Research on the Adjustment of Physical Education Teaching Content Based on the Big Data of Physical Test Scores in Colleges and Universities

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Abstract. Based on the newly promulgated 'Standards of Students' Health and Physical Fitness', and the big data of physical test scores of 4 colleges and universities in a certain area, this paper will use the fuzzy comprehensive evaluation method to analyze and research the big data of college physical test scores. According to the analysis results, the physical test scores of students in the four colleges and universities are not ideal. The actual physical test scores are mainly concentrated in the passing level, while the excellent and good levels are relatively few, and a large number of students fail the physical test scores. In view of this situation, at the end of this paper, based on the big data of college physical examination results, a method for adjusting the teaching content of physical education courses is proposed, which aims to provide a theoretical reference for the subsequent reform of physical education teaching in colleges and universities, so as to improve the level of students' physical quality and ensure the healthy growth and development of students.

Keywords: physical examination results in colleges and universities · big data · physical education · teaching content adjustment

1 Introduction

All along, the Party and the country have paid great attention to and attached great importance to the physical health of the majority of students, and encouraged students to actively participate in physical exercise. China started the reform of physical education, and in 2014 formulated the latest 'National Student Physical Health Standards'. The implementation of this standard not only provides important reference and constraints for sports work, but also drives the continuous improvement of students' physical fitness level to a certain extent. Based on this, in order to deepen the reform of physical education teaching, the research will reasonably propose a variety of methods for adjusting the teaching content of physical education based on the big data of physical test scores in colleges and universities. It has certain practical significance for promoting the teaching reform of physical education and improving the physical quality of students.

Table 1. Table of students in 4 universities in an area

School number	Gender	Number of students in grade 19	Number of students in grade 20
1	Male	2457	2543
	Female	2200	2289
2	Male	1744	1916
	Female	1806	1851
3	Male	1623	1830
	Female	1919	1928
4	Male	1648	1724
	Female	1726	1808

2   Study Objects and Research Methods

2.1   Study Objects

In the research, in order to ensure the accuracy and validity of the research results, the principle of random sampling will be adopted. Four colleges and universities were randomly selected from all colleges and universities in a certain area, and the big data of their students' physical test scores were used as the research objects. The specific students' situation is shown in Table 1.

As shown in Table 1, among the four randomly selected colleges and universities, there are 15,783 boys and 15,527 girls in grades 19 and 20, respectively. The overall difference in the number of males and females is relatively small. At the same time, in specific research, it is also necessary to focus on data missing and screening, and the data used must require relevant students to participate in all physical examination items. If there are missing items, they should be deleted in time to avoid affecting the results of subsequent research.

2.2   Research Methods

In the specific study, Python 2X software will be used for comprehensive analysis of students' physical measurement big data information. The following data processing process is mainly designed in this process.

Data import means to use the read_CSV function to import CSV files on the local end or Web end. Data changes refers that data is extracted and transformed through columns attribute and index speed. After analyzing and processing the data information, the obtained data information needs to be further analyzed and processed by fuzzy comprehensive evaluation method, and MATLAB software is needed in this process. First of all, all data information is accurately screened, and useless data such as missing items and are eliminated to ensure the accuracy of test results. Secondly, based on

the newly promulgated 'Standards of Students' Health and Physical Fitness', a fuzzy comprehensive evaluation of college students' physical test results is carried out. Among them, those with a physical test score of 90 or more are considered excellent. 80–89.9 points are regarded as good, 60–79.9 points are regarded as passing and less than 60 points are regarded as failing. A comment set based on this basis is $V = \{V_1, V_2, V_3, V_4\}$. V_1, V_2, V_3, V_4 are excellent, good, pass, failing. Finally, the evaluation set of physical test score data of college students is $U = \{U_1, U_2, U_3, \ldots U_7\}$. Among them, $U_1, U_2, U_3, \ldots U_7$ based on the section of the boys and girls' physical test program, boys have the body mass index, spirometry, standing long jump, pull-up, sitting anterior flexion, 50 m, 1000 m. Girls have the body mass index, vital capacity, standing long jump, sit-up, sitting position forward flexion, 50 m, 800 m. By constructing a fuzzy comprehensive evaluation analysis matrix, a comprehensive analysis and evaluation of the big data of physical test scores of middle school students in 4 colleges and universities is carried out.

3   Results and Analysis

3.1   Analysis of Big Data Results of Physical Examination Results of College Boys

Based on the distribution of the number of boys in the four colleges and universities, physical test scores and frequency calculations, the membership degrees obtained for each evaluation are shown in Table 2.

The fuzzy vector of weight allocation based on Table 2.

$$R_{male1} = \{0.0971, 0.1323, 0.737, 0.038\},$$
$$R_{male2} = \{0.0759, 0.1229, 0.767, 0.0386\}, \ldots$$
$$R_{male7} = \{0.0178, 0.0677, 0.7758, 0.1431\}$$
$$A_{male} = \{0.0093, \ 0.0854, \ 0.8486, \ 0.071\}$$

Table 2. Big data fuzzy relationship matrix of college boys' physical test scores (N = 15483)

Body test index	Excellent		Good		Pass		Failing	
	Number	Membership	Number	Membership	Number	Membership	Number	Membership
BMI	1486	0.0971	2032	0.1323	11394	0.737	571	0.038
Vital capacity	1158	0.0759	1885	0.1229	11859	0.767	581	0.0386
Standing long jump	384	0.0259	1759	0.1147	11424	0.7389	1916	0.1248
Pull-up	511	0.0341	632	0.0419	3225	0.2094	11116	0.719
Sit forward	3432	0.2228	5934	0.3844	6056	0.3922	76	0.006
50 m	3493	0.2267	7501	0.4856	4175	0.2708	313	0.0213
1000 m	258	0.0178	1031	0.0677	11995	0.7758	2199	0.1431
Statistical weight distribution	0.0093		0.0854		0.8486		0.071	

The big data fuzzy relationship matrix of college male can be constructed as follows.

$$Q_{male} = A_{male} \times R_{male} = \{0.0093,\ 0.0854,\ 0.8486, 0.071\}$$

$$\times \begin{Bmatrix} 0.0971,\ 0.1323,\ 0.737,\ \ 0.038 \\ 0.0759,\ 0.1229,\ 0.767,\ \ 0.0386 \\ 0.0259,\ 1.147,\ \ 0.7389,\ 0.1248 \\ 0.0341,\ 0.0419,\ 0.2094,\ 0.719 \\ 0.2228,\ 0.3844,\ 0.3922,\ 0.006 \\ 0.2267,\ 0.4856,\ 0.2708,\ 0.0213 \\ 0.0178,\ 0.0677,\ 0.7758,\ 0.1431 \end{Bmatrix}$$

It can normalize the fuzzy relation matrix that $Q_{male} = \{0.881,\ 0.804,\ 83.552, 7.543\}$.

The comprehensive evaluation results of excellent, good, pass, and fail are obtained as 0.881%, 0.804%, 83.552, and 7.543%, respectively. It can be seen that the good rate and excellent rate of male students in colleges and universities are relatively low, and most of the students' scores are within the range of pass and failing, indicating that students' physical health is relatively poor.

3.2   Analysis of Big Data Results of College Girls' Physical Examination Results

Based on the distribution of the number of girls in the four colleges and universities, physical test scores and frequency calculations, the membership degrees of each evaluation obtained are shown in Table 3.

The weight allocation based on Table 3.

$$R_{female1} = \{0.0203, 0.1162, 0.8599, 0.008\},$$
$$R_{female2} = \{0.0099, 0.0701, 0.9157, 0.0087\}, \dots$$
$$R_{female7} = \{0.0403, 0.1534, 0.7602, 0.0505\}$$

Table 3. Big data fuzzy relationship matrix of physical test scores of college students ($N = 15527$)

Body test index	Excellent		Good		Pass		Failing	
	No.	Membership	No.	Membership	No.	Membership	No.	Membership
BMI	308	0.0203	1793	0.1162	13308	0.8599	118	0.008
Vital capacity	148	0.0099	1079	0.0701	14171	0.9157	129	0.0087
Standing long jump	861	0.056	2766	0.179	10988	0.7101	912	0.0593
Sit-up	52	0.0037	514	0.0336	12307	0.7953	2654	0.1718
Sit forward	2799	0.1812	2312	0.1497	9965	0.644	451	0.0295
50 m	1594	0.1033	1476	0.0957	11787	0.7617	670	0.0437
800 m	618	0.0403	2369	0.1534	11764	0.7602	776	0.0505
Statistical weight distribution	0.0019		0.0658		0.9054		0.0313	

$$A_{\text{female}} = \{0.0019, 0.0658, 0.9054, 0.0313\}$$

The big data fuzzy relationship matrix of college girls can be constructed as follows.

$$Q_{female} = A_{female} \times R_{\text{female}} = \{0.0019,\ 0.0658,\ 0.9054,\ 0.0313\}$$

$$\times \left\{ \begin{array}{llll} 0.0203, & 0.1162, & 0.8599, & 0.008 \\ 0.0099, & 0.0701, & 0.9157, & 0.0087 \\ 0.059, & 0.179, & 0.7101, & 0.0593 \\ 0.0037, & 0.00336, & 0.7953, & 0.1718 \\ 0.1812, & 0.1497, & 0.644, & 0.0295 \\ 0.1033, & 0.0957, & 0.7617, & 0.0437 \\ 0.0403, & 0.1534, & 0.7602, & 0.0505 \end{array} \right\}$$

It can normalize the fuzzy relation matrix that $Q_{\text{female}} = \{0.0019,\ 0.648,\ 91.44,\ 3.03\}$.

The comprehensive evaluation results of excellent, good, pass, and failing are obtained as 0.0019%, 0.648%, 91.44, and 3.03%, respectively. It can be seen that the rate of good and excellent physical test scores of college girls is relatively low, and most of the students' scores are in the range of pass and failing, indicating that the students' physical health is relatively poor.

4 Adjustment Methods of PE Class Teaching Content Based on the Big Data of College Physical Test Scores

4.1 Combining Big Data Information to Set Teaching Goals

The teaching goal of physical education in colleges and universities is to cultivate students' interest in sports and improve their physical health. Based on this, physical education in colleges and universities should comprehensively analyze the individual indicators, comprehensive indicators and overall development trend of students' physical health according to the comprehensive evaluation and analysis results output by the big data of college physical test scores. In-depth analysis of the problems existing in the current physical fitness indicators of students, it can set the teaching objectives of physical education to clarify the teaching direction of physical education.

4.2 Combining Big Data Information to Formulate Teaching Plans

The formulation of the teaching plan not only needs to meet the requirements of the teaching objectives, but also needs to be adapted to the actual sports characteristics of the students based on the sports needs and hobbies of the students. Based on this, college physical education should comprehensively collect and analyze the characteristics of students' sports needs and hobbies when formulating physical education teaching plans. Combined with the results of comprehensive evaluation and analysis of the big data of physical test results, the most scientific and effective teaching plan is formulated. The specific content should include sports items in physical education classes, teaching time,

training methods. The relevant content should be able to meet the requirements of the teaching sequence, reduce the difficulty of students' understanding of physical education content, and gradually cultivate students' interest in sports. To maximize the adaptation of students' sports characteristics and sports needs, it can continuously improve students' physical health.

4.3   Improve Teaching Content by Combining Big Data Information

College physical education teachers should increase the flexible use of big data information when formulating teaching content based on teaching objectives and teaching plans, so as to enhance the pertinence and effectiveness of physical education teaching content. Specifically, college physical education teachers can comprehensively evaluate each student's strength, endurance, speed, flexibility, flexibility and other aspects based on the physical test results in the student's physical test big data. Teachers scientifically design targeted physical education content, and reasonably control the difficulty of teaching and the way of teaching. While promoting the teaching content to meet the sports characteristics and sports needs of students, it can comprehensively improve the teaching quality to ensure that the teaching content can truly meet the actual requirements of the teaching objectives of physical education in colleges and universities.

4.4   Combining Big Data Information to Configure Teaching Equipment

As one of the necessary elements of physical education teaching in colleges and universities, sports equipment can not only create a relatively good sports environment for students, stimulate students' sports interest, and subtly affect students' sports orientation. It can also enhance the scientificity and effectiveness of sports and avoid physical injuries caused by students using unqualified equipment. Based on this, college physical education teachers should with the support of colleges and universities combine the comprehensive evaluation results of the big data of physical test scores, and flexibly configure sports equipment to enhance the pertinence of physical education teaching. Taking lung capacity exercise as an example, physical education teachers can purchase sports equipment such as medicine balls and touch elevated racks to exercise students' lung capacity. It can strengthen the physical quality related to the students' vital capacity, and then achieve the effect of targeted quality training.

5   Conclusion

Through empirical analysis, it can be seen that the physical health of college students is relatively poor, and targeted exercise and improvement must be carried out. In this regard, college physical education teachers can adjust the teaching content of physical education according to the big data of college physical test results. The specific adjustment method is to set teaching goals in combination with big data information, formulate teaching plans in combination with big data information, improve teaching content in combination with big data information, and configure teaching equipment in combination with big data information. Compared with the traditional experiential PE teaching content adjustment

method, big data analysis and adjustment is more targeted and intuitive, and is more conducive to ensuring the scientificity and effectiveness of the adjusted PE teaching content. Therefore, it should be applied and popularized in the subsequent teaching of physical education in colleges and universities.

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