety of educational data and students' psychological data are collected, and these data can be used to construct quantitative analysis models to support the analysis of students' psychological development [27-28]. Literature [29] established a structural equation model, combined with regression analysis and other methods to quantitatively analyze the relationship between students' physical activity and emotional intelligence, which were positively correlated and mediated by self-efficacy. Literature [30] evaluated the sustainability of psychoeducation in a university physical education model through machine learning modeling and the Internet of Things, and found that this educational model facilitates the improvement of students' psychological quality and independent learning ability. Based on this background, it is important to explore the impact of physical education course psychoeducation on students' psychological development and construct a quantitative analysis model for the optimization of course psychoeducation and the improvement of students' psychological level.

In exploring the question of how Civics education in the physical education classroom specifically affects students' psychological development, we need a set of scientific research methods to measure this effect. The first step is to clarify the symbiotic relationship between Civic Education and students'

psychological development at the theoretical level. In order to transform abstract psychological feelings into analyzable data, the second step is to take physical education students in teacher training colleges as the research object, and introduce the self-esteem scale, the psychological flexibility scale and the happiness index scale, which can accurately portray the students' psychological state from the dimensions of sense of self-worth, stress resistance, and life satisfaction respectively. In the third step, the powerful statistical tool of multiple linear regression model was introduced to identify, among many complex factors, how much the ideological education in physical education classroom contributes to the students' psychological indicators, so as to realize the quantitative assessment and scientific prediction of the educational effect.

2. Theoretical and quantitative methods of influencing psychological development in sports classroom civic education

2.1. The relationship between the laws of individual psychological development and the effectiveness of teaching Civics courses

Ideological and political courses are more theoretical than other courses. How to make it easier for students to accept political theoretical knowledge, regulate their own behavior, and enable them to gradually realize the transformation of "knowledge, belief and action", needs to be combined with the law of students' psychological development. Therefore, the two have a close relationship of mutual promotion. Following the law of students' psychological development can improve the effectiveness of Civics teaching, and the effective implementation of Civics can in turn promote the sound development of students' psychology, and ultimately promote the overall development of students.

First of all, the effective teaching of Civic and Political Science is conducive to the cultivation of students' stable mental state. Civic and political science classes educate and guide students through the content of the courses and the teaching situations set up, which can improve the ideological and moral quality of the students and help them form correct values and noble ideals and beliefs. At the same time, the emotional channeling and moral leadership that occurs in the teaching process of the Civic and Political Science Class can help students eliminate the negative and conservative emotions that may exist deep inside their hearts, so as to form a positive and healthy state of mind towards themselves, the people around them and even towards the society as a whole. Positive psychological state will in turn affect the students' mental state, so that they can face the difficult trivialities of life with a better mental outlook.

Secondly, the teaching of Civics is conducive to the cultivation of individual initiative and creativity and accelerates the socialization process of students. Education itself is a conscious activity of cultivating human beings. Civic and political science classes can guide students to accept the mainstream ideology of the society through the content of the courses, form a sense of identity with the socialist society, and enhance their ability to correctly understand the world and transform the world. Through education, students are motivated to utilize and apply their own initiative and creativity, and to solve practical problems encountered in real life by utilizing the knowledge learned in the classroom, so as to better integrate into the complex society in the future and to promote the harmonious development of themselves and the society.

Finally, the effective teaching of Civic and Political Science can cultivate a more stable psychological state of students by improving their individual "temperament". Compared with other psychological traits, "temperament" is the most stable. But this stability is relative rather than absolute, it will change with the external environment and education and other factors. From the perspective of psychology, any type of temperament needs to be viewed dialectically. In the process of teaching Civics, students with different temperament types should be taught according to their abilities, so that they can gradually form a relatively stable psychological state by improving their "temperament". It is impossible to give all the knowledge and ability to the students in the Civics course, and the society itself is constantly developing and changing. Only when students have formed a stable psychological state can they better cope with various problems in the ever-changing society.

2.2. Study Population and Measurement Instrument

In order to scientifically explore the actual impact of Civic Education on students' psychological development in physical education classrooms, the study selected a representative sample group and used a variety of psychometric tools for data collection.

2.2.1. Objects of study

Students majoring in physical education in three teacher training colleges were sampled, and then

students majoring in physical education were randomly selected according to the total number of students in an equal proportion stratified sampling method, with a total of 478 valid subjects, including 361 male and 117 female students: the number of students from freshman to senior year were 162, 140, 113 and 63, respectively: 279 students of rural origins, 101 students from towns and cities, and 98 students from cities. The average age was 21.43 ± 2.61 years.

2.2.2. Instruments for measuring students' psychological development

In order to accurately assess the psychological development of students after receiving sports ideology education, it is not enough to rely only on subjective judgment, but must use scientific and quantifiable measurement tools. The study selected three scales widely used in psychological research to quantitatively assess students' psychological status from three dimensions: self-esteem level, psychological flexibility and subjective well-being.

(1) Self-esteem scale

The Rosenberg Self-Esteem Scale was used in this study, which covers both self-affirmation and self-negation dimensions. Question 8 was deleted due to its less-than-ideal discriminant index and Chinese-Western differences. After the deletion of this question, the scale consisted of nine questions, of which questions 3, 5, 8, and 9 were reverse-scored questions. The scale was scored on a 4-point Likert scale, with 1 indicating very non-conformity and 4 indicating very conformity, and the higher the score, the higher the level of self-esteem.

(2) Psychological Resilience Scale

The Psychological Resilience Scale used in this study consists of 28 questions, 12 of which are reverse-scored and contain five dimensions: interpersonal assistance, emotional control, family support, positive cognition and goal focus. The scale is scored on a 5-point Likert scale, with 1 indicating complete noncompliance and 5 indicating complete compliance, and the higher the score, the better the psychological resilience.

(3) Indicator of Student Happiness Scale

The index scale of student happiness in colleges and universities is used, which has 12 questions and contains three dimensions: emotional index, life satisfaction and study satisfaction. The scale is scored on a 7-point Likert scale, and the higher the score, the higher the level of happiness.

2.3. Multiple linear regression models and their assumptions

After obtaining multidimensional data on students' psychological development, we introduced a multivariate linear regression model to quantitatively analyze the extent of the impact of physical education classroom civic education on students' psychological attributes.

2.3.1. Multiple linear regression models

Regression models are correlated and can be purposively predicted for a given variable. One-dimensional linear regression modeling is the simplest. However, in portraying the data and establishing the relationship between the variables, we find that the change of the dependent variable is affected by many factors, so for the sake of the comprehensiveness of information and the accuracy of the model, we need to establish a multiple linear regression model for the data.

The specific expression is as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \mu \tag{1}$$

where β_0 is called the constant term; $\beta_1, \beta_2, \cdots, \beta_k$ are called the regression coefficients; y is the random dependent variable; $x_1, x_2, \cdots, x_k$ is the non-random independent variable; and μ is called the the random error term.

If n observations are made on y and x and n sets of observations $y_i, x_{i1}, \cdots x_{ik} (i = 1, 2, \cdots, n)$ are obtained, they are related as follows:

$$y_i = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_k x_{ik} + \mu_i \tag{2}$$

Introducing matrix notation, notation

$$y=\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}, X=\begin{bmatrix} 1 & x_{11} & \cdots & x_{1k} \\ 1 & x_{21} & \cdots & x_{2k} \\ \vdots & \vdots & & \vdots \\ 1 & x_{n1} & \cdots & x_{nk} \end{bmatrix}, \beta=\begin{bmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_k \end{bmatrix}, \mu=\begin{bmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_n \end{bmatrix}$$

Then model (2) can be written in the following form:

$$Y = X\beta + \mu \tag{3}$$

where Y is the $n\times 1$ observation vector; X is the $n\times(k+1)$ known design matrix; μ is the $n\times 1$ random error term, and β is the $(k+1)\times 1$ unknown parameter vector.

In regression analysis, multiple linear regression occupies a fundamental and very important position. The same linear regression modeling is applicable to the article's question of quantifying the impact of physical education classroom civic education on students' psychological development. And non-linear can also be “linearized”, thereby reducing the complexity of the model, for example, the power function to take the logarithm, can be converted from a non-linear model to a linear one. This is more realistic and can lead to effective predictions.

2.3.2. Linear regression model assumptions

For better model parameter estimation, hypothesis testing and judgmental prediction. Usually, the construction of multiple linear regression model live live is carried out under some classical assumptions. If the model does not satisfy these classical assumptions, then it will lead to wrong analysis results and cause some troubles.

The classical assumptions of the linear regression model are as follows:

(1) The random error term μ_i is a random variable with an expected value or mean of 0, which satisfies the assumption of unbiasedness;

$$E(\mu_i)=0,(i=1,2,\ldots,n) \tag{4}$$

(2) The random error term has the same variance for all observations of the explanatory variables, satisfying the homogeneity assumption;

$$\operatorname{var}(\mu_i)=\sigma^2, i=1,2,\ldots,n \tag{5}$$

(3) The random error terms are uncorrelated with each other;

$$\operatorname{cov}(\mu_i,\mu_j)=E(\mu_i\mu_j)=\begin{cases}\sigma^2, i=j \\ 0, i\neq j\end{cases}(i,j=1,2,\ldots,n) \tag{6}$$

This condition is called the Gauss-Markov condition.

(4) The explanatory variables do not have the property of randomness and are uncorrelated with the random error term;

$$\operatorname{cov}(x_{ij},\mu_j)=0,(i=1,2,\cdots,k, j=1,2,\ldots,n) \tag{7}$$

(5) The explanatory variables do not have a perfectly linear relationship with each other. In mathematical language, the matrix of sample observations of the explanatory variables is full rank;

$$\mu_i \sim N(0,\sigma^2) \tag{8}$$

(6) The random error term follows normal distribution, which ensures the validity of F-test and *t*-test;

Under these conditions the valid results of regression coefficients and σ^2 estimation can be obtained, the significance of the explanatory variables in the regression model as well as the model as a whole, and the correct estimation of the prediction interval can be obtained.

3. Reliability test and model validation of the influence of sports classroom civic education on psychological development

Turning next to the empirical analysis, real data were used to examine how exactly the Civic

Education in the PE classroom affects students' psychological development. First, the three scales used in the study were strictly tested for reliability to ensure the accuracy and reliability of the measurement results. Subsequently, correlation and regression analyses were conducted to dig deeper into the intrinsic connection between the dimensions of Civic and Political Education and the psychological indicators.

3.1. Analysis of the reliability of the questionnaire

In order to ensure the reliability of this study, the reliability and validity of all scales were tested. The test chosen for this validity study was the Cronbachs Alpha Coefficient of Consistency (Cronbach's Alpha Coefficient), which is 0.6 or more to prove that the questionnaires have good consistency. The KOM test was chosen for the validity study. When KMO $\geqslant$ 0.9, it means very suitable; when 0.8 $\leqslant$ KMO < 0.9, it means suitable; when 0.7 $\leqslant$ KMO < 0.8, it means fair; when 0.6 $\leqslant$ KMO < 0.7, it means barely; when 0.5 $\leqslant$ KMO < 0.6, it means not suitable.

In this paper, the reliability of the scales involved as a whole and its dimensions were tested using SPSS 26.0, and the validity of the scales was analyzed using KMO values and Bartlett's spherical test.

3.1.1. Self-esteem scale

The self-esteem scale reliability test is shown in Table 1.

Table 1. Reliability and validity test of the self-esteem scale.

Reliability	Dimension	Number of items	Cronbachs α
	Self-affirmation	5	0.783
	Self-denial	4	0.778
	Self-esteem	9	0.796
Validity	KMO	0.871	
	Bartlett	Chi-square	4172.832
		df	34
		Sig.	0.000

The Cronbachs alpha coefficient of the scale as a whole was 0.796, and the Cronbachs alpha coefficients of the two dimensions of self-affirmation and self-negation were 0.783 and 0.778, respectively, both of which were greater than the reliability test criterion of 0.7, which can be seen in the measurement of students' psychological development in the questionnaire of the Self-Esteem Scale of good reliability.

In terms of validity, KMO=0.871, which belongs to the [0.8,0.9) interval, indicating that the validity of the scale is appropriate, and the approximate chi-square value under the Bartlett's test of sphericity is 4172.832, and the degree of freedom df=34, with a significance P-value of less than 0.001, which once again sufficiently corroborates that the validity of the scale is good.

3.1.2. Psychological Resilience Scale

The results of the psychological resilience scale reliability test are shown in Table 2.

Table 2. Reliability and validity test of the psychological resilience scale.

Reliability	Dimension	Number of items	Cronbachs α
	Interpersonal assistance	6	0.763
	Emotional control	5	0.774
	Family support	4	0.762
	Positive cognition	7	0.743
	Goal concentration	6	0.767
	Psychological resilience	28	0.819
Validity	KMO	0.911	

	Bartlett	Chi-square	15373.289
		df	371
		Sig.	0.000

Psychological resilience as a whole also showed good reliability. The Cronbach's alpha coefficient of the total scale is 0.819, and the alpha coefficients of the five dimensions are all above 0.7, especially the “emotional control” dimension has the highest reliability of 0.774, which indicates that the scale has good internal consistency and stability in measuring students' psychological resilience.

In terms of validity, the KMO value of the psychological resilience scale is 0.911, which is much higher than the threshold of 0.9, indicating that the structural validity of the scale is very satisfactory. Meanwhile, the approximate chi-square value of the Bartlett's test of sphericity was as high as 15,373.289, which still reached a significant level with 371 degrees of freedom ($p < 0.001$), further confirming that the scale items have strong correlations with each other, which is suitable for factor analysis.

3.1.3. Subjective well-being scale

The results of the reliability and validity tests of the index of students' subjective well-being scale are shown in Table 3.

Table 3. Reliability and validity test of the Subjective well-being scale.

Reliability	Dimension	Number of items	Cronbachs α
	Emotional index	9	0.902
	Life satisfaction	2	0.783
	Learning satisfaction	1	-
	Subjective well-being	12	0.913
Validity	KMO	0.920	
	Bartlett	Chi-square	7284.027
		df	38
		Sig.	0.000

In terms of reliability, the Cronbach's alpha coefficient of the Total Subjective Well-Being of Students scale is as high as 0.913, showing excellent internal consistency. The Cronbachs α of the affective index dimension = 0.902.In terms of validity indicators, the scale has a KMO value of 0.920, indicating that there are many common factors among the variables, which is very suitable for factor analysis.The approximate chi-square value of the Bartlett's test of sphericity is 7,284.027, with a degree of freedom of 38, and it has reached the level of significance ($p < 0.001$). This scale containing 12 questions can clearly reflect the changes in students' subjective well-being after receiving sports civics education.

3.2. Regressivity Analysis of Civic Education and Mental Health Development in the Physical Education Classroom

This section introduces a multivariate linear regression model to help us identify which are the core drivers of students' psychological growth from the four dimensions of civic education (frequency of civic education integration; richness of civic education forms, students' identification with civic content, and perceived effectiveness of civic teaching).

3.2.1. Correlation analysis

Pearson product-difference correlation was used to analyze the two variables of physical education classroom civic education and students' mental health development to understand the correlation and the strength of the correlation between the two. The results of the correlation analysis of the sports classroom civic education and mental health development are shown in Figure 1.

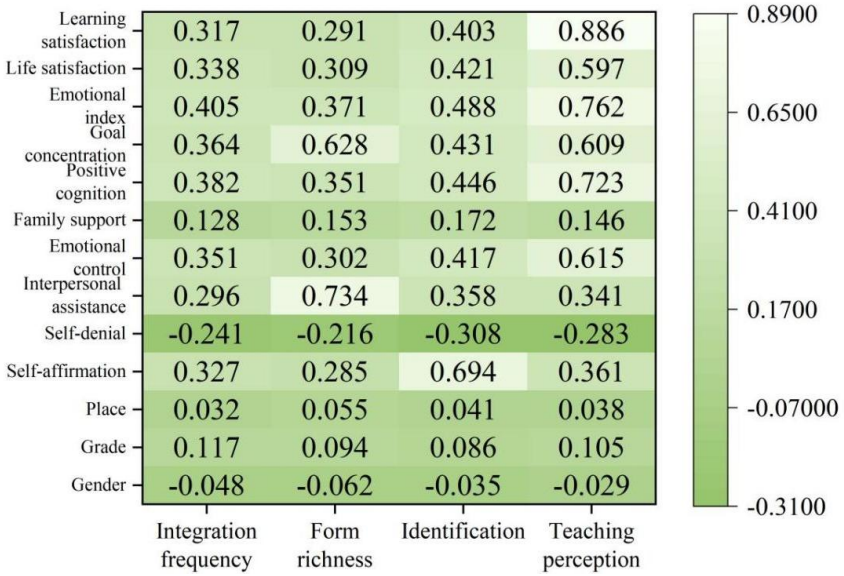

Figure 1. Correlation analysis between and Political Education and Mental Health.

The associations between demographic variables and Civic Education are generally weak, with correlation coefficients ranging from -0.062 to 0.117, which are significantly different, indicating that gender, grade level, and place of origin do not have a significant impact on students' perceptions of Civic Education. Thus, in the following regression analysis, these three demographic variables were placed in the first block of the regression model as control variables.

A deeper look reveals that students' psychological development shows the strongest correlation with perceived effectiveness of Civic education, and the coefficient with learning satisfaction is as high as 0.886, indicating that the more students feel the actual effect of Civic education, the more satisfied they are with their learning. All the dimensions of Civic and Political Education are negatively correlated with self-denial, indicating that effective Civic and Political Education does help to reduce students' self-denial tendency. The richness of Civic and Political Education forms showed particular strengths in interpersonal assistance and goal focus, with correlation coefficients of 0.734 and 0.628, respectively, and significant correlations between the variables, and the diversified forms of teaching and learning may be particularly helpful to the cultivation of these psychological qualities.

3.2.2. Multiple regression analysis

Since there were significant differences in the variables among students by gender, grade level, and place of origin, these three demographic variables were placed in the first block of the regression model as control variables in the regression analysis. Using the degree of physical education classroom civic education as the independent variable and the students' total mental health development score as the dependent variable, multiple regression analyses were conducted to explore the predictive effect of the physical education classroom civic education approach on the students' total mental health score. The results of the multiple regressivity analysis of sports classroom Civics education and mental health development are shown in Table 4.

Table 4. Multiple regression between and Political Education and Mental Health.

	Integration frequency	Form richness	Identification	Teaching perception
Multivariate correlation coefficient	0.684	0.667	0.793	0.884
$R^2/\triangle R^2$	0.315	0.256	0.637	0.718
F	2.303	3.709	25.493***	36.254***
Sig.	0.221	0.339	0.001	0.000

B	0.676	0.621	0.752	0.733
Intercept	68.343			
Beta	0.218	0.158	0.414	0.438

Civics education in the physical education classroom had a significant effect on students' psychological development, but the explanatory power of the four regression models varied. The performance of perceived effectiveness of Civics teaching is the brightest, not only the multivariate correlation coefficient reaches 0.884, but also the explanatory variance is as high as 71.8%, which means that this variable alone explains the vast majority of the variance in mental health development. And the coefficient of determination of students' identification with the content of Civics was 0.637. From the standardized coefficients, the predictive power of students' identification with the content of Civics (Beta=0.414) and the perceived effectiveness of Civic Teaching (Beta=0.438) was significantly stronger than that of the other two variables. This suggests that students' internal identification with the content of Civics and their actual perception of the teaching effect are the core drivers of psychological development. In contrast, the frequency of integration of Civic and Political education and the richness of forms are not significant in enhancing students' psychological health development, with R2 values of only 0.315 and 0.256, which have weak explanatory power, and Beta coefficients of 0.218 and 0.158, which have a relatively limited impact.

4. Analysis of psychological development after the application of civic education in the physical education classroom

Continuing with the 164 students of a teacher training college's physical education program in the research subject of section 2.2.1, the students were proportionally selected to form two groups of 82 students each in each grade level. The experimental group of students in the physical education classroom Civics education, the control group of students in accordance with the traditional teaching mode.

Using the symptom self-assessment scale SCL90 as a research tool, the students' mental health status was divided into somatization, obsessive-compulsive disorder, depression, anxiety, interpersonal sensitivity, hostility, terror, paranoia, and psychosis groups. A five-point Likert scale was used, i.e., no, very mild, moderate, severe, and severe, with no symptoms set as 1 and 2-5 as positive.

4.1. Comparative analysis before and after the experiment

4.1.1. Analysis of the current state of mental health and longitudinal comparison in the experimental group

In order to examine the impact of sports classroom ideology education on the development of students' mental health, the data of SCL-90 assessment before and after the experimental group carried out sports classroom ideology education was analyzed by the difference between the experimental group and the experimental group before and after the SCL-90 assessment data, because SCL-90 test data is not normally distributed, this paper uses the paired samples of SPSS to analyze the difference between the experimental group before and after the experimental group. The comparison data of the experimental group before and after the experiment are shown in Table 5.

Table 5. The comparative data of the experimental group before and after experiment.

	Before	After	Difference	z	df	P	Cohen's d
Somatic symptoms	1.302±0.521	1.232±0.528	-0.070	-1.826	82	0.068	0.215
Obsessive-compulsive disorder	1.673±1.252	1.512±0.946	-0.161	-2.314	82	0.021	0.273
Depression	1.801±1.233	1.549±1.079	-0.252	-3.125	82	0.002	0.368

Anxiety	1.945±1.441	1.488±0.946	-0.457	-3.892	82	0.000	0.459
Social sensitivity	2.023±1.456	1.659±1.157	-0.364	-3.467	82	0.001	0.408
Aggression	1.462±1.014	1.195±0.656	-0.267	-2.983	82	0.003	0.351
Horror	1.306±0.887	1.134±0.561	-0.172	-2.157	82	0.031	0.254
Paranoia	1.512±1.083	1.073±0.306	-0.439	-4.126	82	0.000	0.486
Psychosis	1.368±0.629	1.134±0.438	-0.234	-3.341	82	0.001	0.394

In order to show the distribution of students' mental health status before and after the experiment more clearly, the axes whisker plots of the distribution of nine categories of mental health status of 82 students before and after the experiment in the experimental class were also plotted as shown in Figures 2 and 3.

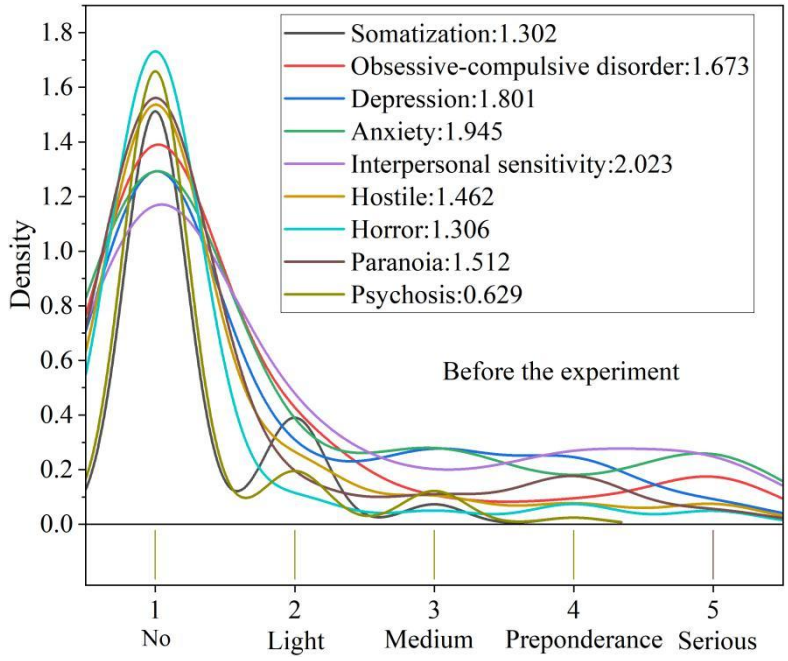

Figure 2. The distribution of 9 types of mental health conditions before experiment.

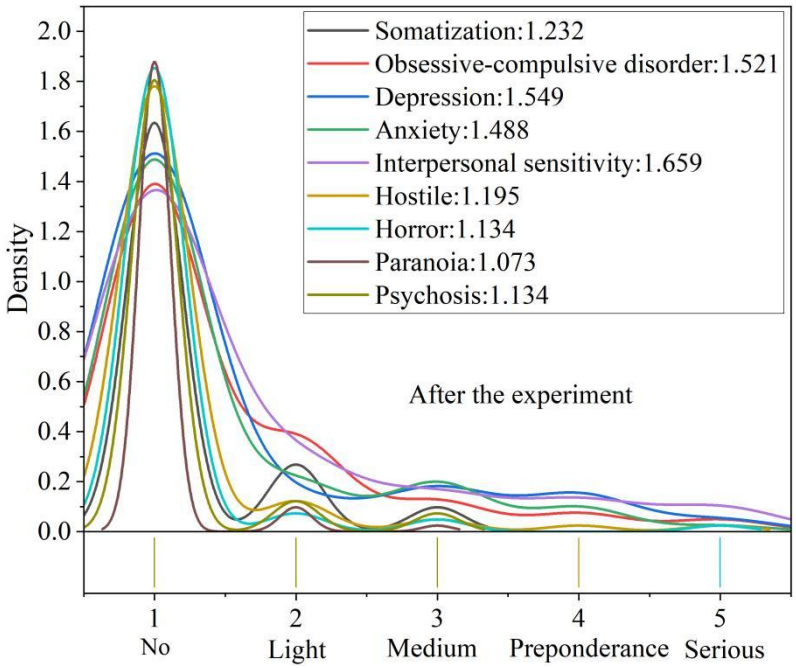

Figure 3. The distribution of 9 types of mental health conditions after experiment.

The data from the experimental group showed that the physical education classroom Civics did bring about positive changes. Over the course of a semester, students improved in all psychological dimensions. Especially in the two dimensions of anxiety and paranoia, the greatest improvement was in anxiety, with scores dropping from 1.945±1.441 to 1.488±0.946, and paranoia dropped even more dramatically from 1.512 to 1.073. Improvements in the dimensions of interpersonal sensitivity, depression, and hostility were also quite obvious, with effect sizes of 0.35 or more, achieving a moderate improvement effect. The only somewhat exceptional one is somatization symptoms, which were also alleviated but not statistically significant, P=0.068 > 0.000, probably because the effect of Civic Education on the physiological dimension is relatively indirect.

Combined with the distribution graph, the density of severe, severe, moderate and mild under the level of each psychological dimension floated between 0.2-0.4 before the experiment, and there were five people with severe interpersonal sensitivity and anxiety, while three people with severe interpersonal sensitivity were relieved and four people with severe anxiety were relieved after the improvement of Civic and Political Education in the physical education classroom. Overall, the mental health level of the students in the experimental group did get an overall improvement, and the density of students without problems increased to 1.9.

4.1.2. Mental health status and longitudinal comparison analysis of the control group

The comparative data before and after the experiment for the control group using the traditional physical education teaching model are shown in Table 6.

Table 6. The comparative data of the control group before and after experiment.

	Before	After	Difference	z	df	P	Cohen's d
Somatic symptoms	1.315±0.508	1.298±0.523	-0.017	-0.445	82	0.657	0.052
Obsessive-compulsive disorder	1.659±1.238	1.613±1.315	-0.047	-1.128	82	0.579	0.057
Depression	1.792±1.241	1.728±1.226	-0.064	-0.523	82	0.551	0.062
Anxiety	1.931±1.433	1.845±1.417	-0.086	-0.674	82	0.513	0.179

Social sensitivity	2.011±1.442	1.883±1.518	-0.128	-1.284	82	0.089	0.251
Aggression	1.448±1.008	1.366±1.095	-0.082	-1.162	82	0.124	0.172
Horror	1.293±0.875	1.226±0.862	-0.067	-0.391	82	0.696	0.046
Paranoia	1.524±1.091	1.467±1.074	-0.057	-0.692	82	0.489	0.092
Psychosis	1.351±0.621	1.328±0.613	-0.023	-0.298	82	0.766	0.035

The effects of the traditional physical education model were indeed more limited, and the changes in the various psychological dimensions of the students in the control group can be characterized as choppy. Most of the dimensions showed only slight improvements, with depression dropping from 1.792 to 1.728 and anxiety from 1.931 to 1.845, but the p-values for all of these changes were above 0.5, suggesting that they were likely just random fluctuations. Only the area of interpersonal sensitivity had a significant increase of 0.1, probably because after a semester of physical education students' interpersonal relationships would be less screwed up with sports. Except for interpersonal sensitivity, the effect sizes of all other dimensions are below 0.2, a figure that tells us quite intuitively that it is indeed not very easy to improve students' psychological state without deliberately integrating Civic Education in physical education classes.

4.2. Cross-sectional comparative analysis of experimental and control groups

In order to test the effect on students' mental health between ideological education and general traditional teaching in physical education classroom, the SCL-90 test data of the experimental group and the control group after teaching were analyzed differently, and the comparative data of the experimental group and the control group after the teaching experiment are shown in Table 7 and Figure 3.

Table 7. Comparison between experimental group and control group after experiment.

	Experimental group	Control group	Difference	z	df	P	Cohen's d
Somatic symptoms	1.232±0.528	1.298±0.523	0.066	1.732	82	0.084	0.127
Obsessive-compulsive disorder	1.512±0.946	1.613±1.315	0.101	2.145	82	0.032	0.087
Depression	1.549±1.079	1.728±1.226	0.179	3.028	82	0.003	0.156
Anxiety	1.488±0.946	1.845±1.417	0.357	4.326	82	0.000	0.293
Social sensitivity	1.659±1.157	1.883±1.518	0.224	3.784	82	0.000	0.168
Aggression	1.195±0.656	1.366±1.095	0.171	2.963	82	0.003	0.183
Horror	1.134±0.561	1.226±0.862	0.092	1.985	82	0.048	0.124
Paranoia	1.073±0.306	1.467±1.074	0.394	5.127	82	0.000	0.482
Psychosis	1.134±0.438	1.328±0.613	0.194	3.421	82	0.001	0.371

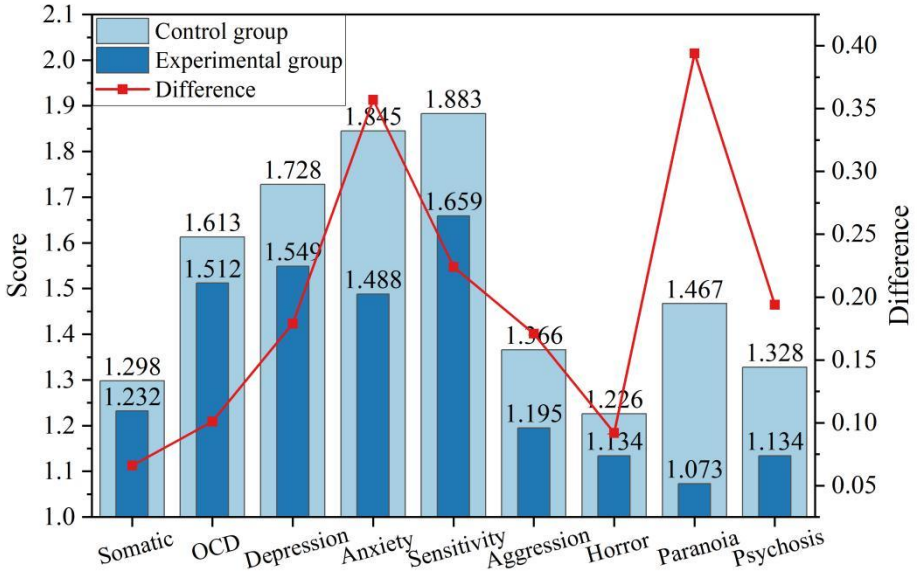

Figure 3. Comparison between experimental group and control group after experiment.

The differences are even more striking when the two sets of data are viewed side-by-side. Students in the experimental group outperformed the control group on all nine dimensions, and the differences reached the 0.05 statistically significant level for all eight dimensions except somatization symptoms. The gap in the paranoia dimension is the most prominent, with a gap of 0.394 and an effect size of 0.482, which means that sports ideology education is most effective in helping students build a more open and inclusive mindset. The gap in the anxiety dimension is also large, with scores of 1.845 and 1.488 for the traditional teaching group and the group integrating Civic and Political Education, respectively, and the experimental group's students have significantly lower levels of anxiety. Even the terror dimension, which has the smallest difference, reaches a significant level although the difference is only 0.092. Compared with traditional teaching, the physical education classroom integrating Civic and Political Education can promote students' mental health in an all-round way.

5. Conclusion

Regression analyses showed that students' internal recognition of the content and their personal perception of the teaching effect were the most important factors driving psychological development, with standardized regression coefficients of 0.414 and 0.438, respectively, compared to the relatively limited contribution of increasing the frequency of education or enriching the form of teaching. The multiple regression model constructed in this study successfully quantified the effects of education on psychological development, with the single variable of “perceived effectiveness” explaining 71.8% of the variance in mental health.

In actual physical education activities, ideological and political education has a significant effect on promoting students' mental health, especially on anxiety and paranoia, with effect sizes of 0.459 and 0.486, respectively, and all kinds of unhealthy mental health of students have been alleviated. This means that physical education classes that incorporate elements of ideology and politics can effectively help students unload their psychological baggage and face their studies and life with a more open and healthy mindset.

References

1. Risyanto, A., Subarjah, H., Ma'mun, A., & Prabowo, I. (2024). The effect of student-centred learning approaches in physical education on positive youth development. Edu Sportivo: Indonesian Journal of Physical Education, 5(1), 10-21.
2. Ní Chróinín, D., Fletcher, T., & O’Sullivan, M. (2018). Pedagogical principles of learning to teach meaningful physical education. Physical education and sport pedagogy, 23(2), 117-133.
3. Wang, N., Wang, Q., Liu, X., Mahfooz, M., & Savila, Z. (2023). Examining the impact of physical education and physical skills development on preschoolers’ physical and mental health. Frontiers in Psychology, 13, 1000653.
4. Bavčević, T., Prskalo, I., & Bavčević, D. (2018). A comparative analysis of different models for management of the teaching process in physical education. Acta kinesiologica, 12(2), 57-66.

5. Hein Mendes, E., & Defreyn, N. (2022). Unique features of physical education–a look at evaluation. Pensar en Movimiento: Revista de ciencias del ejercicio y la salud, 20(2), 130-145.
6. Chapman, S. (2021). Analysing mindset theory and strategies supporting the implementation of real PE to develop a growth mindset culture. Polish Journal of Educational Studies, 73(1), 39-62.
7. Santos, J., Batista, M., Serrano, J., Honório, S., Rente, I., & Petrica, J. (2023). What are students thinking in Physical Education classes. Retos, 49, 1063-1067.
8. Doherty, A., & Forés Miravalles, A. (2019, September). Physical activity and cognition: Inseparable in the classroom. In Frontiers in Education (Vol. 4, p. 105). Frontiers Media SA.
9. Liu, C., Qu, G., & Gao, R. (2023). Defining sports moral character and clarifying its related concepts. Frontiers in Sports and Active Living, 5, 1101377.
10. Jia, J. (2020, February). Ideological and Political Construction Practice of College Physical Education Course from the Perspective of Moral Education Based on" Independence-Cooperation-Exploration". In 2020 12th International Conference on Measuring Technology and Mechatronics Automation (ICMTMA) (pp. 881-884). IEEE.
11. Sun, Q. (2021, May). Organic Combination of Ideological and Political Education and Public Physical Education in Universities. In 2021 2nd International Conference on Computers, Information Processing and Advanced Education (pp. 579-582).
12. Zhang, Y., & Chen, C. (2021). Practice and thinking of integrating ideological and political theory courses into middle school physical education teaching. Frontiers in Educational Research, 4(12).
13. Zhang, H., Lu, H., Xu, S., Xu, B., & Zongxia, L. (2022). The Logical Starting Point and Practical Pursuit of Ideological and Political Education in Physical Education from the Perspective of Fostering Virtue through Education. Journal of Asian Society for Health & Exercise, 4(2), 33-43.
14. Umirovich, A. O. (2021). FACTORS, INFLUENCE ON STUDENT DEVELOPMENT. INFORMATION TECHNOLOGY IN INDUSTRY, 9(3), 945-953.
15. Asghar, M., Minichiello, A., & Ahmed, S. (2024). Mental health and wellbeing of undergraduate students in engineering: A systematic literature review. Journal of Engineering Education, 113(4), 1046-1075.
16. Vygotsky, L. S. (2017). The Problem of Teaching and Mental Development at School Age [Problema obuchenija i umstvennogo razvitija v shkol'nom vozraste]. Changing English, 24(4), 359-371.
17. Ciydem, E., Avci, D., Uyar, M., & Seyhan, A. (2023). The relationship between basic psychological needs and emotional and behavioral problems in middle school students. Journal of Child and Adolescent Psychiatric Nursing, 36(3), 179-187.
18. Liu, M., Shi, B., & Gao, X. (2024). The way to relieve college students' academic stress: The influence mechanism of sports interest and sports atmosphere. BMC psychology, 12(1), 327.
19. Du, X., & Liu, Z. (2022). Influence of physical education on the mental health of college students. Revista Brasileira de Medicina do Esporte, 28(4), 311-314.
20. Wang, K., Li, Y., Zhang, T., & Luo, J. (2022). The relationship among college students' physical exercise, self-efficacy, emotional intelligence, and subjective well-being. International journal of environmental research and public health, 19(18), 11596.
21. Han, X., Li, H., Xiao, C., Wang, W., Gao, K., Yan, S., & Niu, L. (2025). Physical activity enhances college students' mental health through social adaptability and exercise behavior chain mediation. Scientific Reports, 15(1), 21127.
22. Liu, J., Deng, X., Liu, Y., & Li, J. (2024). Value Analysis of Improving College Students' Physical Education and Mental Health Accomplishments under Curriculum Ideological and Political Education. Revista de Psicología del Deporte (Journal of Sport Psychology), 33(1), 126-138.
23. Hui, J., Xin, S., & Cheng, C. (2024). The Effect of Physical Education on Improving College Students' Mental Health in the Context of Curriculum Ideology and Politics. Revista de Psicología del Deporte (Journal of Sport Psychology), 33(3), 207-217.
24. Feng, S. (2022). The Penetration of Personality Psychology In Ideological And Political Education In Colleges And Universities. Psychiatria Danubina, 34(suppl 1), 681-682.
25. Liu, B., & Zhang, L. (2024). The Role of Physical Exercise in Improving College Students' Psychological Quality Under the Background of Ideological and Political Education. Revista de Psicología del Deporte (Journal of Sport Psychology), 33(3), 84-92.
26. Shi, B., & Hou, K. (2024). The Influence of Combining Ideological and Political Courses with Physical Education on the Psychological Resilience of College Students. Revista de Psicología del Deporte (Journal of Sport Psychology), 33(4), 153-160.
27. Babieva, N. S., Romanova, A. V., Reznichenko, S. A., Kosykh, O. I., Kosolapova, N. V., Vlasenko, L. V., & Krasheninnikova, E. I. (2022, July). Digitalization during the era of COVID-19: An analysis of the psychophysiological strain of university students. In Frontiers in Education (Vol. 7, p. 961046). Frontiers Media SA.
28. Abdurahman, S., Atari, M., Karimi-Malekabadi, F., Xue, M. J., Trager, J., Park, P. S., ... & Dehghani, M. (2024). Perils and opportunities in using large language models in psychological research. PNAS nexus, 3(7), pgae245.
29. Wang, K., Yang, Y., Zhang, T., Ouyang, Y., Liu, B., & Luo, J. (2020). The relationship between physical activity and emotional intelligence in college students: The mediating role of self-efficacy. Frontiers in psychology, 11, 967.

30. Zong, X., Lipowski, M., Liu, T., Qiao, M., & Bo, Q. (2022). The sustainable development of psychological education in students' learning concept in physical education based on machine learning and the internet of things. Sustainability, 14(23), 15947.