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A Development of Indicators and Physical Health Evaluation System for University Students in Guangzhou City

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Abstract

Background and Aim: The "Student Physical Health Standards" jointly formulated by the Ministry of Education and the State Sports General Administration have been officially implemented in all types of schools at all levels across the country. These tests have some drawbacks: The test method is single； Neglecting individual differences; Physical health tests and scholarships, linked to physical education scores, even lead to graduation failure, causing stress and anxiety; it neglects the cultivation of students' healthy lifestyles, emotional attitudes, and values. It is an important foundation for college education and the physical and mental health of the whole people to achieve new guarantees for the physical health test of college students in Guangzhou. This study is a survey study whose main purpose is to construct a physical health testing system for college students in Guangzhou.

Materials and Methods: This study is survey development research. Through a survey of no sport's major university students from five universities in Guangzhou (Guangzhou University, Guangdong University of Traditional Chinese Medicine, Guangdong University of Foreign Studies, Guangdong University of Technology, and South China University of Technology). 5 experts were interviewed, 7 members of the expert focus group discussed, and 19 Delphi experts conducted two rounds of validation. The Delphi technique and the Analytic Hierarchy Process were combined to calculate indicator weights using a qualitative and quantitative approach. In the Delphi expert correspondence, the importance scores of indicators are scored using the Likert 5-point scale, and the Analytic Hierarchy Process uses the difference in the average importance scores of each indicator to determine the Saaty scale value.

Results: Based on the TPB theory, the development of indicators and a physical health evaluation system for university students in Guangzhou City was constructed. The first level indicators, including physical shape, physical function, and psychological and behavioral health, were unanimously confirmed by 9 expert appraisal team members. There are 13 secondary indicators, including BMI value, body fat content, body shape, lung capacity, pull-ups, sit-ups, 50m, 800m, 1000m, standing long jump, skipping rope, sitting forward bend, and campus health running body shape.

Conclusion: The evaluation system of the physical health tests of college students in Guangzhou is confirmed by TPB theory to be a total of 30 three-level indicators. There are 3 primary indexes, which are physical quality, mental health, and health behavior management. There are 10 secondary indexes, which are body shape, body function, athletic ability, physical quality, etc. Tertiary indicators are 30, respectively, height, weight, BMI, cardiopulmonary function, and so on.

Keywords: Universities; Physical Health Testing; Evaluation System

Introduction

As the future of the country and the hope of the nation, the physical health of university students is directly related to the long-term development of the country and the rise and fall of the nation. In recent years, the problem of declining physical fitness among university students has gradually become prominent, such as an increase in obesity rates, decreased cardiovascular function, and weakened exercise ability. These problems not only affect the quality of life of university students but may also hurt their future careers.

The country attaches great importance to the physical health of students and has issued multiple policy documents, such as the "Opinions of the Central Committee of the Communist Party of China and the State Council on Strengthening Youth Sports and Enhancing Youth Physical Fitness" issued on May 7, 2007, and the revised "National Student Physical Health Standards" in 2014, aimed at promoting the comprehensive development of students' physical health.

The article by Hu (2018) points out that the reason why the issue of physical fitness has received widespread attention from researchers in recent years is mainly due to the strong and close relationship between physical fitness and individual health status. This connection is reflected on multiple levels. Firstly, physical fitness is the foundation of health. Only individuals with good physical fitness possess the various physiological foundations necessary for health, thereby ensuring their health; Secondly, health is an external manifestation of physical fitness. For example, physical fitness cannot be

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observed with the naked eye, so the judgment of a person's physical fitness is often based on the individual's level of health. Based on the "Opinions" released by Lu (2022). the Ministry of Education has put forward the development policy of "taking school sports as the main way to improve and enhance the physical health status of Chinese students". It can be seen that the role of school sports has been thoroughly clarified.

Shang (2022) suggests that by providing opportunities for athletes and coaches to participate in decision-making, their sense of control and participation in sports organizations can be increased, which can enhance their motivation and engagement, promote teamwork and development, and enhance the community of sports projects. Deng (2020). suggests that students who respond negatively may avoid difficulties in physical fitness tests and avoid facing psychological pressure. They may exhibit avoidance, denial, or avoidance behaviors, which may increase psychological stress during testing and lead to a decline in test performance. Li et al (2016). identified regional distribution differences by analyzing and comparing changes in human functional indicators in different regions. Research suggests that lung capacity and step index are important indicators that affect physical fitness levels, and these two indicators are related to altitude.

The research on the physical health evaluation system for university students in Guangzhou City can provide insights into the effectiveness and existing problems of current physical education teaching in universities, and provide strong support for optimizing teaching content, improving teaching methods, and enhancing teaching effectiveness. The release and promotion of research results can provide reference and guidance for the development of the regional sports industry, and can also carry out more targeted sports activities and fitness guidance services, promote the comprehensive development of the regional sports industry, and help to enhance social attention and participation in the physical health issues of university students. Through media reports, expert lectures, and other forms, more people can understand the importance of university students' physical health and how to improve their physical health level through scientific methods.

Objectives

To develop indicators and a physical health evaluation system for university students in Guangzhou City.

Literature Review

Firstly, this paper draws on three theories, namely, Planned Behavior Theory (TPB), Empowerment Theory, and Behaviorism Theory. TPB is concerned with how much control individuals have over their actions and how their intentions affect their actions.

Wang (2017) optimized physical health test indicators as follows: through screening and weight allocation of different physical health test indicators, the evaluation system of physical health tests was optimized to improve the accuracy and practicability of the test. Wang Yueying (2020) and other scholars noted the correlation between university students' spontaneous exercise and neglect of physical education and physical health testing.

Wang & Yang (2019) proposed that environmental, quality, and occupational health and safety management systems should be used to do a good job in the quality control of university students' physical health testing process, to strengthen the management quality of the testing process, improve the sustainability and scientifically of physical health testing management as well as the objectivity and accuracy of test results. Li (2012). Self-esteem, in the field of sports science, refers to a person's evaluation and perception of their ability and performance in sports activities, as well as their awareness of their importance and value in the field of sports. The individual experiences of achievement, recognition, and pride related to their performance in sporting activities.

Wang (2020). Health behavior management refers to the process by which individuals take positive actions and decisions in their daily lives to promote and maintain physical and mental health. As for the management of health behaviors, the scores for smoking and drinking were lower in the survey design. Sleep, eating habits, frequency of sports participation, and diversity of exercise and physical activity are ideal models for health behavior management. Yu et al (2023). The results showed that the main reason for poor physical health test scores was poor physical health index test scores. The mental health degree of students in higher vocational universities is poor, and they are prone to physical symptoms, schizophrenia symptoms, depression, neurosis, and other symptoms, among which depression is the most serious; The total score of physical health test of students in higher vocational university is positively correlated with every single index, and the more psychologically healthy the students are, the better the total score of physical health test is, the stronger the social adaptability is.

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The New Zealand National Health Test includes four measures of body composition, cardiopulmonary function, flexibility, and muscle endurance. In the United States, 7 test indicators (50 meters running, 600 meters running, standing long jump, softball throwing, round-trip running, pull-ups, sit-ups) were selected for physical examination of the national teenagers, and the test standards and indicators were studied.

To sum up, the methods used in studying students' physical health abroad tend to be systematic, scientific, simple, and practical. According to the research of most foreign scholars, in the school environment, mutual support between peers and encouragement are proportional to students' participation in physical exercise. According to David R. Brown's research on residents' participation in physical exercise, information network platform resource sharing plays a significant role in residents' communities. In terms of policy, universities should establish a long-term cooperation mechanism, focusing on teachers' ability training and encouraging parents to take the lead in physical exercise; Develop and design safe walking routes to encourage students to increase physical activity.

Conceptual Framework

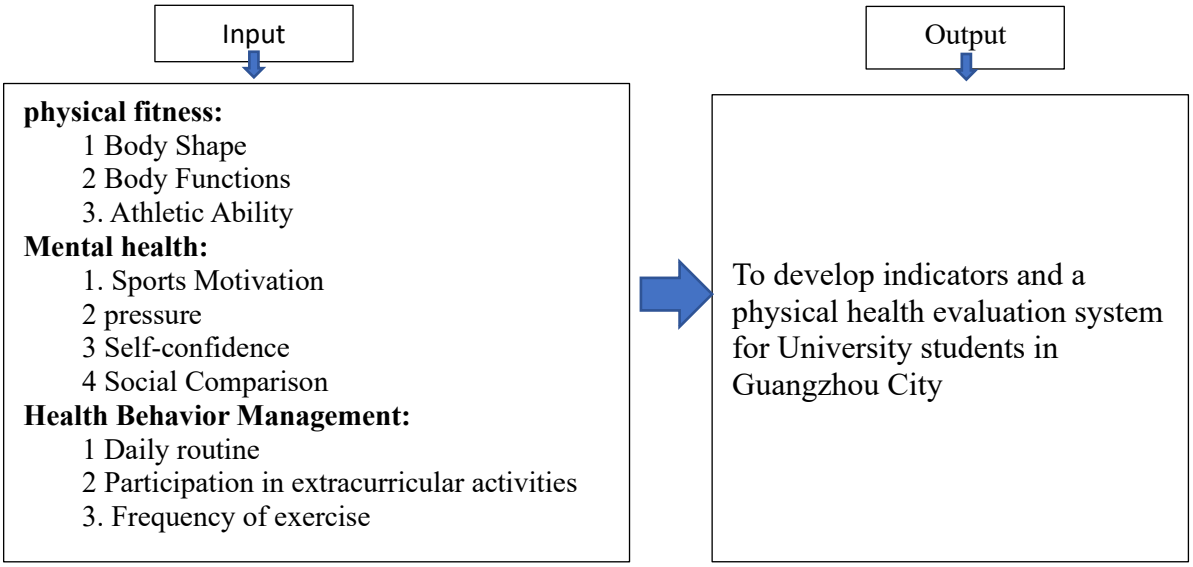

Figure 1 Conceptual Framework

Methodology

This research belongs to the combination of investigation and scientific research theory.

1. Population and sample

1.1 Population size and size

This study covers 5 universities in Guangzhou (Guangzhou University, Guangdong University of Traditional Chinese Medicine, Guangdong University of Foreign Studies, Guangdong University of Technology, South China University of Technology). The respondents were university students from five universities.

1.2 Sample size and confirmation

Taro Yamane1970 carefully designed the calculation method of sample size for non-sports major university students in 5 universities in Guangzhou. In this study, the researchers required a confidence level of 95% and accepted a sample error of 5%. According to the formula, a total of 400 samples were obtained by using non-probability sampling and convenience sampling methods.

1.3 Expert Group

Based on the scale and efficiency of this study, the diversity of expert selection, the needs of specific problems, practical operation, and feedback, etc., the panel is screened by professional background, work experience, age, gender, etc., to ensure that diverse views and opinions can be generated. It can also reduce unnecessary costs and waste of time. The Delphi panel was defined as 19 experts and 7 focus group experts. It includes 5 sports managers, 5 physical health testing experts, 5 professors, and 4 teachers.

2. Research tools

The main research tool used in the study was the expert questionnaire, which consisted of the following three parts:

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1) Expert open questionnaire survey

2) Scoring Scale Questionnaire: A five-level scoring scale (1 to 5) was used to evaluate the level of Chinese university students in all aspects of physical health tests.

3) A questionnaire, based on the consensus reached by the Delphi technique (Rating scale questionnaire) and inspired by the BFS emotional Scale, Physical activity lifestyle questionnaire, Exercise Attitude Scale, and Physical Self-perception Profile (PSPP), is used for university students' self-cognition of physical ability to measure subjective physical ability from various aspects.

3. Data analysis

In this study, SPSS 26.0 software was mainly used to process and analyze the collected data, and a series of statistical analyses were required to deeply explore the characteristics and relationships of the research data.

Results

The development of indicators and physical health evaluation systems for university students in Guangzhou City is based on the TPB theory, mainly focusing on the compliance theory of planned behavior, authorization theory, and behaviorism theory. Through literature review, expert interviews, discussions, and analysis with 7 focus group experts and 19 Delphi experts, the development of indicators and a physical health evaluation system for university students in Guangzhou City was finally confirmed. It consists of three primary indicators: body shape, physical function, and psychological and behavioral health, as well as 13 secondary indicators: body mass index (BMI), body fat content, body shape, lung capacity, pull-up (male), 1-minute sit up (female), 50-meter run, 1000-meter run (male), 800-meter run (female), standing distance jump, 1-minute skipping rope, sitting forward bend, and campus health run. (As shown in Table 1）

Table 1 Physical Health Test Items and Score Weights for University Students

Component	Single indicator	Weight
Body shape	Body Mass Index (BMI)	10%
	Body fat content	10%
	shape	10%
Physical function	vital capacity	5%
	Pull up (male) 1-minute sit-up (female)	10%
	50-meter run	10%
	1000-meter run (male) 800-meter run (female)	10%
	Standing long jump	5%
	1-minute jump rope	5%
	Sit in a forward bend	5%
Psychological and behavioral health	School health run	20%

Body shape is mainly evaluated by measuring key indicators such as height, weight, waist circumference, hip circumference, etc. These indicators comprehensively reflect the basic structure and proportion of the human body and have crucial significance in determining whether an individual's growth and development are normal and whether their body shape is symmetrical. BMI (Body Mass Index) is calculated by dividing weight (in kilograms) by the square of height (in meters), and a value that is too high or too low may be associated with a range of health problems. Body fat content, which refers to the proportion of adipose tissue in the human body, is a core indicator for measuring the degree of obesity. Excessive body fat content not only affects appearance but may also lead to a series of health problems, such as an increased risk of metabolic diseases due to excessive accumulation of abdominal fat.

Physical function is mainly reflected through lung capacity testing, which is one of the important functional indicators for measuring the level of human growth and development. Through lung capacity testing, we can compare the lung ventilation function of similar populations, identify lung diseases, and analyze the impact on students' lungs in the current environment. The pull-up test is

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used to evaluate the development level of upper limb muscle strength in boys, which reflects the strength and endurance of upper limb muscles. The sit-up test is a commonly used indicator to reflect the endurance level of female students' waist and abdominal muscles. It can evaluate the endurance of abdominal muscles and hip muscles and is an important means of assessing the strength of students' core muscle groups. The 50-meter running test is an indicator of students' speed quality, which can test their development level of speed, agility, and nervous system flexibility. The 1000-meter/800-meter test is an important indicator for evaluating students' endurance quality. It can test both aerobic and anaerobic endurance levels of the human body. Through long-distance running tests, we can gain a comprehensive understanding of students' cardiovascular function and endurance levels. The standing long jump test is a physical fitness exercise that combines explosive power, body coordination, and technique. It can reflect students' lower limb explosive power and body coordination, directly reflecting their comprehensive physical fitness level. Finally, the 1-minute skipping rope test reflects a person's agility and coordination, which is a whole-body aerobic exercise that can exercise multiple parts of the body, including cardiovascular function, muscle strength, and endurance.

Psychological and behavioral health is mainly achieved through campus health running. As an aerobic exercise, healthy running can comprehensively exercise students' bodies, effectively improve cardiovascular function, enhance muscle strength and endurance, thereby helping to improve students' physical shape, reduce obesity and poor posture, and comprehensively enhance their overall physical fitness.

Discussion

The results show that an increase in body fat among students is more likely to lead to an increase in various indicators of body shape. The higher the body fat of students, the higher their weight, BMI, waist circumference, hip circumference ratio, and lower their basal metabolism.

Zhu & Dong (2016) surveyed 866 university students using the Big Five Personality Inventory, Exercise Motivation Scale, and Emotion Regulation Scale. The main purpose is to investigate the influence of personality traits on university students' exercise motivation. The research results show that openness, rigor, agreeableness, and extroversion have a positive impact on exercise motivation; There is a significant impact on the self-regulation mode and cognitive level of exercise motivation and emotions among university students, while expression inhibition has a negative impact.

Folkman (1984) found that the coping strategies university students adopt when facing psychological pressure from physical fitness tests have a significant impact on their emotions and test performance. Different coping strategies may have varying impacts on the results of physical fitness tests. One way to cope is to actively respond. Research has found that students who actively respond are more likely to proactively face difficulties and challenges in physical fitness tests. They adopt a positive attitude to cope with psychological pressure, such as self-encouragement and self-affirmation.

Zhang (2020) Taking 48 universities across the country as research objects, this study compared the physical shape, physical function, physical fitness, and physical health before and after participating in health running through experimental testing methods.

In summary, multiple studies by experts and scholars have shown a correlation between students' body fat and their physical fitness and shape. An increase in body fat may lead to an increase in body shape indicators and a decrease in basal metabolism. Sports have a significant impact on the health of university students, as they can enhance physical fitness, promote coordinated development, and improve learning efficiency and physical function. Personality traits have a positive impact on university students' exercise motivation while coping strategies have a significant impact on student's physical fitness test performance and psychological stress. Campus health running, as a widely participated form of exercise, can effectively promote students' physical fitness and health. It is necessary to build a good sports atmosphere, set tasks reasonably, and attach importance to after-school exercise and group activities.

Recommendation

When development of indicators and a physical health evaluation system for university students in Guangzhou City, the system can be further refined and optimized.

1. Deepen the integration and application of theories

Strengthening the refined application of TPB theory (Theory of Planned Behavior): When constructing an evaluation system, not only should attention be paid to compliance with planned behavior, but also in-depth exploration should be conducted on how attitudes, subjective norms, and perceived behavior control affect university students' participation in physical health tests and daily exercise behavior.

2. Optimize the indicator system

Add dynamic assessment: In physical function tests, in addition to static tests (such as lung capacity), dynamic cardiopulmonary function tests (such as VO2max test) can be introduced to comprehensively evaluate students' aerobic capacity. Diversified assessment of psychological and

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behavioral health: In addition to campus health runs, questionnaire surveys, psychological health scales (such as the Self Rating Anxiety Scale and the Self Rating Depression Scale), and tracking of daily exercise habits can be included to assess students' psychological status and exercise behavior from multiple dimensions.

3. Strengthen data collection and analysis

Establish an electronic data platform: Utilize modern technological means such as smart wearable devices, mobile apps, etc. to collect students' daily exercise data, and achieve real-time monitoring and remote transmission of data. Big data analysis: Using big data analysis technology to deeply mine students' physical health data, identify potential health risks, and provide a scientific basis for personalized intervention.

4. Promote personalized intervention and feedback

Personalized health prescription: Based on students' physical health test results, develop personalized exercise, diet, and mental health intervention plans. Regular feedback and tracking: Establish a regular feedback mechanism to enable students to timely understand their physical health status and improvement progress, to enhance their sense of participation and enthusiasm.

5. Enhance the construction of campus sports culture

Enrich campus sports activities: In addition to campus health runs, a variety of sports activities and competitions can also be organized, such as basketball games, football games, fitness gymnastics competitions, etc., to stimulate students' interest in sports. Strengthen publicity and education: Through various channels such as lectures, posters, and social media, promote the importance of physical health, and popularize health knowledge and exercise methods.

6. Strengthen school-enterprise cooperation and academic exchanges

Collaborate with scientific research institutions and medical institutions to jointly conduct research on physical fitness and health, and enhance the scientific and practical nature of the evaluation system. Promote academic exchanges: Regularly hold forums and seminars on physical fitness and health, invite domestic and foreign experts to share the latest research results and practical experience, and promote the continuous improvement and innovation of the evaluation system.

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