Role of Sports Based on Big Data Analysis in Promoting the Physique and Health of Children and Adolescents

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Abstract: Healthy body is the foundation of young people's growth. With the popularization and globalization of the Internet, multimedia technology is rapidly changing the impact of traditional media on the growth of young people. The current health situation of young people is not optimistic. The decline in physical fitness, obesity and psychological dysplasia of adolescents have aroused the concern of all sectors of society. In recent years, the emergence and dissemination of big data (BD) has brought a new dimension to the value of data applications. The combination of BD and youth health services provides young people with good health opportunities. Through the recording, analysis and release of adolescent physical health data, the system has established an extensive knowledge database on adolescent physical and mental health, thus improving the physical health of adolescents. This paper summarized and combed the overview and application of BD, and analyzed and discussed the reasons for the continuous decline of young people's physique. Through the analysis of the application of BD in the promotion of young people's physical health, this paper proposed more achievable improvement strategies and plans, and then summarizes and discusses the experiment. According to the survey and experiment, the random simulation algorithm was introduced into daily exercise, diet and life preference. The new system and health improvement strategy designed for teenagers' physical health using BD could help students improve their physical health by 55%.

Keywords: Physical Health Promotion of Children and Adolescents, BD Analysis of Sports, Artificial Intelligence, Medical Diagnosis

1. Introduction

Multimedia technology has opened up a window for young people to a new world, and provided a platform for today's young people to learn widely, obtain information, exchange ideas, use potential, entertain and understand the world. At the same time, the huge negative impact is a severe test for the healthy growth of modern youth. Youth health is the key to quality education. In recent years, due to high learning pressure, lack of sports awareness, malnutrition and other reasons, many young people are unable to live a healthy life due to their low physical quality, poor eyesight, overweight and so on. School is an important place for young people's sports activities. The main goal of school physical education is to improve the physical health of young people. In recent years, the health status of young people has improved, but the participation of young people in sports activities is still disappointing. One reason is that the school has a single sports teaching method.

The physical and mental health development of young people is a big problem in modern

education. Kokko Sami used descriptive statistics to analyze existing data sets. The results showed that in specific areas, about two-thirds of children and adolescents participate in sports clubs [1]. Rhodes Ryan E summarized and evaluated the evidence of the benefits of immersive natural experiences for children and adolescents' mental, physical and social health. By using the system evaluation scheme, the research quality was evaluated for a subset of the research, and the evidence quality was reviewed at the result level [2]. Zhu Zheng proposed a social ecological model, which studied the factors that affect children and adolescents' participation in sports activities. The results showed that gender, age, race and self-concept are the most common influencing factors [3]. Tarp Jakob determined the role of physical activity intensity and exercise duration in regulating the correlation between physical activity and cardiac metabolic risk markers [4]. Smith Jordan J found that reducing the potential adverse effects of screen time on health may be due to non discriminatory or random activities [5]. Rodriguez-Ayllon Maria suggested that participating in sports activities may contribute to the current and future mental health of young people. Through systematic review and meta-analysis, the impact of physical activity intervention on mental health results was determined [6]. Chaput Jean-Philippe surveyed physical activity and sedentary behavior guidelines for children and adolescents [7]. The above research has a more specific interpretation of promoting the physical health of children and adolescents, but it is not related to the BD analysis of sports.

The main direction of sports BD analysis is to study sports posture recognition, including posture recognition, positioning and motion analysis, spatial positioning and human tracking, sensor data analysis, information and communication technology applications, sports training, rehabilitation and competition. Patel Devansh comprehensively reviewed 5G intelligent sports and healthcare solutions assisted by the Internet of Things. It must be classified through existing literature and presented in the structure of 5G intelligent medicine [8]. Sikka Robby S believed that the design and development of Internet of Things and 5G Internet games and medical applications have begun. 5G auxiliary intelligent medical network is the integration of Internet of Things devices, which needs to improve network performance and enhance mobile phone radio waves [9]. Shidong Li discussed the impact of sports activities on the economic survival and social life of female athletes. Research showed that economic survival is an important part of sports activities and women athletes' social life [10]. Luo Jianjun analyzed the impact of large-scale sports event communication in the context of BD, and concluded that the scale of sports industry is still small [11]. Goes F R expounded the theory of data mining and the theory of sports data analysis. Taking the data analysis in basketball and track and field as an example, he discussed the application of data mining in sports industry, mass fitness monitoring and sports data analysis, and analyzed the impact of BD on sports [12]. Zhang Lan believed that the sports industry is an important part of social life and the national economy[13]. Byun Jisun analyzed the oral records of sports development contributors and explored the BD research direction of future sports development contributions [14]. These discussions on BD analysis of sports are relatively comprehensive, but they do not include the promotion of children's and adolescents' physical health.

With the continuous development of BD technology, sports leaders can draw conclusions by analyzing and verifying data, which accurately reflect the characteristics of school sports activities and the changes in the health status of young people. It is objective and comprehensive. It can assess the health status of teenagers and solve their health problems, so as to further improve their health level.

2. Overview and Practical Application of BD

(1) Analysis of BD

BD is a huge and growing information asset. It has high decision-making ability, insight and

discovery ability. The traditional database has low timeliness and single data type, while the BD has the advantages of high timeliness, unified data type, high time efficiency, and multiple data types. It successfully solves the defects in the traditional database [15-16].

(2) The feasibility of BD in improving the physical health of young people

The existing physique test data is incomplete and cannot integrate various data. At the same time, traditional testing methods lack data analysis and comparison, and the testing efficiency is low. There is no early warning mechanism, which means that schools and parents would not be able to grasp the health status of young people at the first time, and BD can solve these problems. The potential of obtaining BD on adolescent health is reflected in two main areas. First, with the development of Internet technology, Internet data can contain more information to ensure the integrity of youth health data. Second, with the sharp increase in the number of teenagers, traditional data processing methods are slow and inefficient. BD can be processed quickly and analyzed and compared. The feasibility of BD in improving young people's health is shown in Figure 1.
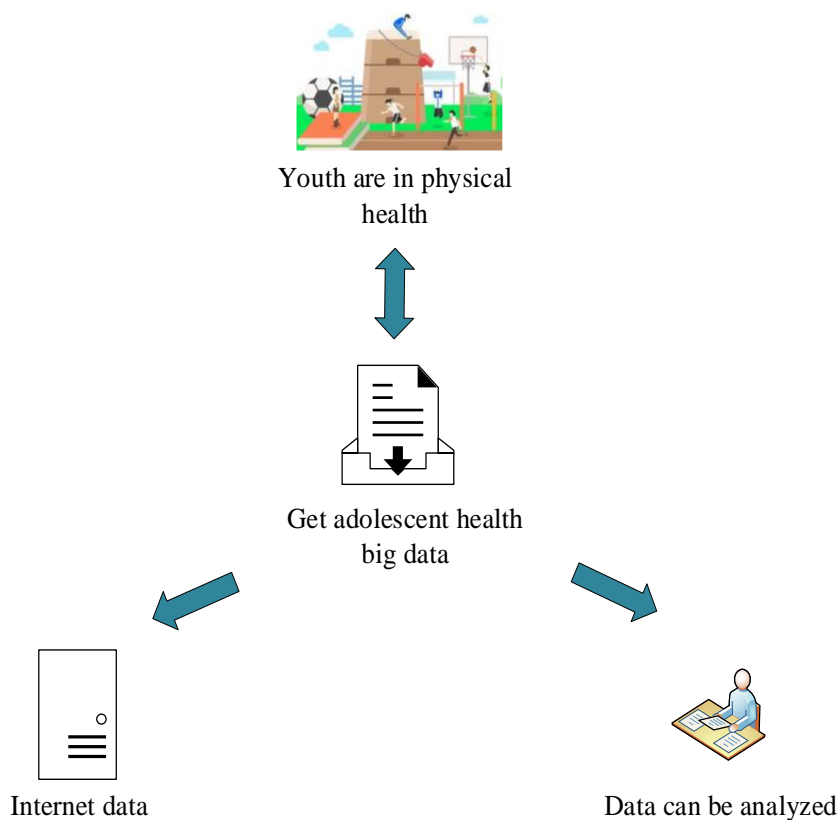

Figure 1. Feasibility of BD in improving the physical health of adolescents

(3) The significance of BD technology in promoting the physical health of young people

With the development of BD information technology, BD has become the infrastructure and standard equipment of all organizations [17-18]. With the increasing application of data in finance, sports, education, health and other fields, BD is also widely used. In recent years, the health of adolescents has become more serious. With the development of network technology, a large amount of data resources can be fully utilized to find new solutions to adolescent health problems. The collection and analysis of a large number of data on adolescents' physical and mental health would help to accurately predict their health status and lay a foundation for improving their physical health.

3. Reasons for the Continued Decline in the Physique of Adolescents

(1) The change of life style and the lack of understanding of the importance of sports

From dynamic to static, outdoor games are the most popular activities for teenagers. These activities not only improve the physical condition of teenagers, but also improve their reaction ability and overall quality. However, TV and computer games have become the favorite activities of teenagers. Teenagers spend most of their days watching TV and playing computer games, and seldom do outdoor activities. In addition, with the rapid updating of transportation tools, the daily exercise of young people has been greatly reduced. Both schools and students put learning first. Arbitrary reduction of school sports activities would reduce the amount of physical activity of teenagers. Nowadays, young people do not attach importance to the importance of physical exercise and lack enthusiasm for sports. After class, students are just doing perfunctory sports. On the surface, it reaches a certain exercise time, but the amount of exercise is far from enough.

(2) Irrational dietary habits and excessive academic burden

In recent years, with the development of economy and the deepening of international trade, the number of product categories has increased rapidly, especially food categories, which attract the attention of modern teenagers. In addition, parents' lack of knowledge about nutrition and teenagers' overeating would cause the rise of fat, protein and kalu, which have led to an increase in the obesity rate of teenagers. At present, the demand for talents in society is growing, and the pressure of competition is growing. Teenagers should study hard. For the future of young people, schools and parents take advantage of the pressure of courses and activities to occupy the time for young people to participate in sports and reduce their rest time, which leads to further deterioration of their physical conditions and may lead to juvenile myopia.

(3) Reasons for the lack of physical health

In recent years, with the rapid development of science and technology, smart phones, tablets and other electronic products are increasingly popular among young people. Many teenagers are used to having mobile phones in their hands, and their heads are everywhere. With the passage of time, teenagers have developed the bad habit of sitting still. This static lifestyle would bring physical problems to young people In addition, parents' overemphasis on children's behavior has led to the neglect of young people's health, and schools' overemphasis on students' performance has increased the learning burden of young people. Too much emphasis on learning, lack of physical exercise and neglect of sports and health would reduce the level of physical activity and physical health of young people. In addition, unhealthy diet is also one of the main causes of adolescent health problems. Excessive consumption of snacks, fast food and other high calorie foods may lead to obesity in young people. In addition, traditional physical testing has not fundamentally solved this problem for a long time, and adolescent health data has not been collected, analyzed, stored and mined. Therefore, the main reason for adolescent health problems is the lack of understanding of adolescent health problems, which is as shown in Figure 2.
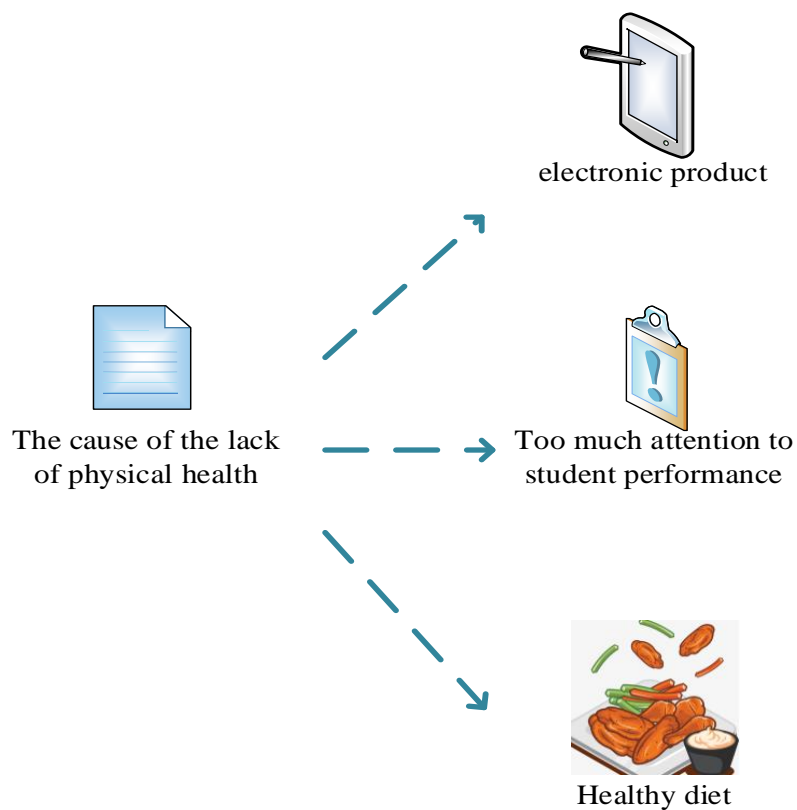
Figure 2. Cause of the lack of physical health

(4) The Influence of Multimedia Technology on Adolescent Health

Teenagers are going through an important stage in shaping their world outlook and values. If they rely on the virtual world of the network for a long time, it would be difficult to get rid of the network, and there would be network diseases, such as excessive Internet addiction, and even alcohol and smoking, which are manifested as mental fatigue, physical discomfort and other symptoms that affect the physical and mental development. Grey information about the network includes pornography, violence and political reaction, and unfiltered information is completely exposed by teenagers. Teenagers' judgment and self-control are relatively weak, which seriously affects their physical and mental health. The impact of multimedia technology on adolescent health is shown in Figure 3.
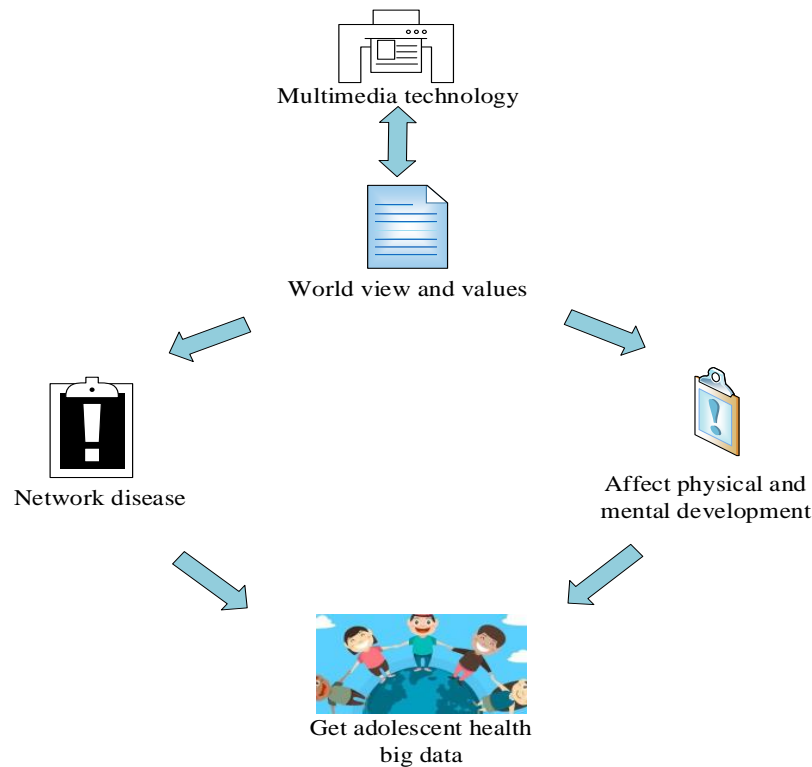
Figure 3. The impact of multimedia technology on adolescent health

4. Application of BD in the Promotion of Young People's Physical Health

(1) Sports goals determined based on BD and development of teenagers' exercise plans

In a broader sense, the concept and technology of data collection emphasize the importance of identifying problems and using data as a strategic framework to solve problems [19-20]. The main goal of school physical education is to improve the physical health of young people and cultivate their sports habits and hobbies. This is not only in line with the basic requirements of school sports, but also in line with the long-term development of young people. In addition to existing data, schools can also use quantitative data to assess student health indicators. By identifying the problems in the indicators, the problems related to youth health indicators can be solved and youth health can be improved. After the BD survey and analysis of students' physical health, a youth training course has been developed. However, the formulation and implementation of youth curriculum should improve the individual performance of young people and make them adapt to their own characteristics and sports needs. On this basis, schools should strengthen the collection, analysis and compilation of data on the characteristics and needs of youth sports, and make rational use of data and information when making youth sports plans, which is shown in Figure 4. Schools should develop sustainable sports programs to improve the physical health of young people. Training time and teaching methods can provide more targeted sports for young people, which can greatly promote positive sports activities rather than negative activities.
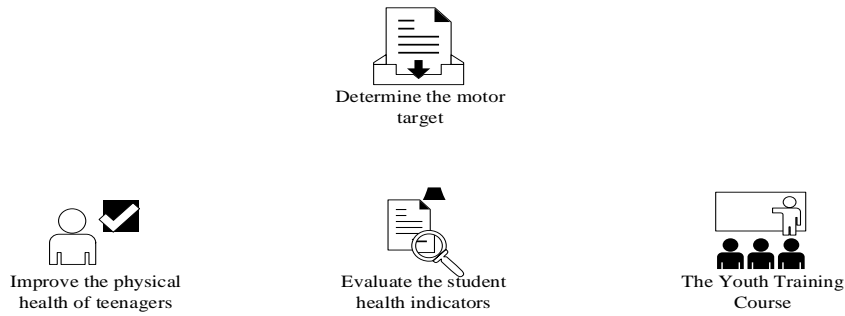
Figure 4. Determine sports goals and develop an exercise plan for adolescents based on BD

(2) Physical education teaching content revised based on BD and goals

Sports are an important means to promote young people's health. When determining the content of physical education, physical education can use quantitative data to further improve the relevance and effectiveness of physical education. Physical education teachers can identify students' physical problems related to endurance, ability and speed according to young people's physical conditions, vital capacity and running time, and then teachers can choose content and teaching methods purposefully. This can effectively meet the particularity and needs of young people in sports and improve the quality of physical education. It would greatly help to strengthen the role of young people in promoting physical health.

(3) BD layout of motion mechanism

Schools need to configure sound sports equipment to create a strong physical exercise environment and encourage young people to participate in sports activities, which can effectively improve the physical health indicators of young people. In terms of sports equipment, schools should increase sports equipment to create an environment conducive to sports and improve the level of young people's sports activities. By providing them with appropriate guidance to participate in sports activities, the health level of young people can be improved. Once the health problems of young people are found in the school data, targeted sports should be carried out to better guide young people's sports behavior and improve their physical health.

5. Application of Random Simulation Algorithm in Promoting the Physical Health of Children and Adolescents

By using the algorithm based on probabilistic random model and calculating the physical condition of each student, this method can produce reliable data conclusions, which is more interpretable and independent for teenagers' physical problems. The physical fitness evaluation is carried out in component mode, and the data is collected and converted. Through the conversion of data, a scheme suitable for the improvement of young people's physique is designed.

It is supposed that there is a multi index evaluation system consisting of n teenagers as evaluation object $w_1, w_2, ..., w_n$ and m indicators $x_1, x_2, ..., x_m$.

$x_{ij} = x_j(x_i)(i = 1, 2, ..., n; j = 1, 2, ..., m)$ is the data value of the evaluated object u_i about indicator x_{ij}, and the evaluation matrix is:

$$\alpha = [x_{ij}]_{nm} = \begin{bmatrix} x_{11}, x_{12}, ..., x_{1n} \\ x_{21}, x_{22}, ..., x_{2n} \\ ..., ..., ..., ... \\ x_{n1}, x_{n2}, ..., x_{nm} \end{bmatrix} \quad (1)$$

Among them, $m, n \geq 3$, and α is the normalization after data processing.

The constitution evaluation process is described as follows:

$$\beta_i = y(x_{i1}, x_{i2}, ..., x_{in}), i \in n \ (2)$$

y is the function value. The physical comparison of $x_{i1}, x_{i2}, ..., x_{in}$ can be completed by

arranging $y_1, y_2, ..., y_n$ from large to small.

It is assumed that α_{ij}, β_{ij} are the advantages of evaluation object $u_i (i \in N)$ on indicator

$x_j (j \in m)$, and they meet the following requirements:

$$\alpha_{ij} = \frac{1}{n-1} \sum_{k=i} (x_{ij} - x_{kj}), i \in n. j \in m, k \in n \ (3)$$

$$\beta_{ij} = \frac{1}{m-1} \sum_{p=j} (x_{ij} - x_p), i \in n. j \in m, k \in m \ (4)$$

$w_i = (w_{i1}, w_{i2}, ..., w_{in}), (i \in n)$ is the dominant weight vector of the indicator:

$$w_{ij} = u(m+1-j) / \sum_{k=1}^{m} u(k) \ (5)$$

The set function represents probability:

$$f(u_i') = \sum_{j=1}^{m} w_j(i', i'') \ (6)$$

$$f(u_i'') = \sum_{j=1}^{m} w_j(i', i'') \ (7)$$

The best exercise plan can be obtained by calculating the above steps. If the dominance matrix

S is recorded as $S_{ij} = s(u_i, u_j)$, then there are:

$$S = [s_{ij}]_{nn} = \begin{bmatrix} s_{11}, s_{12}, ..., s_{1n} \\ s_{21}, s_{22}, ..., s_{2n} \\ ..., ..., ..., ... \\ s_{n1}, s_{n2}, ..., s_{nn} \end{bmatrix} \quad (8)$$

6. Evaluation of the Results Combined with Random Simulation Algorithm and Practical

Application

In order to further the current physical and health conditions of teenagers, four schools were investigated and interviewed to investigate the reasons for the poor physical fitness of students. The schools were divided into: A, B, C, D. In the form of a questionnaire, the survey content mainly summarized four points to investigate the continuous decline in the physical fitness of young people, namely: the use of electronic products, unreasonable eating habits, excessive academic burden, and insufficient exercise. From these four points, the reasons for the continuous decline of teenagers' physique can be analyzed. The number of samples was 400. The survey is shown in Table 1.

Table 1. The reason for the continuous decline of adolescent physical fitness

	A	B	C	D
Electronic products use	83%	63%	72%	68%
Eating habits are not reasonable	71%	65%	63%	57%
Overweight academic burden	76%	74%	66%	81%
Less exercise	82%	79%	86%	84%

It can be seen from Table 1 that among the reasons for the continuous decline of the physical fitness of the students and adolescents in the four schools, the use of electronic products, unreasonable eating habits, excessive academic burden, and insufficient exercise were all high, especially insufficient exercise. Among the reasons that students of School A thought affect their physical fitness, 83% of them used too much electronic products, and 71% of them had unreasonable eating habits; the proportion of overweight academic burden was 76%, and the proportion of insufficient exercise was 82%. Among the reasons that students in School B thought affect their physical fitness, 63% used too much electronic products and 65% used unreasonable eating habits; the proportion of overweight academic burden was 74%, and the proportion of insufficient exercise was 79%. Among the reasons that students in School C thought affect their physical fitness, 72% used too much electronic products and 63% used unreasonable eating habits; the proportion of overweight academic burden was 66%, and the proportion of insufficient exercise was 86%. Among the reasons that students of School D thought affect their physical fitness, 68% of them used too much electronic products, and 57% of them had unreasonable eating habits; overweight academic burden accounted for 81%, and insufficient exercise accounted for 84%.

In order to enhance the physical fitness and health of teenagers, the random simulation algorithm was introduced into daily exercise, diet and life preferences, and BD was used to design improvement strategies for teenagers' physical health. In order to investigate the impact of random simulation algorithms on the physique of young people, this paper investigated four primary and secondary schools that introduced a new strategy to improve physical health. The schools were divided into: A, B, C, D. The students were investigated, and the number of samples was 400. The students' satisfaction with the new physical health improvement strategy was investigated. The evaluation results were divided into three levels: satisfied, average and dissatisfied. The specific effects are shown in Figure 5.
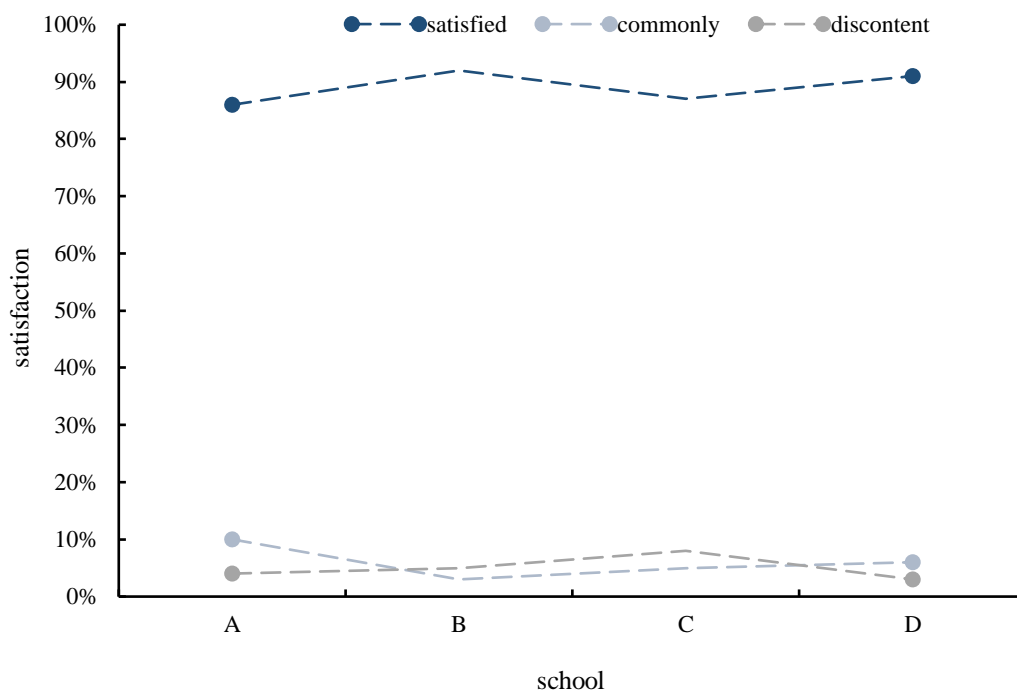
Figure 5. Student satisfaction with the new physical health improvement strategy

In Figure 5, among the new strategies for improving physical health, adolescents had a high degree of satisfaction. The traditional new strategies for improving physical health were relatively backward. It was difficult for young students to improve their enthusiasm to participate in this, and the new strategy to improve physical health had reversed this situation. By starting from the enthusiasm of young people, it had improved the participation of young people, and young people had a high degree of satisfaction with the new physical health improvement strategy. The students of School A were 86% satisfied with the new physical health improvement strategy, and the students of School B were 92% satisfied with the new physical health improvement strategy; the students of School C were 87% satisfied with the new physical health improvement strategy, and the students of School D were 91% satisfied with the new physical health improvement strategy.

Everything has a process. In introducing the new strategy of improving physical health into daily life, this paper re-investigated students in schools A, B, C and D. The reasons for the continuous decline in the physical fitness of these four young people were investigated, including the use of electronic products, unreasonable eating habits, excessive academic burden, and insufficient exercise. The survey results are shown in Figure 6.
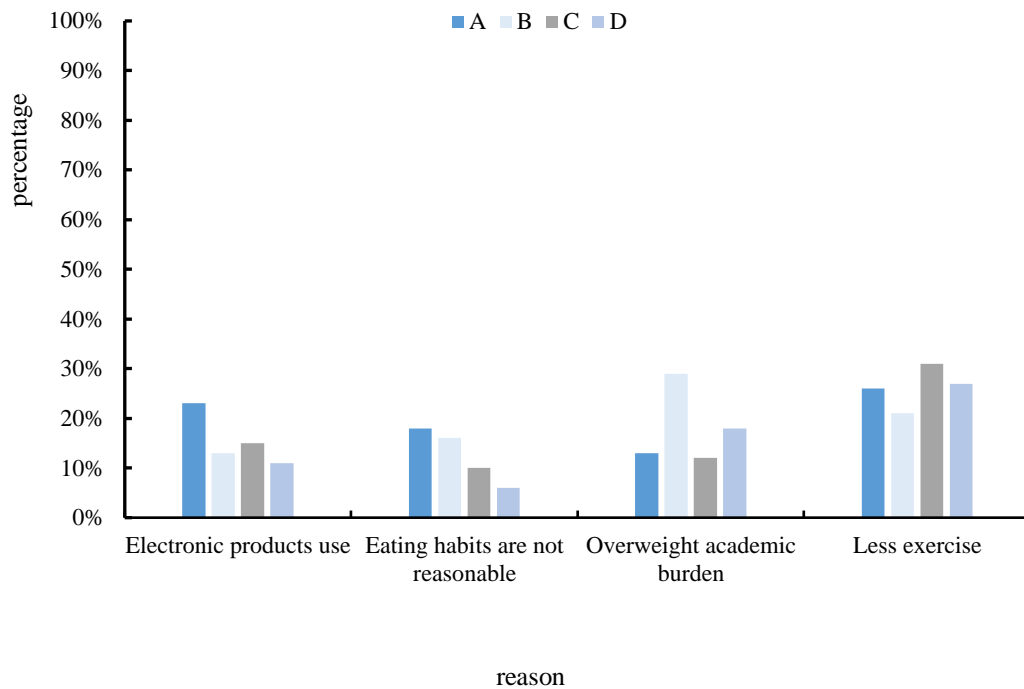
Figure 6. Investigate the causes of adolescent physical decline

According to Figure 6, teenagers' physical decline had been greatly alleviated after being brought into life and school for a period of time through the new strategy of improving physical health. Among the reasons that students in School A thought affect their physical fitness, excessive use of electronic products had decreased by 60%, and unreasonable eating habits had decreased by 53%; the overweight academic burden decreased by 63%, and the lack of exercise decreased by 56%. Among the reasons that students in School B thought affect their physical fitness, excessive use of electronic products had decreased by 50%, and unreasonable eating habits had decreased by 49%; the overweight academic burden decreased by 45%, and the lack of exercise decreased by 58%. Among the reasons that students in School C thought affect their physical fitness, excessive use of electronic products had decreased by 57%, and unreasonable eating habits had decreased by 53%; the overweight academic burden decreased by 54%, and the lack of exercise decreased by 55%. Among the reasons that students in School D thought affect their physical fitness, excessive use of electronic products had decreased by 57%, and unreasonable eating habits had decreased by 51%; the overweight academic burden decreased by 63%, and the lack of exercise decreased by 57%. According to experiments and surveys, the new strategy for improving physical health could improve the physical health of teenagers by 55%.

In order to detect the difference between the new physical fitness improvement strategy and the traditional physical fitness improvement training, the changes of a school under the two physical fitness improvement strategies were investigated. A total of 200 students were investigated for comprehensive evaluation. Among them, there were 100 people in the old and new models, and they adhered to the strategy of improving physical health for four months. Finally, the physical fitness test was conducted. The full score was 100, and it was divided into four grades. 100-85 was excellent, and 84-70 was qualified; a score below 69 was a failure. Through the proportion of scores, the advantages and disadvantages of the two strategies for improving physical fitness were evaluated. The results are shown in Figure 7.
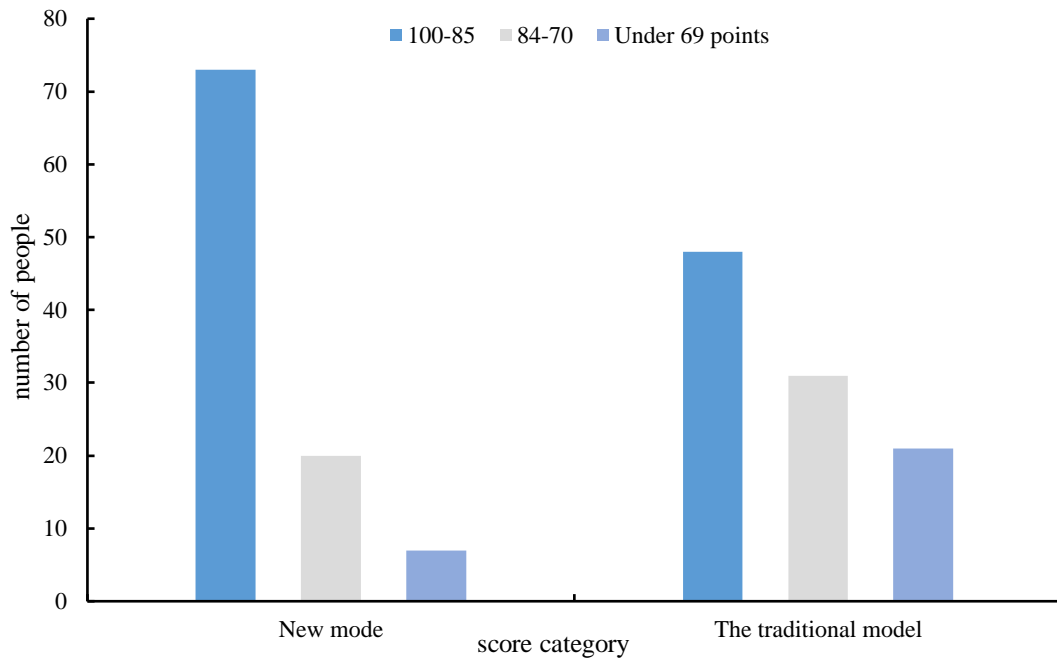
Figure 7. What is the difference between the new physical health improvement strategy and the traditional physical health improvement training

It can be seen from the histogram in Figure 7 that compared with the two strategies for improving physical health, the number of outstanding people in the new strategy for improving physical health was 73, while the number of outstanding people in the traditional strategy for improving physical health was 48. The number of people who failed the new strategy for improving physical health was 7, while the number of people who failed the traditional strategy for improving physical health was 21. The comparison results show that the new strategy for improving physical health can improve the physical quality and health of young people. The new strategy for improving physical fitness can design interesting exercise methods and activity scenes based on BD, and improve the enthusiasm of young people for sports, which can better cultivate young people's healthy physique.

7. Conclusions

The combination of BD and sports is a trend in the future. BD provides new insights for improving the health of young people. Through the research, analysis and derivation of sports health data, BD can help young people make more intelligent sports plans and better serve their health, thus forming a new sports model in a new era. However, as data collection and processing technologies become more effective, BD data protection is facing major challenges, and information protection in BD needs to be further strengthened. The training of sports reserve talents is an important link and hope for the development of national sports. In terms of the new concept and starting point, the consensus on sports should be strengthened, and the regional, project and resource benefits should be fully utilized. It is necessary to expand the channels for talent selection and pay attention to the growth patterns of young people and sports training methods.

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