



# Research and Analysis on Building a Healthy Running Management System for Colleges and Universities in the Context of a Big Data Platform

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**Abstract.** In today's rapid development of "Internet +", big data platform is widely used in various fields of society. The physical health of college students has always been a hot issue in our country, and the decline of college students' physical health has not been greatly improved. In this context, this paper combines the characteristics and needs of college students' physical exercise, describes the design and functions of the healthy running management system, and explores the effect of the use of the healthy running management system. The results show that the healthy running management system can improve students' vital capacity and middle and long-distance running performance, and the teachers and students have a high degree of acceptance of the healthy running management system.

**Keywords:** big data platform; college students; healthy running management system.

## 1 Introduction

The current situation shows that except for one physical education class per week, the vast majority of college students do not engage in other sports, and the physical fitness level of college students is declining year by year. The Outline of the "Healthy China 2030" Plan states: "By 2030, adolescent students should participate in physical activities more than three times a week at a moderate level of intensity, and the rate of excellence in meeting the national physical fitness standards for students should be more than 25%." School sports work should take the improvement of students' physical health as an important goal [1]. Important documents such as the 13th Five-Year Plan for Sports Development also mention the need to utilize the power of big data platforms to achieve better development in various sports fields. The Health Run, also known as the Sunshine Health Run, is a response to the "three walks" for college students carried out by the Ministry of Education, the State General Administration of Sport, the National Federation of Students, and the Central

Committee of the Communist Youth League in colleges and universities across the country. The program is one of the most important initiatives of China's higher education institutions to strengthen physical education and extracurricular exercise by allowing college students to walk off the Internet, out of the dormitory, and onto the playground. Schools require college students to complete a certain number of miles of running outside of physical education classes and include running scores in the final grades of physical education classes. In this context, a healthy running management system has emerged. Cheng L investigated the physical activity behavior of college students with respect to the campus running management system and concluded that the implementation of the campus running APP is conducive to increasing students' motivation to participate in extracurricular physical activity, and the running route planning and tasks of the campus running are helpful for the development of students' exercise plans [2]. Xu Y. Z concluded from his research that the students' extracurricular physical activity is collected through a big data platform, which can be used to urge students to develop healthy and regular running habits and improve their physical fitness and health [3]. Xu X. J concluded that college students can scientifically and reasonably arrange the time for physical exercise and correctly recognize the importance of extracurricular physical exercise, which helps to improve students' physical fitness and develop regular extracurricular physical exercise habits through her research on the use of the healthy running management system in higher vocational colleges and universities [4]. Some scholars have studied the possible role of running on sand for the treatment of overpronation feet [5]. A study has been done to change the pace of healthy running using music [6].

To summarize, there are more theoretical studies on healthy running management systems, but fewer articles on the design and effect of healthy running management systems. This paper analyzes the design, function and effect of using the healthy running management system by using the literature method, questionnaire survey method and mathematical statistics method. By analyzing the data before and after the use of the healthy running management system in a university in Fujian Province, to explore a mode of training to improve the physical quality of college students, and to provide reference for the better application and promotion of the "Healthy Running" management system in the after-school exercise of college students.

## **2 Design of a Healthy Run Management System**

### **2.1 Establishment of a Database of Administrative Classes**

The administrative class database is an important part of the healthy running system. The basic tables used in the system are the student table, the teacher table, the class table, and the course table. The student table includes information such as student number, name, and major; the teacher table includes information such as work number and teacher name.

The relationships between them are: each teacher manages several classes, each class corresponds to one teacher, teacher and class are teaching relationship; each student can take one physical education class per semester, there are several students

in that physical education class, physical education class and students are learning relationship; each teacher teaches several students but each student can only choose one teacher, and there is a professor relationship between teacher and student. There is a one-to-one relationship between classes and physical education classes, and each class corresponds to one PE class.

## **2.2 Establishment of a Database of School Administrators**

The administrator database includes information such as the administrator's name, work number, school notification, and health run rules. Administrators can manage multiple teachers and multiple students, and there is a management relationship. Administrators have the right to log in to the system, manage students, modify teacher information, modify student information, modify student data, print data, and exit the system.

## **2.3 Setting Up Health Run Monitoring Content**

### ***Setting the Time for a Healthy Run***

Set up the running time for students, and set the shortest and longest time ranges for completing a certain distance of running. The system should meet the needs of data collection and data processing for multiple exercise students. feedback on the exercise time to students through graphs, and calculate the total exercise time of students in a semester.

### ***Setting Healthy Running Distances***

Set the total distance that students will complete for each healthy run, plan the specific location of the healthy run, and map the route.

### ***Setting a Healthy Running Pace***

Set the running speed of students and display the running speed of students in that period in real-time. The system should remind students who are below the speed requirement in time to help them adjust their running speed, so as to ensure that students complete each healthy running in accordance with the school's prescribed speed.

### ***Set the Number of Healthy Runs***

Set the number of times a student can run healthily. If a student completes a healthy run according to the specified time, speed, and distance, a valid score will be recorded. At the end of the semester, the system summarizes the valid scores and gives feedback to the teachers.

### **3 The Main Functions of the High School Health-run Management System**

#### **3.1 Basic Information Management Functions**

This function is mainly used to manage students' health information, specifically: entry and view of personal sports data (including age, gender, student number, name, class, major); entry and view of personal sports status data (including personal basic information, maximum heart rate during running, running speed, running time, running distance, etc.); record of the effective number of healthy runs, and view of the running track and whether the current run is effective through the statistical results. Track and whether the current run is valid or not.

#### **3.2 Record Function of Healthy Running Outside Physical Education Classes**

It is mainly used to record each student's health running outside PE class. Students are required to download the Healthy Running App and register for an account to log in after passing the face recognition. Through the GPS positioning system and face recognition system, a punch card point is set up in the school. Students complete the running punch card task according to the requirements, and the healthy running APP will record the relevant data in real time during the running process. After the students finish the running task, the healthy running APP will save and upload the relevant data and achievements of the students during the running process in real time, so that the administrators or teachers can receive the valid data in the background in time.

#### **3.3 Health Status Assessment Function**

This function focuses on assessing the student's health status using a health status assessment model. Based on the information entered by the student such as height, weight, vital capacity, flexibility, etc. the health status of the student is assessed at rest and during exercise.

#### **3.4 Scientific Fitness Recommendation Function**

The system recommends a large number of videos on scientific fitness as well as an introduction to common sense exercise. These videos can be viewed, downloaded and saved by students and teachers. This function shows students the scientific way of physical fitness and prevents them from engaging in bad sports. Scientific fitness methods can effectively avoid the occurrence of sports injuries, diseases of bodily functions, and the decline of will quality [7,8].

## 4 Impact Analysis of the Implementation of the Health-run Management System

Taking the students of a university in Xiamen, Fujian Province as an example, the healthy running management system has been running well for one year without serious anomalies and loopholes. After one year of implementation, a questionnaire survey was conducted on 60 teachers, and the results showed that the teachers were highly satisfied with the health running system. A comparison of students' physical test cores before and after the use of the system shows that there are significant improvements in vital capacity, male 1000 meters and female 800 meters.

### 4.1 Teachers' Evaluation of the Healthy Running Management System

A questionnaire was distributed to 60 teachers to investigate their evaluation of the healthy running management system and the results are as follows:

**Table 1.** Teacher satisfaction survey

target	The number of teachers /person	percentage /%
satisfied	36	60
basically satisfied	18	30
same as	5	8.3
not very satisfied	1	1.7
discontent	0	0

As shown in Table 1: 60% of the teachers were satisfied with the healthy running management system and 30% were basically satisfied. It shows that most of the teachers are still satisfied with the healthy running management system.

### 4.2 The Effect of a Healthy Running Management System on Students' Lung Capacity

Cardiopulmonary function refers to the ability of the human heart inhale oxygen into the lungs after the blood from the heart enters the lungs[9,10].

A one-year "healthy running" experiment was conducted with 300 college students from a university in Fujian Province (the students were required to complete 120 healthy runs in a year, each 2.5 kilometres, at a speed of 5-10 min/km), and the lung capacity of the college students was tested before and after the experiment according to the standards of the National Physical Fitness Standard for College Students. Lung capacity was tested before and after the experiment.

T-tests of two independent samples using SPSS 16.0 on the vital capacity of the students after one year of using the healthy running management system is shown below:

**Table 2.** Pre- and post-comparison of students' spirometry scores

target	Before use $\bar{X}$	After using $\bar{X}$	Z	P
vital capacity	11.70±2.055	13.18±2.015	2.512	0.016

From the data in Table 2, of the 300 university students who participated in the survey, the mean spirometry score was 11.70±2.055 before participating in the healthy running activity and 13.18±2.015 after participating in the healthy running activity. It can be seen that after one year of using the system, the vital capacity of the students improved compared to the previous one, and the T-test result is a significant difference (P<0. 0 5). Cardiopulmonary function refers to the ability of the human heart inhale oxygen into the lungs after the blood from the heart enters the lungs, including the intensity of the heartbeat, the speed of the blood circulation, and the vital capacity and number of times. It indicates that the use of a healthy running system in colleges and universities is more conducive to improving students' vital capacity level.

**4.3 Effect of Healthy Running System on Students' Running Performance**

Three hundred university students were tested on their performance in 800 metres and 1000 metres according to the standards of the National Physical Fitness Standard for Students for university students.

T-tests of two independent samples were conducted using SPSS 16. 0 on the students' performance in 1000 meters and 800 meters after one year using the Healthy Running Management System, and the results are as follows:

**Table 3.** Pre- and post- Comparison of students' performance in middle-distance running

target	Before use $\bar{X}$	After using $\bar{X}$	Z	P
Men's 1000m	69.55±9.322	76.14±5.330	2.844	0.001*
Women's 800 meters	69.09±9.511	72.96±8.374	2.598	0.010

(where an \* indicates a highly significant difference in the data)

From the data in Table 3, it can be seen that after using the healthy running management system for 1 year, the male students' performance on 1000 meters test is significantly higher than that before the use of the system, and the T-test result is a highly significant difference (P<0.01); the female students' performance in 800 meters test is also higher than that before the use of the system, and the T-test result is a significant difference (P<0. 05). It indicates that the use of healthy running system in colleges is beneficial to the improvement of students' middle and long-distance running performance. The main reason for this difference is that students need to complete a certain kilometer running task outside the physical education class, and the number of running times has increased than before. The energy supply of middle and long-distance running is characterised by aerobic metabolic energy supply.300 students performed 120 healthy running exercises per school year, which led to an increase in

aerobic metabolic capacity, and therefore better performance in 800m and 1000m than before.

#### 4.4 Analysis of Students' Self-perception After Using the Healthy Running System

The results of the survey on the students' feelings about using the healthy running management system through the questionnaire method are as follows:

**Table 4.** List of self-feelings after using the health running system (N=566)

Exercise effect	Number of students	percentage
obvious effect	321	57
general effect	178	31
No effect	67	12

By analyzing the data in Table 4, it can be seen that the number of students who think that the effect on themselves is obvious after using the healthy running management system is 57%. Thirty-one percent of the students thought that the healthy running management system had an average effect on their exercise. Twelve percent of the students thought that they did not achieve the effect of exercise after using the system. The data shows that most of the students think that after using the healthy running management system, they still have some effect on themselves, and those who didn't like to exercise before have gradually developed the good habit of running and exercising.

## 5 Conclusions

This paper elaborates on the system background, system settings, and system functions of the construction of college students' sports health running management system, and conducts a questionnaire survey and mathematical analysis on the use effect of the health running system. Through the questionnaire survey and data analysis, it is concluded that: teachers have higher satisfaction with the healthy running management system; most students feel good about themselves when using the healthy running management system; the use of the healthy running management system can improve the level of vital capacity of students; the use of the healthy running management system can improve the performance of students in 800 meters and 1000 meters.

The introduction of the "Healthy Running Management System" is an innovation in the mode of physical education teaching in colleges and universities, which not only improves students' physical fitness, but also provides real-time and effective monitoring of students' extracurricular physical activities.

## References

1. Guo J., Zhang J. S. (2022) Exploration and practice of information technology integration into extracurricular physical exercise systems in colleges and universities. *Sports Science and Technology Literature Bulletin.*, 30: 162-163. DOI:10.19379/j.cnki.issn. j.cnki.issn. 1005-0256.2022.04.046.
2. Cheng L. (2021) A study on the influence of Campus Run APP on college students' physical exercise behavior. *Sports & Style.*, 398: 219-220. <https://kns.cnki.net/>.
3. Xu Y. Z. (2021) Practical research on improving students' physical fitness and health level by utilizing the Sports World campus data platform. *Contemporary Sports Science and Technology.*, 9: 127-129. DOI:10.16655/j.cnki.2095-2813.2019.10.127.
4. Xu X. J. (2021) A survey study on the participation of university students in extracurricular exercise and attitudes towards the Campus Trail Fun Run APP. *Science & Technology of Stationery & Sporting.*, 16: 78-96. <https://kns.cnki.net/kns8s/defaultresult/index?crossids>.
5. Jafarnezhadgero, A., Fatollahi, A., Sheykhholeslami, A. et al. (2021) Long-term training on sand changes lower limb muscle activities during running in runners with over-pronated feet. *BioMed Eng OnLine*, 20: 118. <https://doi.org/10.1186/s12938-021-00955-8>.
6. Lally E M. (2023) Using Music to Modify Step-Rate and Running Biomechanics in Healthy Runners. the University of Wisconsin - Milwaukee ProQuest Dissertations & Theses, 30527992. <https://www.proquest.com/docview/2833522200>.
7. Mu Y. X. (2022) Construction of evaluation index system of physical-motor function in adolescent middle-distance runners and its empirical study in lower limb sports injury. M. A. Capital Institute of Physical Education, Beijing, China. DOI:10.27340/d.cnki.gstxy.2022.000320.
8. Yang Chen, Feng R, Wan X. l et al. (2022) Research progress on the risk factors and interventions of running-related injuries. *Chinese Journal of Sports Medicine.*, 41:484-493.
9. Yang R., Jiang K., Wang W. C et al. (2024) Effects of eight-duanjin on cardiopulmonary function and quality of life of patients with coronary heart disease and chronic heart failure. *Primary Chinese Medicine.*, 3:26-32. DOI:10.20065/j.cnki.btc.20240006.
10. Li G. T., Gao X. J., Wu D. Z et al. (2023) A study of heart rate-oxygen uptake linear index to infer maximal oxygen uptake in 18-25 years old college students. *China Sports Science and Technology.*, 59:55-60. DOI:10.16470/j.csst.2023045.

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