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Application of Matlab in Physical Test Score Analysis: Taking C High School as an Example

Hongfang Qin

Meishan Checheng Middle School, Meishan, Sichuan, 620000, China

ABSTRACT
In response to the prevalent issue of data dormancy in the field of middle school physical fitness and health testing, this study employs Matlab to conduct a quantitative analysis of the physical test scores of C High School in Meishan City, Sichuan Province. Based on the analysis, several reasonable suggestions are proposed to provide decision-making support for sports management departments.

KEYWORDS
Matlab; Physical education teaching; Physical test scores; Data analysis

1 Introduction

According to the deployment of the "Healthy China 2030" Plan, the physical health of adolescents is a crucial cornerstone for building a healthy China [1]. Physical education and academic performance are not mutually exclusive. Research has demonstrated that moderate exercise can promote blood circulation, stimulate bone growth, and enhance learning efficiency by relieving stress.

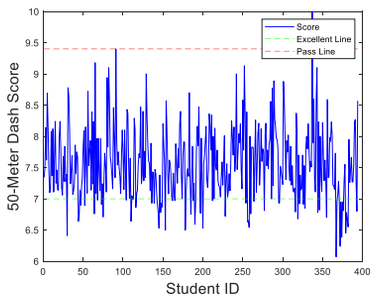
However, the current physical fitness test results of high school students are not optimistic. From 2010 to 2020, there has been a slight improvement in the physical health level of Chinese middle school students, but numerous deficiencies persist [2]. Literature [3] points out that the physical development of Chinese middle school students faces challenges, particularly in strength qualities, which are generally inadequate. Literature [4] collates historical physical test data of middle school students in Hunan, revealing that the performance of male students in pull-ups and female students in sit-ups is far from satisfactory. Literature [5] analyzes the scores of the 2019 physical health test in Taiyuan, Shanxi, and notes significant room for improvement in the endurance of both male and female students. There is still a substantial gap between the current situation and the "Healthy China 2030" goal of having more than 25% of students achieve an "excellent" rating in physical health standards [6]. This phenomenon is attributed to multiple factors: Firstly, the physical fitness testing process in some schools often halts after testing, resulting in a large amount of test data being merely statistically processed without further utilization. Secondly, intervention measures lack precision, as schools often adopt a uniform training model without personalized guidance or the utilization of existing data analysis to formulate targeted intervention plans and strengthen specialized training, thereby failing to consolidate after-school physical education extensions [7]. Consequently, the effectiveness of students' athletic ability improvement is poor. Therefore, it is essential to conduct an in-depth analysis of students' physical test scores, enhance the efficiency of data utilization, and truly activate the endogenous driving force for improving adolescents' physical health. This study utilizes Matlab to analyze the minimum, maximum, pass rate, and excellence rate of high school students' physical test scores, conducts correlation tests on factors influencing the scores, and attempts to provide targeted suggestions.

2 Data source

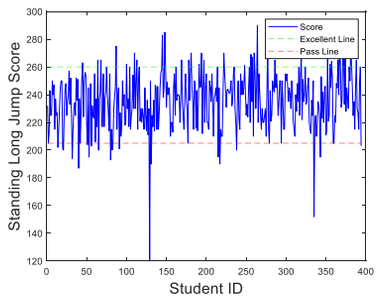
A total of 875 students from 16 classes in the 2023 grade of C High School participated in the physical health test, including 394 males and 481 females. Male students were tested in 50-meter dash, standing long jump, sit-and-reach, 1000-meter run, and pull-ups; female students were tested in 50-meter dash, standing long jump, sit-and-reach, 800-meter run, and one-minute sit-ups. No missing or erroneous tests were recorded, and all scores were deemed valid. Scoring was based on the "National Student Physical Health Standards" [8].

Prior to the test, a questionnaire was designed and distributed to students to investigate factors influencing their performance. The questionnaire was divided into three parts: the first part collected basic information such as name, gender, height, weight, and age; the second part listed 21 questions related to exercise behavior and training, such as "How many times per week have you engaged in lower limb strength training in the past month? ☐ 0 times ☐ 1-2 times ☐ 3-4 times ☐ 5 times or more"; the third part included open-ended questions, such as seeking specific suggestions for improving sit-and-reach performance. A total of 120 questionnaires were distributed, with 118 valid responses received, including 57 from male students and 61 from female students.

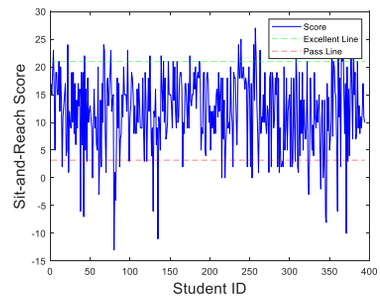
3 Case analysis



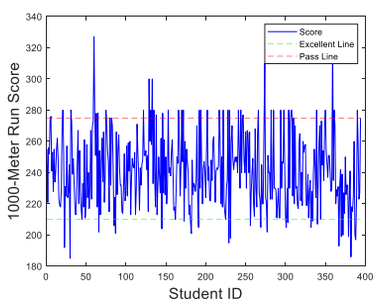
Figures 1 50-meter dash scores of male students



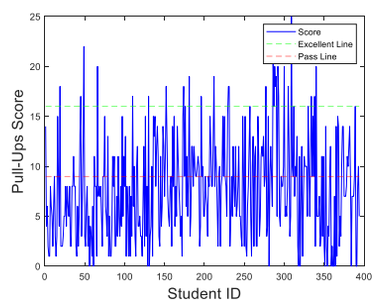
Figures2 Standing long jump scores of male students



Figures3 Sit-and-reach scores of male students

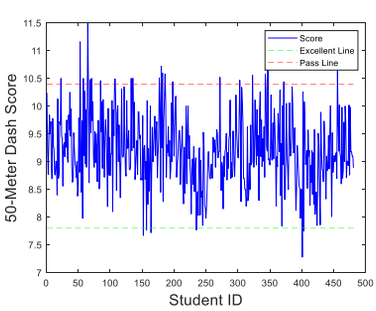


Figures4 1000-meter run scores of male students

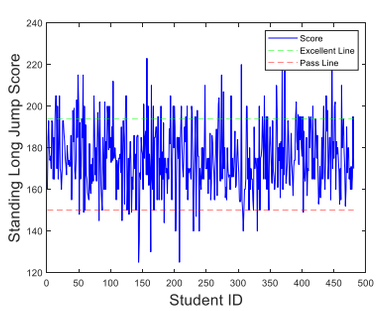


Figures5 Pull-ups scores of male students

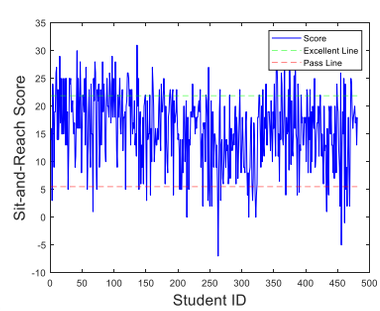
Figures 1~5 illustrate the physical test scores of male students. According to Matlab analysis, the worst and best scores for the 50-meter dash were 10 seconds and 6.07 seconds, respectively, with an average score of 7.56 seconds, a pass rate of 99.49%, and an excellence rate of 17.01%. For the standing long jump, the worst and best scores were 120 cm and 290 cm, respectively, with an average score of 235.18 cm, a pass rate of 94.92%, and an excellence rate of 11.93%. For the sit-and-reach, the worst and best scores were -13 cm and 28 cm, respectively, with an average score of 12.02 cm, a pass rate of 87.06%, and an excellence rate of 8.38%. For the 1000-meter run, the worst and best scores were 327 seconds and 185 seconds, respectively, with an average score of 241.34 seconds, a pass rate of 89.34%, and an excellence rate of 7.87%. For pull-ups, the worst and best scores were 0 and 25, respectively, with an average score of 7.84, a pass rate of 41.12%, and an excellence rate of 8.12%. Male students' physical test scores exhibit characteristics of "significant shortcomings in upper limb strength" and "polarization in physical test items," with weak core strength but notable short-distance running capabilities. A targeted strength improvement plan could be formulated to strengthen basic pull-up training and endurance, improve sit-and-reach flexibility through graded training, and gradually narrow the gap in physical fitness.



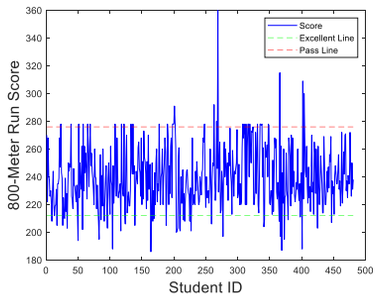
Figures6 50-meter dash scores of female students



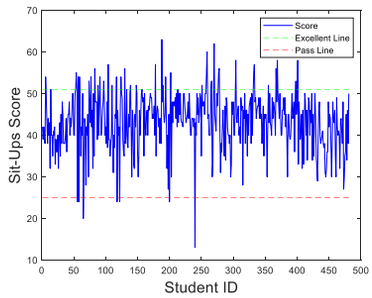
Figures7 Standing long jump scores of female students



Figures8 Sit-and-reach scores of female students



Figures9 800-meter run scores of female students



Figures10 Sit-ups scores of female students

Figures 6~10 illustrate the physical test scores of female students. According to Matlab analysis, the worst and best scores for the 50-meter dash were 11.49 seconds and 7.28 seconds, respectively, with an average score of 9.21 seconds, a pass rate of 95.01%, and an excellence rate of 1.25%. For the standing long jump, the worst and best scores were 125 cm and 230 cm, respectively, with an average score of 175.67 cm, a pass rate of 96.26%, and an excellence rate of 16.42%. For the sit-and-reach, the worst and best scores were -7 cm and 31 cm, respectively, with an average score of 15.82 cm, a pass rate of 91.89%, and an excellence rate of 19.75%. For the 800-meter run, the worst and best scores were 360 seconds and 186 seconds, respectively, with an average score of 239.67 seconds, a pass rate of 92.10%, and an excellence rate of 9.15%. For one-minute sit-ups, the worst and best scores were 13 and 63, respectively, with an average score of 43.16, a pass rate of 98.54%, and an excellence rate of 9.15%. Female students' physical test scores exhibit characteristics of "high pass rates but low excellence rates," with most basic physical fitness indicators meeting standards but lacking in explosive power and endurance. Their strengths lie in flexibility and core strength, suggesting that speed and endurance specialized training could be conducted while maintaining these advantages.

Matlab was also used to analyze the questionnaire results. Thecorrfunction was employed to calculate the correlation coefficients (r-values) between each physical test subject and influencing factors. The r-value typically ranges between -1 and 1, where 1 indicates perfect positive correlation, -1 indicates perfect negative correlation, and 0 indicates no linear correlation. Strong correlations (r-values close to ±1) suggest a high likelihood of direct causality, moderate correlations (r-values around ±0.5) indicate clear intervention directions, weak correlations (r-values around ±0.3) require analysis in conjunction with other variables, and extremely weak correlations (r-values close to 0) may be influenced by confounding factors. The results of the correlation analysis are presented in Table 1.

From the table, it is evident which factors significantly influence the performance in each physical test subject, which factors have less impact, and which are irrelevant. For the standing long jump, the most crucial factor is the frequency of

Table 1 Analysis of factors influencing high school students' physical test scores

Subject	Influencing Factor	Correlation Coefficient	Correlation Direction	Strength
Standing Long Jump	Lower Limb Strength Training Frequency	0.57	Positive	Moderate
Standing Long Jump	Ankle Joint Flexibility	0.32	Positive	Weak
Standing Long Jump	Pre-test Tension Level	-0.14	Negative	Extremely Weak
Sit-and-Reach	Stretching Training Frequency	0.58	Positive	Moderate
Sit-and-Reach	Weight/Height^2	-0.43	Negative	Moderate
Sit-and-Reach	Clothing Restrictions During Test	-0.21	Negative	Weak
50-Meter Dash	Short-Distance Sprinting Training Frequency	-0.58	Negative	Moderate
50-Meter Dash	Sleep Deprivation	0.38	Positive	Weak
50-Meter Dash	Body Fat Percentage	0.29	Positive	Weak
800-Meter Run	Long-Distance Running Training Volume	-0.58	Negative	Moderate
800-Meter Run	Sleep Quality	0.41	Positive	Moderate
800-Meter Run	Pre-test Meal Intake	-0.28	Negative	Weak
1000-Meter Run	Long-Distance Running Training Volume	-0.59	Negative	Moderate
1000-Meter Run	Sleep Quality	0.42	Positive	Moderate
1000-Meter Run	Pre-test Meal Intake	-0.27	Negative	Weak
One-Minute Sit-Ups	Core Area Training Frequency	0.56	Positive	Moderate
One-Minute Sit-Ups	Waist-to-Hip Obesity Level	-0.42	Negative	Moderate
One-Minute Sit-Ups	Body Flexibility	0.06	Positive	Extremely Weak
Pull-Ups	Upper Limb Strength Training Frequency	0.68	Positive	Strong
Pull-Ups	Grip Strength	0.71	Positive	Strong
Pull-Ups	Record of Limb Injuries	-0.22	Negative	Weak

lower limb strength training. For the sit-and-reach, the most crucial factor is the frequency of stretching training, with a lower weight/height^2 ratio also contributing to better performance. For the 50-meter dash, the most crucial factor is the frequency of short-distance sprinting training. For the 800-meter and 1000-meter runs, the most crucial factors are the volume of long-distance running training, with sleep quality also being highly significant. For one-minute sit-ups, the most crucial factor is the frequency of core area training, with performance also being influenced by the waist-to-hip obesity level. For pull-ups, the most crucial factors are the frequency of upper limb strength training and grip strength. The data confirms that training can significantly enhance physical performance, but the training must be targeted. Students should be encouraged to control their BMI and maintain a slender physique. Additionally, ensuring adequate rest time and good sleep quality are beneficial for improving performance.

3 Conclusion

This study confirms the feasibility and effectiveness of using Matlab for analyzing physical test score data and attempts to provide targeted suggestions to support decision-making by sports management departments. Through comprehensive analysis of physical test data, schools can identify various factors influencing students' performance and better formulate physical training plans, thereby promoting effective improvement in students' physical health. Meanwhile, it is essential to strengthen the training of physical education teachers, ensuring that they can tailor their teaching methods to individual student needs and better implement the requirements of the "Healthy China 2030" Plan, contributing to the modernization construction.

About the Author

Hongfang Qin, born in 1995, female, Han ethnicity, from Dazhu, Sichuan, holds a Master's degree in Physical Education and is a teacher at Meishan Checheng Middle School, Sichuan Province. Her research interests include physical education teaching and sports training.

References

[1] State Council's Opinion on Implementing the Healthy China Action [J]. Official Gazette of the People's Republic of China, 2019(21): 17-21.

[2] Chen Jinghui, Li Shanshan. Current Situation and Countermeasures of Middle School Students' Physical Health Under the Background of Building a Sports Power [J]. Contemporary Sports Technology, 2021, 11(07): 241-243.

[3] Shen Shuo, Li Chunlei, Jin Li, Ming Anhua. Investigation and Analysis of the Current Situation of Middle School Students' Physical Health in Hubei Province in 2016 [C]//. Abstracts of the 2019 Annual Meeting of the Chinese Physiological Society and the 15th National Young Outstanding Physiological Academic Paper Exchange Conference of the Zhang Xijun Fund and the 13th National Young Physiological Workers' Academic Conference. [Publisher Unknown], 2019: 476-477.

[4] Mai Jia. Analysis and Research on the Current Situation of Middle School Students' Physical Health in Hunan Region [J]. Journal of Hunan First Normal University, 2018, 18(03): 104-109.

[5] Fan Chenxi. Analysis of Influencing Factors and Promotion Countermeasures for Middle School Students' Physical Health in Taiyuan City [D]. Shanxi University, 2020.

[6] The CPC Central Committee and the State Council Issue the "Healthy China 2030" Plan Outline [Internet]Available from:https://www.gov.cn/zhengce/2016-10/25/content_5124174.htm.

[7] Sun Jun, Luo Qiulan, Luo Xiaobing. High-Quality Development of Primary and Secondary School Physical Education in China Under the "Double Reduction" Policy: Key Points, Difficulties, and Directions [J]. Journal of Guangzhou Sport University, 2023, 43(2): 44-51.

[8] Ministry of Education's Notice on Issuing the "National Student Physical Health Standards (Revised in 2014) [Internet]Available from: http://www.moe.gov.cn/s78/A17/twys_left/moe_938/moe_792/s3273/201407/t20140708_171692.html.